EVANS, Thomas Parker, 1934-
AN EXPLORATORY STUDY OF THE VERBAL AND
NON-VERBAL BEHAVIORS OF BIOLOGY TEACHERS
AND THEIR RELATIONSHIP TO SELECTED PERSON-
ALITY TRAITS.

The Ohio State University, Ph.D., 1968
Education, general

University Microfilms, Inc., Ann Arbor, Michigan

© Copyright by
Thomas Parker Evans
1968
AN EXPLORATORY STUDY OF THE VERBAL AND NON-VERBAL BEHAVIORS OF BIOLOGY TEACHERS AND THEIR RELATIONSHIP TO SELECTED PERSONALITY TRAITS

DISSERTATION
Presented in Partial Fulfillment of the Requirements for the Degree Doctor of Philosophy in the Graduate School of The Ohio State University

By
Thomas Parker Evans, B.A., M.A.

* * * * * *

The Ohio State University
1968

Approved by

[Signature]
Adviser
College of Education
PREFACE

THE UNIQUE NATURE OF THE STUDY

The study reported in this dissertation and a study by Mr. Abe LeVon Balzer were parallel in part. The two researchers worked together on arrangements with school systems and teachers, video tape recording in the classrooms, instrument development, and observer agreement. Each researcher made his own record of the data and analyzed the data in light of his own problem statements. The reports were written separately and, consequently, are not the same. Details pertaining to those areas of investigation that were accomplished jointly and those that were accomplished independently are reported in Chapters I and III.
ACKNOWLEDGMENTS

The present study would not have been possible without the assistance and cooperation of many people. The writer wishes to express his appreciation to the following:

To Professor John S. Richardson for the encouragement and direction he gave me throughout my work at The Ohio State University.

To Professor Paul R. Klohr and Professor Herbert L. Coon for their guidance as members of my doctoral advisory committee.

To Professor James K. Duncan and Professor Herbert L. Coon for their constructive criticism and willingness to serve on the reading committee for the dissertation.

To the teachers and administrators of the participating schools whose willingness made this investigation possible.

To LeVon Balzer and Jack Matthews whose studies were, in part, parallel with the present study.

To my parents, Alma and William Francis, who gave me constant encouragement.

To my wife, Rebecca, for her valuable encouragement and assistance throughout all phases of my graduate program.

To my children, Michael and Teresa, for their patience and understanding.
VITA

March 5, 1934
Born - Martin, Kentucky

1957 . . . .
B.A., Transylvania College, Lexington, Kentucky

Science Teacher, Lexington, Junior High School, Lexington, Kentucky

1962 . . . .
M.A. in Education, University of Kentucky, Lexington, Kentucky

1965-1968 . .
Teaching Associate, College of Education, The Ohio State University, Columbus, Ohio

FIELDS OF STUDY

Major Field: Education

Studies in Science Education. Professor John S. Richardson

Studies in Teacher Education. Professor Herbert L. Coon

Studies in Curriculum and Supervision. Professor Paul R. Klohr
# CONTENTS

<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>PREFACE</td>
<td>11</td>
</tr>
<tr>
<td>ACKNOWLEDGMENTS</td>
<td>iii</td>
</tr>
<tr>
<td>VITA</td>
<td>iv</td>
</tr>
<tr>
<td>TABLES</td>
<td>vii</td>
</tr>
<tr>
<td>ILLUSTRATIONS</td>
<td>ix</td>
</tr>
<tr>
<td>Chapter I. INTRODUCTION</td>
<td>1</td>
</tr>
<tr>
<td>Basic Assumptions</td>
<td></td>
</tr>
<tr>
<td>The Problem</td>
<td></td>
</tr>
<tr>
<td>Definition of Terms</td>
<td></td>
</tr>
<tr>
<td>Need for Study</td>
<td></td>
</tr>
<tr>
<td>Limitations of the Study</td>
<td></td>
</tr>
<tr>
<td>Delimitations of the Study</td>
<td></td>
</tr>
<tr>
<td>Design of the Study</td>
<td></td>
</tr>
<tr>
<td>Organization of Remainder of Study</td>
<td></td>
</tr>
<tr>
<td>II. BACKGROUND AND RELATED LITERATURE</td>
<td>25</td>
</tr>
<tr>
<td>Measuring Classroom Behavior by Systematic Observation</td>
<td></td>
</tr>
<tr>
<td>Personality and the Guilford-Zimmerman Temperament Survey</td>
<td></td>
</tr>
<tr>
<td>Correlation of Personality Traits and Teacher Behavior</td>
<td></td>
</tr>
<tr>
<td>III. DESIGN OF THE STUDY</td>
<td>119</td>
</tr>
<tr>
<td>Selection of Pilot Sample</td>
<td></td>
</tr>
<tr>
<td>Pilot Recording</td>
<td></td>
</tr>
<tr>
<td>Instrument Development</td>
<td></td>
</tr>
<tr>
<td>Method of Encoding Behavioral Data</td>
<td></td>
</tr>
<tr>
<td>Inter-Observer Agreement</td>
<td></td>
</tr>
<tr>
<td>Selection of Study Sample</td>
<td></td>
</tr>
<tr>
<td>Data Collection</td>
<td></td>
</tr>
<tr>
<td>Analyses of Data</td>
<td></td>
</tr>
</tbody>
</table>

v
CONTENTS--Continued

Chapter IV. THE STUDY ........................................... 144

Purposes
Review of Procedure
Handling of Data
Hypothesis One
Hypothesis Two
Findings Not Directly Related to Hypotheses
Summary

V. SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS . 187

Summary
Conclusions
Recommendations

Appendix
A. Biology Teacher Behavior Inventory ............ 216
B. Data Record ........................................... 246
C. Master Data Record ................................. 248
D. A General Description of Requested Research Resources and Opportunities ............ 252
E. Observer Agreement Data Record ............... 255

BIBLIOGRAPHY ............................................. 257
# TABLES

<table>
<thead>
<tr>
<th>Table</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Amount of Observational Time and Number of Ten-Second Time Intervals</td>
<td>149</td>
</tr>
<tr>
<td>2. Inter-Observer Agreement</td>
<td>161</td>
</tr>
<tr>
<td>3. Correlation Coefficients Between Selected Personality Traits and Categories of Teacher Classroom Behavior</td>
<td>168</td>
</tr>
<tr>
<td>4. Correlation Coefficients Between Selected Personality Traits and Major Subcategories of Teacher Classroom Behavior</td>
<td>170</td>
</tr>
<tr>
<td>5. Correlation Coefficients Between Selected Personality Traits and Subcategories of Management</td>
<td>171</td>
</tr>
<tr>
<td>6. Correlation Coefficients Between Selected Personality Traits and the Subcategories of Control, Release, and Goal Setting</td>
<td>172</td>
</tr>
<tr>
<td>7. Correlation Coefficients Between Selected Personality Traits and Subdivisions of Content Development</td>
<td>174</td>
</tr>
<tr>
<td>8. Correlation Coefficients Between Selected Personality Traits and Subcategories of Teacher Centered and Student Centered Content Development</td>
<td>175</td>
</tr>
<tr>
<td>9. Correlation Coefficients Between Selected Personality Traits and Subcategories of Affectivity</td>
<td>176</td>
</tr>
<tr>
<td>10. Correlation Coefficients Between Selected Personality Traits and Communication Acts Within Content Development</td>
<td>178</td>
</tr>
<tr>
<td>11. Correlation Coefficients Between Selected Personality Traits and Forms of Expression</td>
<td>173</td>
</tr>
</tbody>
</table>
### TABLES-Continued

<table>
<thead>
<tr>
<th>Table</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>12. Correlation Coefficients Between Selected Personality Traits and the Verbal and Non-Verbal Behaviors of Biology Teachers</td>
<td>179</td>
</tr>
<tr>
<td>13. Percentage of Teacher Behaviors in Various Categories</td>
<td>182</td>
</tr>
<tr>
<td>14. Percentage of Total Behaviors in Major Subcategories</td>
<td>183</td>
</tr>
<tr>
<td>15. Percentage of Communication Acts Within Content Development</td>
<td>184</td>
</tr>
<tr>
<td>16. Percentage of Teacher Behaviors in the Various Forms of Expression</td>
<td>185</td>
</tr>
</tbody>
</table>
ILLUSTRATIONS

<table>
<thead>
<tr>
<th>Figure</th>
<th>Description</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Paradigm for Research on Teaching</td>
<td>2</td>
</tr>
<tr>
<td>2.</td>
<td>Paradigm for Research in Teacher Effectiveness</td>
<td>3</td>
</tr>
<tr>
<td>3.</td>
<td>Personality-Behavior Paradigm for Research on Teaching</td>
<td>7</td>
</tr>
<tr>
<td>4.</td>
<td>Observation Blank</td>
<td>31</td>
</tr>
</tbody>
</table>
CHAPTER I

INTRODUCTION

According to N. L. Gage (32), concern for teacher effectiveness has long dominated the conceptions that most research has brought to the field of teaching. This is not surprising when one considers the significance of such research. A valid criterion or criteria for teacher effectiveness might well revolutionize our present educational system. Regardless of the voluminous amount of research, there still exist no commonly agreed upon standards which will suffice as consistent predictors of teacher effectiveness. According to Biddle and Ellena many of the decisions that are made in this area still depend completely on past experience and intuition. The existing research pertaining to teacher effectiveness is largely contradictory and inconsistent. Today, we do not know how to select, encourage, train for, or evaluate teacher effectiveness (14,p.vi).

In analyzing the existing research in the area of teacher effectiveness, one sees most frequently the following paradigm (32,p.114).
The dependent variable in this paradigm is the criterion of teacher effectiveness, and the task becomes one of determining or measuring this criterion, measuring the potential correlates of this criterion, and determining statistically the correlations between the criterion and its potential correlates. Researches using this paradigm have numbered in the hundreds and have yielded thousands of correlations. Nevertheless, for the most part, these studies have produced disappointing results (32,p.114).

As a result of the lack of success using the preceding paradigm, Mitzel has suggested the following paradigm, Figure 2, for the researching of teacher effectiveness (32,p.119).

Figure 2 illustrates four types of variables or classes of information that are necessary concerns of the researcher who seeks fundamental knowledge concerning teacher effectiveness. The paradigm is presented, not because it is assumed to be ideal, but because it makes the provision for classroom behaviors, a crucial factor in studying teacher effectiveness. The importance of this variable is further elucidated by Biddle and Ellena in Contemporary Research on Teacher Effectiveness (14,p.20).
It is unlikely . . . that significant advances will be made in understanding teacher competence [effectiveness] without a clearer picture of teacher behavior and its effects.

It seems apparent that the actual behavior of the classroom teacher is such a crucial factor in teacher effectiveness that it is necessary to devise means of observing and recording this behavior. The paradigm reveals that teacher classroom behavior is extremely important for educational research in the area of teacher effectiveness.

![Fig. 2.—Paradigm for Research in Teacher Effectiveness](image-url)
Mitzel's paradigm does not suggest that there have been no previous attempts at studying teacher classroom behavior. Nothing could be further from the truth. He is simply pointing out the importance of this variable in studying teacher effectiveness. There have been several attempts to classify objectively and record classroom behavior before and after the development of Mitzel's paradigm. One of the earliest attempts can be traced back before World War I. At that time, Horn (49) developed a device primarily to record student behavior, although he made some provision for systematically recording the teacher's classroom behavior. Other attempts have been made since that time; among these are: Pluckett (76) in 1928, Barr (68) in 1929, Horn (49) in 1929, Wrightsone (91) in 1934, Anderson and Brewer (4) in 1945, Withall (89) in 1949, Medley and Mitzel (67) in 1958, Flanders (27) in 1959, Hughes and associates (53) in 1959, Galloway (33) in 1962, and Parakh (75) in 1965.

Regardless of the numerous researches which have been completed, there is still a need for additional research in the area of teacher classroom behavior. Reasons for this statement are many. For example, both Withall and Flanders were interested in only verbal behavior. They worked on the assumption that the verbal behavior of the teacher was an adequate sample of the teacher's total classroom behavior. Galloway, on the
other hand, dealt with only the teacher's non-verbal behavior, although he made it clear that he felt this non-verbal behavior was not an adequate sample of the teacher's total classroom behavior. These two studies made significant contributions to the research in education. However, they did leave out important aspects of the teacher's total classroom behavior.

It would seem that both the verbal and the non-verbal behavior of the teacher should be studied if significant findings are to be expected. Hall suggests this point in *The Silent Language* (p. 15).

In addition to what we say with our verbal language we are constantly communicating our real feelings in our silent language—the language of behavior.

Although Hall is making a plea for non-verbal behavior, it seems that the one supports the other. Either taken separately is incomplete.

Many of the earlier studies were partially hampered because of the lack of recording devices, such as the video-recorder, which would allow researchers to permanently record the classroom behaviors. Had such a device been available, the studies could be re-verified and used for comparisons with recent observations. Higher reliability scores might have been possible. In addition, observers could see the classroom situations repeated and be more confident that important behaviors
had not been overlooked in the original study. However, because of the impossibility of again seeing the actual classroom behaviors, further research in this area becomes a necessity.

The final argument to be made for developing additional observation and recording devices for teacher classroom behavior is supported by the following quotes by Jackson (53,p.107) and Biddle and Ellena (14,p.20).

One point, though fairly obvious, needs special emphasis: no single set of observational categories including the ones described here is adequate to capture the complexity of the classroom. To answer any question of educational significance, it is probable that many observational devices will be required.

... A general classification of teacher behavior appropriate to the study of effectiveness has not been advanced ...

These men point out the need for additional research involving the development of a reliable category system for systematically observing and recording teacher classroom behaviors.

According to Mitzel, Figure 2, personality is one of the components that make up teacher classroom behavior. Certainly the assumption that there is a relationship between a person's personality, his unique pattern of traits, and his behavior can be supported by reviewing the literature on the subject. Guilford provides evidence, which supports this point of view, in the following statement (40,p.38).
Perhaps something needs to be said in defense of our reference to personality traits as determiners of behavior, which implies that they are "causes." It is not uncommon to look upon traits in this manner. G. W. Allport (1937), for example, refers to traits as "determining tendencies," or long range mental sets, or dispositions of readiness to behave in certain ways. To those who are reluctant to think in terms of "causes," let us say that all we need to mean is that behavior can be partially accounted for, or predicted by, these personal properties called traits. It is not necessary to assume that traits by themselves can bring about behavior or even account for its properties. Behavior does not occur without temporary instigating forces provided by drives or motives on the one hand and by external stimulation on the other. Behavior is a joint product of temporary organic conditions, the situation, and personality traits, all operating together at the moment.

The paradigm, and the accompanying explanation, further suggests that teacher personality is an independent variable and directly affects the teacher's classroom behavior, the dependent variable. By concentrating on just these two variables and placing aside the total idea of teacher effectiveness, the following paradigm can be envisioned.

<table>
<thead>
<tr>
<th>Teacher Personality</th>
<th>Teacher Classroom Behavior</th>
</tr>
</thead>
<tbody>
<tr>
<td>Independent Variable</td>
<td>Dependent Variable</td>
</tr>
</tbody>
</table>

Fig. 3.—Personality-Behavior Paradigm for Research on Teaching
Assuming the relationship in Figure 3 to be true, one should be able to find high positive correlations between selected measures of personality and the way a teacher behaves in the classroom. However, attempts to find high positive correlations have not met with success. Therefore, it seems important that further research be accomplished in this area if the total concept of teacher effectiveness is ever to be realized.

**Basic Assumptions**

The following assumptions are inherent in this study.

1. Teacher verbal and non-verbal behavior that affect student behavior can be identified and recorded.

2. Verbal behavior by itself is not an adequate sample of the teacher's total classroom behavior.

3. Observed teacher verbal and non-verbal behavior may be classified into categories according to inferred intent.

4. Certain aspects of personality can be measured by the **Guilford-Zimmerman Temperament Survey**.

5. There is a relationship between one's personality and his behavior.

6. An individual's personality is composed of his own unique pattern of traits.

7. An individual's traits, once developed, are fairly consistent or stable through time.
Statement of Problem

An investigation of teacher effectiveness is beyond the scope of this particular research because of the complexity and difficulty of the task. However, this research does investigate two important aspects of the teacher effectiveness paradigm suggested by Mitzel. First, an attempt is made to observe, categorize, and record teacher behavior, both in the regular classroom and in the laboratory. Second, an attempt is made to determine the relationships that exist between certain personality traits and teacher classroom behavior. In this study, no value judgments are made concerning the behaviors and or the selected personality traits which the teachers may exhibit. The teachers remain anonymous. It simply is an effort to identify and record teacher behaviors in the classroom and the laboratory and correlate these behaviors to selected personality traits. In other words, the purposes of this study are as follows:

1. To develop a reliable category system for first hand systematic observation of the verbal and non-verbal behaviors of high school biology teachers in both classroom and laboratory instructional situations.

2. To determine the relationship between selected personality traits and the verbal and non-verbal behaviors exhibited by high school biology teachers in both classroom and laboratory instructional situations.
Hypotheses

The hypotheses to be tested in this study are as follows:

1. A reliable category system for first-hand systematic observation of the verbal and non-verbal behaviors of high school biology teachers, in both classroom and laboratory instructional situations, can be developed.

2. There is a significant positive correlation between selected personality traits and the verbal and non-verbal behaviors exhibited by high school biology teachers in both classroom and laboratory instructional situations.

Definition of Terms

The following definitions are presented to clarify the meaning of the various terms as they are used in the problem statement and hypotheses.

1. Reliability is defined as inter-observer agreement, which is calculated using the Scott formula for inter-observer agreement. \( \Pi_1 \), or inter-observer agreement, is the ratio of the amount that two observers exceed chance agreement to the amount that perfect agreement exceeds chance (78).

2. A category is defined as a class or division into which specific behaviors are classified. The boundaries or limits of a category are explicit, i.e., a category
includes certain behaviors and excludes all others.

3. A category system is "... a set of categories into one and only one of which every behavior of a certain type can be classified" (68, p.299).

4. Biology teacher is any teacher identified by the superintendent or science supervisor of the school systems involved as a teacher of biological science, including biology, physiology, zoology, and botany, in grades nine through twelve. In this study, all biology teachers taught a minimum of four periods of biological science per day during a five-day week.

5. A trait "... is any distinguishable, relatively enduring way in which one individual differs from another" (40, p.2). It refers to consistent patterns of actions or underlying depth characteristics of personality.

6. Personality is a particular or unique pattern of traits which an individual exhibits in his behavior. It is "... that organization of unique behavior equipment an individual has acquired under the special conditions of his development" (65, p.8).

7. Selected traits are the ten traits which are measured by the Guilford-Zimmerman Temperament Survey. These traits are: 1) General activity, 2) Restraint, 3) Sociability, 4) Emotional stability, 5) Ascendance, 6) Objectivity, 7) Friendliness, 8) Thoughtfulness, 9) Personal relations, and 10) Masculinity.
8. Teacher classroom behavior is anything a teacher says or does in the teaching-learning situation which is inferred as having an influence on the teaching-learning situation. It includes both teacher verbal and non-verbal behavior.

9. Teacher verbal behavior constitutes one segment of teacher classroom behavior. It is the oral language that a teacher uses in the teaching-learning situation. Teacher verbal behavior is confined to an oral form of behavior and does not include facial expressions nor voice timbre and inflection.

10. Teacher non-verbal behavior is that segment of teacher classroom behavior other than the use of oral language. It includes anything a teacher does which is inferred as having an influence on the teaching-learning situation. It includes such things as the use of silence, gestures, facial expressions, timbre, and inflection of voice, and the spacial relationships with students.

11. First-hand systematic observation refers to the recording and encoding of teacher verbal and non-verbal behavior.

12. Recording involves the "capturing" of the teacher classroom behavior on video tapes by means of a video tape recorder. The behavior events are thus available for immediate playback, and they can be reviewed a number of times.
13. Encoding is the method used to classify the verbal and non-verbal behavior of teachers into the category system.

Need for Study

The need for this and other studies in the area of teacher classroom behavior are partially discussed in the introduction; nevertheless, the following reasons are important enough to be reiterated.

It appears that studies of teacher behavior are a prime requisite for a better understanding of teacher effectiveness. Until information concerning how a teacher behaves in the classroom is known or readily accessible, this variable can not be controlled. Too many of the researches in the area of teacher effectiveness have falsely assumed that the behavior of the teacher(s) was either similar or different. Such an important variable as the teacher's behavior can not and should not be assumed. Consequently, the present state of affairs justifies the need for this study.

Although the literature reveals an abundance of research in the area of teacher classroom behavior, the science teacher has largely been ignored. In addition, most of the previous researchers have studied either the verbal or the non-verbal behavior of teachers. Therefore, the science educator is limited in the amount of
information that he has at his disposal to establish and conduct teacher education programs. Many of the decisions that he must make are still dependent on past experience and intuition and will remain so until new knowledge is gained. Because of the existing lack of knowledge, a need is seen for research dealing with the verbal and non-verbal behavior of science teachers.

According to Fowler and Soar (30), relatively few studies have been undertaken to study teacher personality and the classroom behavior complex simultaneously. This is true in spite of the fact that psychologists generally agree that there is a relationship between one's personality and his behavior. Furthermore, the few studies that do exist, which study teacher personality and teacher classroom behavior, have not attempted to utilize the Guilford-Zimmerman Temperament Survey. Certainly a need exists to study simultaneously teacher personality, using the Guilford-Zimmerman Temperament Survey, and teacher classroom behavior.

A further need for this study is revealed through a search of the literature and a statement by Biddle (13). Several researchers have studied the behavior of teachers utilizing such things as live observations, specimen records, sound recordings, time lapse photography, and 16 mm sound motion pictures, but the use of video tape recordings to study the behavior of teachers, especially
science teachers, is almost non-existent. This is true even though "it seems clear that audiovisual recordings \[video tape recordings\] are required for the serious, analytic study of classroom processes" (13, p. 341).
Such a device provides the researcher with a behavioral record which can be scanned repeatedly.

The following statements provide a recapitulation of the need for this study.

1. A study of teacher classroom behavior is a prime requisite for a better understanding of teacher effectiveness.

2. Studies of the classroom behavior of science teachers are limited in number.

3. Most studies of teacher classroom behavior are restricted to the study of the verbal or non-verbal behavior of teachers.

4. Few studies exist which study teacher personality and the classroom behavior complex simultaneously.

5. Video tape recordings provide the researcher with behavioral records which can be scanned repeatedly.

**Limitations of the Study**

The following are considered to be limitations of this study.

1. The extent to which the Guilford-Zimmerman Temperament Survey is a valid and reliable measuring
device of selected personality traits is a limiting factor in this study.

2. The number of subjects in this study is limited to eight biology teachers.

3. The presence of an observer with a video tape affects the verbal and non-verbal behavior of the classroom teacher.

4. Teachers may exhibit a personality in a classroom situation that is different from the personality that they exhibit in other situations.

5. The quality of the observational data will be limited by the observer's skills, abilities, and the extent of the training period.

Delimitations of the Study

The following statements describe the limits beyond which this study does not attempt to go.

1. A study of teacher effectiveness is beyond the scope of this research.

2. This study is not concerned with value judgments concerning the behaviors and or the selected personality traits which the teachers exhibit.

3. It does not attempt to establish predictive relationships between personality characteristics and teaching behavior.

4. This study does not attempt to measure and record
classroom interaction analysis. The pupil behaviors are considered but only to the extent that they provide clues for inferring teacher behavior.

**Design of the Study**

The selection of the pilot sample, pilot recordings, instrument development, observer agreement, selection of study sample, and collection of the behavioral data were accomplished jointly with Abe LeVon Balzer, a co-researcher at The Ohio State University. The actual writing of the dissertation was not a joint project, nor was the collection of personality data, nor the analysis of data. Each researcher developed his own research proposal, and analyzed the data in view of his own problem statement.

**Selection of Pilot Sample**

The initial contact was made with the Superintendent of the Cincinnati Public Schools by Dr. John S. Richardson. This was followed by a conference during which a general description of the requested resources and opportunities was presented to three members of the administrative staff. Consent was given, and eight biology teachers were selected by the Secondary Science, Administrative Supervisor. Each teacher was then contacted by the researchers and given an explanation of the nature of the research, and each was individually
assured that no value judgments were to be made of the teaching that was to be recorded. The teachers were given a free choice to participate or not in the research. All eight biology teachers that were contacted chose to participate in the study.

The research design of Mr. Balzer required that the study sample be composed of an equal number of BSCS and non-BSCS biology teachers, and the present study required a wide range of biology teachers. However, the pilot sample contained only two BSCS teachers. This situation was discussed with the Administrative Supervisors from the Cincinnati Public Schools, and the Administrative Supervisor of Secondary Science volunteered to contact the superintendents of three adjoining school systems to see if they had teachers who would like to take part in the research projects. Once contacted, the superintendents agreed to take part in the research, provided the individual teachers were agreeable. An appointment was scheduled between the researchers and each superintendent by the Administrative Supervisor of Science of the Cincinnati Public Schools.

The researchers conferred with each of the superintendents, and three biology teachers were selected. Each teacher was contacted and each agreed to participate in the research. Thus, the pilot sample consisted of eleven biology teachers from nine schools
in the Greater Cincinnati Area. Every biology teacher that was contacted agreed to participate in the pilot study.

Pilot Recordings

Prior to and during the pilot recordings, considerable effort was spent in becoming familiar with the video tape recorder and its operation. In addition, considerable time was spent in experimenting with various sound systems to be fed into the video tape recorder. It was discovered that the microphone that comes with the recorder was satisfactory when the teacher was more or less stationary, but inadequate while the teacher moved around the room. Therefore, it became necessary to use a wireless microphone, transmitter, and a tuner to record sound which was satisfactory for the proposed research. The teacher pinned the microphone to his clothes and placed the transmitter in his pocket. The tuner was plugged into the video tape recorder.

Video tape recordings of the participating biology teachers were made during their regular class sessions. Thirteen tapes, each one class period in length, were made of the eleven biology teachers. Each teacher was notified in advance when the taping was to occur, and each was asked not to prepare any differently from a normal class presentation. At the completion of each
pilot tape, the teacher and class involved were invited to view the tape. Each teacher viewed at least a partial tape of himself.

The pilot tapes represented, by administrative definition, BSCS and non-BSCS biology teachers. The BSCS biology tapes included the yellow, blue, green, and special materials versions. Non-BSCS was represented by academic, general, and basic biology. The participating schools represented the inner-city as well as suburban areas.

The Cincinnati Public schools defined academic, general, and basic biology in the following manner. Academic biology was above average in difficulty. It was designed for students whose intelligence quotients were ninety and above. General biology was of average difficulty. It was designed for students whose intelligence quotients were seventy-seven to eighty-nine. Basic biology was less than average in difficulty. It was designed for students whose intelligence quotients were between sixty and seventy-six.

Instrument Development

The thirteen video tape recordings of the eleven biology teachers were scanned repeatedly by the researchers. Individual behaviors were identified and written on three by five cards. For example, "asks
factual question," "laughs at student joke," and "frowns at student response," were each written on individual cards. Next, the cards were placed into piles according to related behaviors, resulting in the **Biology Teacher Behavior Inventory** (Appendix A).

**Observer Agreement**

Once the **Biology Teacher Behavior Inventory** and Glossary were developed and revised, fifteen, five-minute samples of the pilot tapes were chosen at random and recorded on three, thirty-minute video tapes. These tapes were set aside until the method for encoding the data from the video tapes was developed, and each of the researchers learned the various symbols of the category system.

The method of encoding consisted of identifying as many teacher classroom behaviors as possible and recording them on the Data Record (Appendix B). There was no time limit placed on the observer; he could replay the tapes as many times as he felt necessary. The tapes were then replayed, and ten-second intervals were marked on the Data Record. The predominant behavior, during a ten-second interval, was recorded in the appropriate column of the Data Record.

Once the method of encoding was learned by each researcher, the fifteen, five-minute samples of teacher
classroom behavior were encoded by each observer. Inter-observer agreement was calculated by means of the Scott formula for inter-observer agreement (78).

Selection of Study Sample

Eight of the eleven biology teachers were selected by the researchers to take part in the final study. The teachers were selected on the basis of two criteria, i.e., whether they taught BSCS or non-BSCS biology and the accessibility of their school and the classroom within the school. The study called for a wide range of biology teachers, and the equipment was cumbersome and difficult to carry over long distances. Thus, four BSCS teachers and four non-BSCS teachers were chosen, representing five schools and two school systems in the Greater Cincinnati Area. Each teacher was contacted a second time in person and asked if he would take part in the research. Every teacher contacted agreed to take part in the remainder of the study.

Collection of Data

The personality data were collected by means of the Guilford-Zimmerman Temperament Survey. Each teacher was given a copy of the survey and instructions for its completion. In addition, the teacher was given verbal instructions and an addressed envelope. Upon completion of the survey, the teachers mailed the survey
and answer sheet to the researcher. The envelopes were set aside and the answer sheets were scored after the collection of the behavioral data.

Five video tapes, one class period in length, were made of each of the eight biology teachers. Behavioral data were encoded from the tapes and placed on a Master Data Record (Appendix C).

Method of Data Analyses

Data analysis was completed by means of nonparametric statistics and logical analysis. Nonparametric statistics were used to determine the relationships between the ten selected personality traits and the verbal and non-verbal classroom behavior exhibited by the high school biology teachers. Nonparametric statistics were used because all the conditions necessary for the use of parametric statistics could not be met. The number of subjects was extremely small, and the subjects were not drawn at random from the population.

Organization of the Remainder of the Study

Chapter Two is devoted to the background and related literature and is divided into three sections. Section One deals with the development and use of category systems for measuring classroom behavior by systematic observation. A discussion of personality is presented in Section Two, and the final section is
devoted to research which correlates teacher behavior and personality traits.

The design of the study is covered in Chapter Three. Selection of the pilot and study sample, pilot recordings, instrument development, inter-observer agreement, and collection of data are discussed in detail.

Chapter Four is devoted to the handling of data. It includes the presentation of data, test of the hypotheses, and the findings.

A summary of the study, conclusions, and recommendations for future research are presented in Chapter Five.
CHAPTER II

BACKGROUND AND RELATED LITERATURE

This chapter, which has been separated into three parts, deals with the research studies and literature that are pertinent to the present study. The first section deals chronologically with the researches which consider the development and/or use of instruments for measuring classroom behavior by systematic observation. Emphasis is placed upon those studies which have given particular attention to the classroom behavior of teachers. Part two of this chapter deals with a discussion of personality and the Guilford-Zimmerman Temperament Survey. Attention is also given to the use of the Survey and its correlation with other personality scales. The final section examines those researches which specifically attempt to correlate teacher behavior and personality traits.

Measuring Classroom Behavior by Systematic Observation

The earliest efforts to measure classroom behaviors objectively have naturally resulted from the efforts of supervisors (68,p.254). The need for a device to help these observers be more empirical and systematic
was apparently felt before World War I because Ernest Horn developed a system for recording student classroom behavior. Horn's instrument was simply a student seating chart on which he placed symbols to indicate when individual students participated in classroom activities (49).

Horn's system for recording and classifying classroom behavior was modified and enlarged by Puckett in 1928. Puckett's system provided for a limited number of teacher behaviors, although the system was almost exclusively devoted to the quantitative recording of pupil behaviors (76).

Barr, in 1929, developed and used an instrument for observing and recording classroom behavior in an attempt to identify behaviors which discriminated effective from ineffective teachers. He recorded his observations in the form of symbols and abbreviations on a piece of graph paper, e.g., T meant teacher; X meant teacher question; C meant teacher comment. The horizontal lines on the paper represented ten-second intervals, and the vertical lines represented the pupils who were participating (68, pp. 258-259).

Barr's study contained data which he obtained from general observations, attention scores, stenographic reports, time-distribution studies, and a time chart.
Some of the characteristic actions, which were identified by Barr, of good and poor teachers are as follows (68, p. 259):

1. Laughs
   a. Little or no laughing
   b. At pupil or class
   c. With class
   d. Laugh mannerism, abruptness, etc.
   e. No report
2. Smiles
   a. Pleasantly or appreciatively
   b. Sarcastically, critically, etc.
   c. Does not smile
   d. No report
3. Jokes with class
4. Giggles
5. Gestures
6. Nods to pupil to recite
7. Nods approval
8. Points at pupil to recite
9. Snaps finger for attention
10. Stamps foot ("hurry up," attention, etc.)
11. Puts hand on pupil's head, shoulder, etc., to recite
12. Shakes head (disapproval)
13. Waves at pupil to sit down

In addition, Barr studied and categorized questions asked in the classroom according to the type of answer required. The categories were: (1) Recall facts, (2) Memorized judgments, (3) Expository question (explain, define, illustrate, etc.), (4) Real judgments, and (5) Unclassified (68, p. 260).

In 1934, Wrightstone (91) proposed a more complex system in an effort to measure teacher stimulation and response of class discussion. Wrightstone devised his code by visiting classrooms in which discussions and
recitations were taking place, and he took notes in narrative form. After studying and organizing the written statements into categories of defined types of teacher behaviors, the following code was developed and used for observing a teacher's conduct of class discussions (91, pp. 455-456):

(5a) Allows pupil to make a voluntary contribution.
(5b) Encourages pupil to make a contribution.
(5c) Proposes a question or thesis for pupil or class.
(5d) Refers pupil or pupils to sources of data or information.
(5e) Suggests (explains) means, methods, activity or solution.
(5f) Discourages or prohibits a pupil contribution.
(5g) Recalls pupil's attention by direct word, look or gesture
(5h) Assignment by teacher of a specific subject matter or tasks.
(5i) Question and answer on assigned textbook subject matter.

Sound recordings were used by C. D. Jayne in the early forties to assist in analyzing teacher behaviors. Typed transcripts were made of the recording and these were used to identify such things as the number and type of questions, comments, presentations and the participations made by the classroom teacher. Jayne felt that such a technique allowed for a more complete record of all teacher activities in the classroom than had previous techniques (56).

The earliest studies of classroom climate were
conducted by Anderson and his associates and were based on the assumption that integration and domination are psychologically different techniques of responding to others (4) (5) (68) (71). In these studies integrative and dominative behavior were defined as follows (5, p. 89):

Domination is the behavior of a person who is inflexible, rigid, deterministic, who disregards the desire or judgment of others, who himself in the conflict of differences has the answers. Examples are the use of force, commands, threats, shame, blame, attacks against the personal status of another. Domination is the technique of autocracy or dictatorship; it obstructs the growth processes in others. It is the antithesis of the scientific attitude and the open mind.

The term integrative behavior was chosen to designate behavior leading to a oneness or commonness of purpose among differences. It is the behavior of a flexible growing person who is looking for new meanings, greater understandings in his contacts with others. It is non-coercive; it is the expression of one who attempts to understand others, who is open to new data. It is consistent with the scientific approach, the open mind. It is both an expression of growth in the person using it and a stimulus to growth in others. It does not stifle differences, it makes the most of differences; it actually creates new and harmonious differences.

Anderson began his experimental studies of dominative and socially integrative behavior by examining the behaviors of preschool children. He developed an observational blank on which he tallied the
behaviors of children as they played in a sandbox. From these scores, he calculated the individual student's I-D Index (4). The index was used in each of the studies that followed.

The I-D Index was defined as the ratio of the integrative tallies to the corresponding dominative tallies. It could be computed for various lengths of time. Anderson had earlier used the D-I Index, which was the ratio of the dominative scores to the integrative scores; however, he found this measure to be awkward in interpreting results. Therefore, he discontinued its use in favor of the I-D Index (4, p.15).

A later study was conducted by Anderson that focused on the measurement of teachers' classroom behavior in terms of domination and social integration. A new instrument for recording observations, the Observation Blank (Figure 4), was derived, based on the earlier studies of domination and integrative social contacts of paired school children and the measurement of domination and of socially integrative behavior in teachers' contacts with children (5) (4, p.22).

Each blank contained identifying information, such as school, grade, date, observer, and teacher. It provided spaces at the top for recording student names and a space for group and unidentified student. Categories
Observation Blank

School.............. Grade.............. Section................ Observer........... Date.............
Teacher........ Activity....... Observation Began........... Ended........... Elapsed Time.............

<table>
<thead>
<tr>
<th>RANK ORDER</th>
<th>ACTIVITY TIME</th>
<th>Group</th>
<th>ACTIVITY TIME</th>
<th>Group</th>
<th>ACTIVITY TIME</th>
<th>Group</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Deter</td>
<td></td>
<td>1</td>
<td></td>
<td>1</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>2. Direct Ref</td>
<td></td>
<td>2</td>
<td></td>
<td>2</td>
<td></td>
<td>2</td>
</tr>
<tr>
<td>3. Relocates</td>
<td></td>
<td>3</td>
<td></td>
<td>3</td>
<td></td>
<td>3</td>
</tr>
<tr>
<td>4. Postpo</td>
<td></td>
<td>4</td>
<td></td>
<td>4</td>
<td></td>
<td>4</td>
</tr>
<tr>
<td>5. Disapp blame obs</td>
<td></td>
<td>5</td>
<td></td>
<td>5</td>
<td></td>
<td>5</td>
</tr>
<tr>
<td>6. Wrt thr cond-pr</td>
<td></td>
<td>6</td>
<td></td>
<td>6</td>
<td></td>
<td>6</td>
</tr>
<tr>
<td>7. Call grp act att</td>
<td></td>
<td>7</td>
<td></td>
<td>7</td>
<td></td>
<td>7</td>
</tr>
<tr>
<td>8. Ration material</td>
<td></td>
<td>8</td>
<td></td>
<td>8</td>
<td></td>
<td>8</td>
</tr>
<tr>
<td>9. Le method</td>
<td></td>
<td>9</td>
<td></td>
<td>9</td>
<td></td>
<td>9</td>
</tr>
<tr>
<td>10. Q Le Method</td>
<td></td>
<td>10</td>
<td></td>
<td>10</td>
<td></td>
<td>10</td>
</tr>
<tr>
<td>11.</td>
<td></td>
<td>11</td>
<td></td>
<td>11</td>
<td></td>
<td>11</td>
</tr>
<tr>
<td>12.</td>
<td></td>
<td>12</td>
<td></td>
<td>12</td>
<td></td>
<td>12</td>
</tr>
<tr>
<td>13.</td>
<td></td>
<td>13</td>
<td></td>
<td>13</td>
<td></td>
<td>13</td>
</tr>
<tr>
<td>14.</td>
<td></td>
<td>14</td>
<td></td>
<td>14</td>
<td></td>
<td>14</td>
</tr>
<tr>
<td>15. Perfunctory Q or S</td>
<td></td>
<td>15</td>
<td></td>
<td>15</td>
<td></td>
<td>15</td>
</tr>
<tr>
<td>16. Apprvl</td>
<td></td>
<td>16</td>
<td></td>
<td>16</td>
<td></td>
<td>16</td>
</tr>
<tr>
<td>17. Accepts diff</td>
<td></td>
<td>17</td>
<td></td>
<td>17</td>
<td></td>
<td>17</td>
</tr>
<tr>
<td>18. Extend invit</td>
<td></td>
<td>18</td>
<td></td>
<td>18</td>
<td></td>
<td>18</td>
</tr>
<tr>
<td>19. Q or S re I or A</td>
<td></td>
<td>19</td>
<td></td>
<td>19</td>
<td></td>
<td>19</td>
</tr>
</tbody>
</table>

Fig. 4--Observation Blank
were listed vertically down the side of the sheet.

The categories developed by Anderson and associates were as follows (4, pp. 25-27):

1. Determines a detail of activity or acts for the child in carrying out a detail.
2. Direct refusal.
3. Relocating, reseating, or placing children in different relation to each other or to property, i.e., different from the relation which the children have themselves selected.
4. Postponing, slowing up the child.
5. Disapproval, blame, or obstruction.
6. Warning, threats or conditional promises.
7. Call to attention or to group activity.
8. Rations material.
11-14. Inclusive deleted on the blank. [These categories were deleted or combined with other categories. The numbers were retained because the observers had memorized the categories by number and relative position on the blank.]
15. Perfunctory question or statement.
16. Approval.
17. Accepts difference.
18. Extends invitation to activity.
19. Question or statement regarding child's expressed interest or activity.
20. The build-up.
22. Sympathy.
23. Permission.
24. Undecided.

Categories one to eight, inclusive, represented dominative behaviors, and categories fifteen to twenty-three, inclusive, represented the teachers integrative contacts. Categories eleven to fourteen, inclusive, were deleted or combined with other categories. However, the numbers were retained because the experimenters had
memorized the other categories by number and by relative position on the blank (5).

Three teachers from eight different kindergarten groups were observed. The observers marked the blank by placing a tally in the child's column for each contact which the teacher had with each child. When the contact was directed toward the group rather than to the individual; a tally was placed in the group column opposite the appropriate category. If a contact was made with an unidentifiable student, a tally was made in the column provided. Every contact, which the teacher had during the five-minute period of observation, was recorded (5).

Using statistical analysis, the researchers found the correlations between observers to be relatively high, i.e., it ranged from .87 to .94 or above (5).

Medley and Mitzel feel that Anderson's greatest contribution was the creative instrument that he developed. The small sample used prevented the conclusions that were drawn from being readily accepted (68, pp. 265-266).

In 1949, John Withall developed a category system for teacher verbal behavior and substituted the term, Social-Emotional Climate, for the I-D Index, which had been previously established by Anderson and associates (68, p. 267). Withall felt that this
dimension could be measured in terms of verbal
teacher behavior alone, based on the assumptions that
climate is largely determined by the teacher's behavior
and that a teacher's verbal behavior represents adequately
her total classroom behavior (89, p. 347).

The technique Withall employed in the measurement
of Social-Emotional Climate in the classroom involved
transcribing the verbal behavior of a teacher, in the
act of teaching, from sound recordings into the following
categories (89, p. 349).

1. Learner-supportive statements that
have the intent of reassuring or
commend the pupil.

2. Acceptant and clarifying statements
having an intent to convey to the
pupil the feeling that he was understood
and help him elucidate his ideas and
feelings.

3. Problem structuring statements or
questions which proffer information
or raise questions about the problem
in an objective manner with intent
to facilitate learner's problem
solving.

4. Neutral statements which comprise
polite formalities, administrative
comments, verbatim repetition of
something that has already been said.
No intent inferable.

5. Directive or hortative statements
with intent to have pupil follow
a recommended course of action.

6. Reproving or deprecating remarks
intended to deter pupil from
continued indulgence in present
"unacceptable" behavior.

7. Teacher self-supporting remarks
intended to sustain or justify the
teacher's position or course of
action.
The preceding categories represented a continuum from "learner-centeredness" to "teacher-centeredness." Learner-supportive statements, acceptant and clarifying statements, and problem structuring statements were seen as the "learner-centeredness" end of the continuum. Directive or hortative statements, reproving or deprecating remarks, and teacher self-supporting remarks were considered as "teacher-centeredness" categories of teacher behavior. If the greatest number of teacher statements fell into category three (problem-structuring statements), the climate was described as problem-centered. The Climate Index was determined using the ratio of categories one, two, and three (learner-centered statements) to the total number of teacher statements (68, p. 267).

In order to determine the objectivity and reliability of his category system, Withall had four trained judges apply the index to three transcripts of teacher statements. The percentage of agreement was 66, 56, and 75 per cent, respectively. The reliability, defined as the size of an adequate sample, was determined by "adding further data to ascertain at what point addition of further data caused little or no change in the obtained patterns of statements. It was concluded that two hundred
statements would provide an adequate sample of a teacher's verbal behavior (89, p.350).

Validity was determined in four ways. First, Anderson's Teacher Behavior Categories were used as a criterion instrument, based on the same data as the Climate Index. Pupil's recorded comments and feelings were compared with the Climate Index. Results of independent judges were predicted using a teacher-characteristics rating scale and compared with the Climate Index. And, finally, the Climate Index was related to the description of a classroom situation using various frames of references, i.e., a categorizer using the criteria of the Climate Index, judges ratings of teacher behavior in an actual situation, and the frame of the pupils feelings in the classroom (89).

Based on a very small sample, which included a total of twenty-three, seven-minute excerpts and five full class sessions, Withall concluded that a reliable and valid measure of classroom Social-Emotional Climate could be assessed and described using the Climate Index and that different patterns of verbal behavior, used by several teachers, could be identified. He stated that improvements of the Climate Index were in order, especially the clarification of categories one, four and five.
Categories one, two, three, five, and six should be subdivided into A and B areas. He further concluded that the Climate Index, within the limits of behavioral and personality variations, gave a constant pattern of verbal behavior for a teacher from day to day (89, p. 360).

A category system for studying first hand observations of group processes and the methodology for its use were developed and published by Robert Bales in 1950 (7). He identified the following twelve categories (7, p. 9):

\[
\begin{align*}
\text{A} & \quad \text{Shows solidarity; raises other's status; gives help, reward.} \\
\text{B} & \quad \text{Shows tension-release; jokes, laughs, shows satisfaction.} \\
\text{C} & \quad \text{Agrees; shows passive acceptance; understands, concurs, complies.} \\
\text{D} & \quad \text{Gives suggestion, direction, implying autonomy for other.} \\
\text{B} & \quad \text{Gives opinion, evaluation, analysis; expresses feeling, wish.} \\
\text{C} & \quad \text{Gives orientation, information; repeats, clarifies, confirms.} \\
\text{C} & \quad \text{Asks for orientation, information repetition, confirmation.} \\
\text{D} & \quad \text{Asks for opinion, evaluation, analysis, expression of feeling.} \\
\text{D} & \quad \text{Asks for suggestion, direction possible ways of action.} \\
\text{C} & \quad \text{Disagrees; shows passive rejection, formality; withholds help.} \\
\text{D} & \quad \text{Shows tension; asks for help; withdraws out of field.} \\
\text{D} & \quad \text{Shows antagonism; deflates other's status; defends or asserts self.}
\end{align*}
\]

The individual items in the category system were related in a number of ways. First, the categories designated by C represented questions asked; B represented attempted answers; A represented several
varieties of positive reactions and; D represented several varieties of negative reactions. Second, categories one to three, inclusive, represented behaviors in the positive social-emotional area. Categories four to nine, inclusive, represented the neutral task area, and categories ten to twelve, inclusive, represented the negative social-emotional area. Finally, a problem-solving sequence was outlined in the pattern of pairs of categories, i.e., there was a symmetrical relationship between the top half and the bottom half of the category list. Categories one and twelve represented the problem of reintegration. Categories two and eleven represented the problems of tension reduction. Categories three and ten represented the problems of decision. Categories four and nine represented the problems of control. Categories five and eight represented the problems of evaluation, and the problems of communication were illustrated by categories six and seven.

The observer viewed the group through a one-way mirror, and recorded every item of behavior he could observe and interpret on an interaction recorder. A one-way mirror was used because Bales felt that there was a certain loss when sound recordings were used alone (7,p.4).

The interaction recorder was a driving mechanism for a wide paper tape upon which scores could be
written. A detachable glass plate containing the categories fit on the top of the recorder. The right-hand side of the moving tape was exposed in order that the scores could be written directly on the tape. The panel of the recorder indicated the number of minutes that had been recorded, and a light flashed every sixty seconds.

Bales and Strodtbeck (8) used Bales' system to study group processes. They hypothesized that group processes tend to move through time from a relative emphasis on the problem of orientation to the problems of evaluation and, subsequently, to the problems of control and that the frequencies of negative and positive reactions tend to increase. The data they obtained supported the acceptance of their hypotheses.

The efforts of Cornell, Lindvall, and Saupe (23) represented an attempt to measure differences in classrooms based on the assumption that if differences exist, they are measurable. The dimensions that they chose to investigate were first made on a logical basis. Consideration was given to those dimensions of the classroom teaching-learning situation which would provide a behavioral picture of what takes place in the classroom. However, the final instrument, the Classroom Observation Schedule, was the result of trying out and modifying the rationalized instrument. The dimensions
that were identified, and an explanation of each dimension follows (23, pp. 18-23):

A. Differentiation. This dimension deals with the extent to which provision is made for individual differences among students in a classroom learning situation.

B. Social Organization. This dimension relates to the type of group structure and the pattern of interaction among individuals in the classroom as a whole.

C. Initiative. This dimension is related to the extent to which pupils are permitted to control learning situations in a classroom.

D. Content. This dimension provides a picture of the differences among classrooms in the source and the organization of the content of learning.

E. Variety. This dimension reveals the extent to which a variety of activities or techniques are used in the facilitation of learning.

F. Competency. This dimension is designed to detect relative differences through the observation of a few selected teacher behaviors.

G and H. Classroom Climate. Dimensions G and H consider the social-emotional climate which exists in a classroom. Dimension G provides a picture of this as it is reflected in the behavior of the teacher, while dimension H uses the behavior of the pupils.

The Classroom Observation Code Digest was also developed by Cornell, et al. It was meant to be used by the observer as a guide in making entries on the Classroom Observation Schedule (23, p. 27).
The instruments were to be used simultaneously in direct observation of the teaching-learning situation. During a five-minute time interval, dimensions A, B, C, and D were observed and coded on the Classroom Observation Schedule from the Classroom Observation Code Digest. A checkmark was used to record dimension E or every activity that occurred during the five minutes. Dimensions F, G, and H were checked each time a particular behavior was observed. The instruments were designed to accommodate up to twelve, five-minute observations (23, pp. 55-56).

The authors stated that simple frequencies could be used to analyze data obtained using the Classroom Observation Schedule. However, they assigned weights to each of the dimensions except for F, G, and H. These were scored according to frequency of occurrence (23, pp. 28-30).

The instrument was used in a study of twenty-two classrooms in the public schools of Illinois. Half of the classrooms was from urban schools, and half was from rural schools. Observers worked in teams of two persons, and each team observed each classroom for one-half hour. Using this data, the authors reported that the reliability was from .42 to .89 based on the individual observer scores, and it was from .59 to .94 based on team scores. They further concluded that the data
significantly discriminated among the teaching-learning situations (23, pp. 33-37).

An interesting approach was used by Cogan in determining the classroom behaviors of teachers. Rather than using trained observers, he used children's perception of the teacher behaviors (21) (22).

Cogan sought to organize teacher behaviors under three categories, i.e., inclusive (integrative, affiliative, and nurturant behaviors), preclusive (dominative, aggressive, and rejectant behaviors), and conjunctive (level of demand, ability to communicate, and competence in classroom management). The specific behaviors were drawn from the work of other researches, including Anderson and Brewer (87) (21, p. 90).

The study included thirty-three junior high teachers and 987 pupils in two communities of sharply differing socioeconomic characteristics. Cogan used an analysis of covariance to examine the children's description of their teachers and the children's description of their required and self-initiated activities for the course. Cogan reported that the data supported his hypothesis that the children's perception of the inclusive behavior of their teacher were positively related to their self-initiated work (88, p. 1038).

In a second study, Cogan examined the differences
between teachers, schools, communities, and school subjects based on the descriptive records by the pupils. He concluded that there were significant differences between teachers and between schools (22).

Marie Hughes' study of the verbal and non-verbal behaviors of elementary school teachers grew out of her earlier work as a consultant to a group in the Provo City Schools of Utah (53). This group was interested in developing a description and definition of teaching. The school district cooperated with and was financed by the Utah Merit Study Committee, whose purpose was to describe teaching and to evaluate it for the purpose of improving teaching. The money was provided with the understanding that an effort would be made to formulate a method of rating teachers (51). After a two-year study of observer-recorded reports of teacher-learner interactions, the Code for the Analysis of Teaching was developed. Marie Hughes then used this document to develop a tentative system for the classification of teacher verbal and non-verbal behaviors. The system of classification she developed and used was as follows (47,p.167):

a. Controlling. The teacher structures, regulates, sets standards, judges, or otherwise controls pupil behavior.

b. Imposition. The teacher moralizes, gives help without being asked, appraises without data, informs beyond the ongoing situation, imposes herself into
the situation rather than employing a routine, or otherwise imposes distractions between the pupil and his task.

c. Facilitating. The teacher checks for information, clarifies procedures, demonstrates procedures, or otherwise facilitates the pupils' efforts.
d. Developing Content. The teacher stimulates, clarifies, generalizes, summarizes, evaluates, answers questions, agrees, or otherwise develops content for pupil learning.
e. Responds. The teacher clarifies pupil problems or experience, interprets situations or feelings, acknowledges mistakes or otherwise responds to pupils in terms of content and pupils efforts to learn.
f. Positive Affectivity. The teacher encourages, praises, gives recognition, offers solace, or otherwise shows positive regard for pupils.
g. Negative Affectivity. The teacher admonishes, reprimands, accuses, threatens, ignores, refuses requests, or otherwise shows negative regard for pupils.

The seven categories or functions of behavior constitute a dominative-integrative scale on the basis of Harold H. Anderson's study as patterns of dominative, integrative, or neutral behavior. Controlling, imposition, and negative affectivity are dominative categories of behavior. Developing content, response, and positive affectivity are integrative categories of behavior. Facilitating was a neutral category falling between the two ends of the dominative-integrative scale. These categories, according to Gage, are similar to those developed by Withall,
except that Hughes did not restrict her categories to teacher verbal behavior (68, p. 269).

Forty-one elementary teachers from the West Coast participated in the study. Twenty-five of these teachers were selected from a group of forty teachers judged as "good" by their central office staff. These teachers represented fourteen schools in five school districts.

The raw data of the study consisted of thirty-minute narrative records, taken in shorthand by two trained observers, of everything the teacher said and did in the classroom and the responses which were elicited from the pupils. Actions in which the teacher was not a part were omitted due to the purpose of the study and the feeling that the major force of influence in a classroom was from teacher to pupil. Each teacher was observed a minimum of three times by two recorders. At the end of each period of observation, the recorders compared and collated their transcriptions. The final product was a narrative description of teacher behavior on which both observers agreed.

The specimen records of each teacher's behavior were then analyzed and coded into the previously developed system of classification. The coding was accomplished by two independent workers and
checked by a third. Disagreements were eliminated in a conference between the three workers.

One outcome of Hughes' study, although considered by the authors as a hypothesis, was a model pattern for teacher behavior which was divided into the following categories: Controlling Functions (20-40 per cent), Imposition (1-3 per cent), Facilitating (5-15 per cent), Content Development (20-40 per cent), Personal Response (8-20 per cent), Positive Affectivity (10-20 per cent) and Negative Affectivity (3-10 per cent) (68,p.271).

A second outcome was that the categories failed to discriminate between those teachers selected as "good" and the other "representative" teachers in the study.

Hughes drew the conclusion that teachers exhibited the same pattern of behavior, i.e., the number of controlling acts did not vary significantly in different situations when compared with the interaction between situations and teacher (68,p.271). "In other words, the differences found among teachers were contributed by relatively few individuals" (51,p.34). These findings are not consistent with the findings of Medley and Mitzel, and Mitzel and Rabinowitz (68,p.271).
Other conclusions drawn were as follows (53):

1. In comparing negative affectivity and positive affectivity, teachers are generally more positive than negative in their behavior.

2. Most teachers rely heavily on the dominative functions in their teaching. Eighty per cent of the teachers studied were dominative in over fifty per cent of the total teaching acts.

3. The control function was performed most frequently by the teachers. It constituted from fifty to seventy per cent of the total teaching acts.

4. Only twenty-nine of the records had eight per cent or more of the total number of teaching acts in the response category.

Finally, Hughes concluded that the developed classification system was usable for research and for in-service training. However, it was realized that the code was not a finished product.

A technique for objectively observing and recording classroom behaviors (OScAR) was developed by Medley and Mitzel as part of a longitudinal study of graduates of Teacher Education programs of the Municipal Colleges of New York City (67, p. 217). The OScAR was constructed by modifying, combining and expanding the earlier ideas and methods purposed by Cornell (23) and Withall (89). It was designed to be used for direct
observation of a classroom session by a single observer (67,p.218).

The OScAR was composed of six sections including the following: 1) Activity Section, 2) Grouping Section, 3) Signs Section, 4) Materials Section, 5) Teacher Behavior Section, and 6) Subject Section. Each of the sections was further divided into a number of categories ranging from seven in the Grouping Section to fifty items in the Activity Section (67,pp.220-222).

The Teacher Behavior Section contained eight categories. Five of the categories pertained to teacher statements. These categories were: 1) Pupil Supporting Statements, 2) Problem-Structuring Statements, 3) Miscellaneous Statements, 4) Directive Statements, and 5) Reproving Statements. Two additional categories were devoted to the facial expressions of the teacher, and the final category was to be checked when the teacher asserted his authority (67,pp.222-223).

The observer was supposed to arrive in the classroom at a predetermined time and take his place in the rear of the classroom as unobtrusively as possible. Next, he took a quick look around the classroom and started his stop-watch. Then he checked the appropriate items in the Activity Section of the instrument. This section contained such categories as the teacher working with an individual
student (t wks w ind p) and pupil talks to visitor (p tks to vstr) (67,p.219).

After checking the Activity Section, the observer moved to the Grouping Section, Materials Section, and the Signs Section and made the appropriate tallies. Only one tally was made in each category because these sections were used to record how many of the categories were observed, not how frequently they occurred (67,p.223).

Next, the observer started his stop-watch, and the following five minutes was used to concentrate on the Teacher Behavior Section of the OScAR. During this period, both the frequency and the kinds of behavior were recorded (67,p.223).

The above procedure was repeated until six, five-minute periods of observations were complete. Separate columns were provided on the instrument for each of the five-minute periods. Then the observer left the class attempting not to interrupt the teaching-learning process (67,p.223).

Medley and Metzel used their developed instrument to gather data in the classroom of forty-nine beginning elementary teachers in the New York public schools. The items observed were combined into fourteen scoring keys and further grouped into three relatively discrete dimensions of classroom behavior-
emotional climate, verbal emphasis, and social structure. Based on this data, Medley and Mitzel reports that their correlation of observer agreement was high (0.605 to 0.916), and that the OScAR was sensitive to differences among typical teachers' classrooms (67, pp. 224-230).

According to Openshaw and Associates (71), the first to give careful consideration to the logical aspects of teaching were Smith and Meux. Their research grew out of B. O. Smith's criticism of interaction that centered in the attitudinal, social, and emotional components of behavior and his belief in the necessity for research in substantive interaction (81, p. 212). The purpose of their study was to develop a means for dividing and analyzing the teacher verbal behavior into pedagogical units. It was based on the assumption that the influence of instruction was primarily logical in nature.

The terms, "episode" and "monologue," were used by Smith and Meux to analyze teacher verbal behavior. Episodes were defined as the exchange between two or more speakers, and a monologue was defined as an individual contribution. The first phase of their study was concerned only with the episode (71, p. 24). The episodes were further divided into three steps, i.e., an opening phase or entry, a continuing phase, and a closing phase (68, p. 287).
Smith and Meux developed a set of thirteen categories for classifying the opening phases of episodes from transcripts of sound recordings based on logical or "ideal responses" and "epistemic rules". These categories were: 1) Defining, 2) Describing, 3) Designating, 4) Stating, 5) Reporting, 6) Substituting, 7) Valuating, 8) Opining, 9) Classifying, 10) Comparing and contrasting, 11) Conditional inferring, 12) Explaining and 13) Directing and managing classroom (68,p.287).

The basic data for the study were obtained by preparing transcripts of the verbal discourse of secondary school class sessions in four subject-matter areas—English, science, mathematics, and social studies. Five consecutive classes in each of seventeen classrooms were recorded, and transcripts were made. The transcripts were analyzed, and the teachers' verbal behavior was categorized according to the set of categories for classifying opening phases of episodes (71,p.24).

Based on the data obtained, Smith and Meux reported that the logical operations of teacher verbal behavior could be identified and described as to their logical validity and accuracy (71,p.25). The median percentage of observer agreement was sixty-seven per cent. They further found that the largest number of frequencies fell into the categories of Description (25 per cent),
Designing (15 per cent), Explaining (13 per cent), and Classroom Management (9 per cent) (68, p. 288).

A second study by Smith and Meux (now in progress extended the earlier research. A new verbal unit, the strategy, formed the basis for analysis. Strategy was defined as "a set of verbal actions that serves to attain certain results and to guard against others" (71, p. 25).

The strategy was broken down into two basic dimensions, the treatment dimension and the control dimension. The treatment dimension was concerned with structuring information to disclose the content that is to be learned. The control dimension dealt with the operations used by the teacher to guide the pupils in performing operations on the content. This research placed emphasis on the learner's behavior (71, pp. 25-26).

Muriel Wright attempted to identify behaviors related to pupil achievement based on the assumption that mastery of the subject-matter was the key aspect of the classroom. She studied the interaction in secondary school algebra classes using three frames. Categories relating to the general objectives of mathematics teaching were developed for each of the frames. The frames, categories and their definitions follow (90, pp. 104-105).

A. Ability to think
   1. Analyzing. Working from an assumption of a desired conclusion
towards accepted principles.

2. Synthesizing. Working from accepted principles toward a desired conclusion.

3. Specializing. The use of the significant attributes of a given set in an analogous set, or the applying of a given set to a smaller included set.

4. Generalizing. The recognition of significant attributes of a given set and the passing from the consideration of the given set to that of a larger inclusive set.

B. Appreciation of Mathematics

1. Methodology. Awareness, recognition of and intellectual pleasure in understanding the characteristics of the field of mathematics in terms of its methodology.

2. Subject matter. Awareness, recognition of and intellectual pleasure in understanding the characteristics of the field of mathematics in terms of its subject matter.

3. Other fields and areas. Awareness, recognition of and intellectual pleasure in understanding the place of mathematics in other fields and in applied areas.

4. Historical significance. Consideration of the place of mathematics in the historical development of civilization.

C. Attitude of Curiosity and initiative


2. Initiative. Independence of thought and action including perseverance and self-directed work towards the desired outcome.

Any interaction which did not fit into one of these frames was classified as neutral (68,p.288).

Time samples were used in order to gather data, i.e., the statement of the first speaker, in a fifteen-second interval, was analyzed and categorized. During
sixty seconds, the first and third fifteen-second interval were used for observation, and the second and fourth interval were used for classification. Each analyzed statement was categorized in each of the three frames. In addition, each behavior was classified as either being positive or negative.

The data were gathered from twelve algebra classes in the secondary schools of St. Louis. Two observers were used to observe live classroom sessions. Four visits were made to each classroom, and the length of the period of observation was forty-five minutes or ninety observations (90).

Based on the gathered data, Wright reported that a high level of consistency was shown by the principal observer. However, the assistant observer was still gaining observational experience (90, p.120).

The system used by Wright for analyzing classroom verbal discourse was refined and modified by Wright and Proctor in 1961. The names of the frames were changed, albeit they kept the same meanings. The category system was modified somewhat, but the methodology for using the instrument remained the same. Observer agreement and stability of class behavior were investigated and reported to be adequate (68, pp.288-290).

Two extreme shortcomings of the instrument and
the techniques developed by Wright and Proctor were suggested by Medley and Mitzel. First, the observers should be highly trained mathematicians. Second, the instrument itself required a rigorous training period for the observers. However, the research did have merit; its greatest value lay in the possibility of its extension (71, p.27).

The Teacher Characteristics Study by Ryans was, in part, an outgrowth of the interests and research of the National Teacher Examinations, an earlier project of the Council on Education. The study, conducted over a six-year period and involving approximately 6,000 teachers in 1,700 schools and 450 school systems, represented one of the most extensive research programs ever concerned with the objective study of teachers. The study represented more than one hundred separate research projects (77).

The objectives of the study, which grew out of the need for research on the personality of teachers, were described by Ryans in the following statements (77, p.9):

Objective I: The identification and analysis of some of the patterns of classroom behavior, attitudes, viewpoints, and intellectual and emotional qualities which may characterize teachers.

Objective II: The development of paper-and-pencil instruments suitable for the estimation of certain patterns of
classroom behavior and personal qualities of teachers.

Objective III: The comparison of characteristics of various groups of teachers.

Phase one of the study entailed the development of an assessment record and an accompanying glossary to describe behaviorally and operationally the dimensions listed on the assessment blank. The development of the assessment record, which became known as the Classroom Observation Record, was the result of a study of the literature pertaining to teacher behavior and an investigation of teacher "critical incidents." "A 'critical incident' was defined as any observable act which might make the difference between success or failure in some specified teaching situation" (77, p.79).

The Classroom Observation Record was composed of eighteen bipolar dimensions of teacher behavior and four bipolar dimensions of pupil behavior. The dimensions of behavior and the glossary for one dimension were as follows (77, pp.86-92):

PUPIL BEHAVIORS
1. Apathetic-Alert
2. Obstructive-Responsible
3. Uncertain-Confident
4. Dependent-Initiating

TEACHER BEHAVIORS
5. Partial-Fair
6. Autocratic-Democratic
7. Aloof-Responsive
8. Restricted-Understanding
9. Harsh-Kindly
10. Dull-Stimulating
11. Stereotyped-Original
12. Apathetic-Alert
13. Unimpressive-Attractive
14. Evading-Responsible
15. Erratic-Steady
16. Excitable-Poised
17. Uncertain-Confident
18. Disorganized-Systematic
19. Inflexible-Adaptable
20. Pessimistic-Optimistic
21. Immature-Integrated
22. Narrow-Broad

GLOSSARY (Teacher Behaviors)

Immature
1. Appeared naive in approach to classroom situations.
2. Self-pitying; complaining; demanding.
3. Boastful; conceited.

Integrated
1. Maintained class as center of activity; kept self out of spotlight; referred to class's activities, not own.
2. Emotionally well controlled.

The usual procedure for using the record involved the observation of a teacher for about fifty minutes, on two occasions, by different observers. After a fifty-minute visit, the observer recorded his assessments of the twenty-two dimensions of behavior on a seven-point scale. A third observation was required in cases of considerable divergence between the two earlier observations on any teacher behavior pattern (77,p.94).

During phase two of the research, the following patterns of observable teacher behaviors were identified
and given primary attention throughout the remainder of the study (77,p.77).

TCS Pattern X: understanding, friendly vs. aloof, egocentric, restricted teacher behavior

TCS Pattern Y: responsible, businesslike, systematic vs. evading, unplanned, slipshod teacher behavior

TCS Pattern Z: stimulating, imaginative, surgent or enthusiastic vs. dull, routine teacher behavior

These patterns were selected on the basis of a review of related literature, a study of "critical incidents," the observation of large numbers of teachers, and a statistical analysis of the teacher behavior assessments (77).

An attempt was made in phase four of the study to develop instruments to predict the characteristics of teachers. Some twenty-five instruments were made, including the Teacher Classification Schedule, which was made up of items culled from the other self-made instruments. The result was a set of scoring keys for nine dimensions of teacher behavior. Reliability of this key was from .7 to .8, although the validity scores were extremely low (77,pp.386-389).

Phase four of the study was an effort to show relationships between scores on the Classroom Observation
Record and age, sex, marital status and extent of religious participation. Ryans reported that some relationships exist; however, Charters (20) stated that simple relationships between the scores, and the potential correlates were not discernible (77).

Flanders has developed one of the most widely used techniques for observing classroom climate to date called Interaction Analysis. Interaction Analysis grew out of Flander's belief that research on classroom climate was incomplete because it failed to consider short term patterns of teacher influence (28,p.42). Basically, Interaction Analysis was a system for recording classroom verbal discourse. The current instrument and technique evolved from earlier studies of classroom interaction in Minnesota and New Zealand. The earlier instrument contained ten categories of teacher talk and one category of student talk. Such things as silence and confusion were completely ignored. These earlier studies were confined to such purposes as establishing instrument reliability and attempting to correlate student attitude to patterns of teacher verbal behavior (29,pp.49-65).

The more recent instrument contained ten categories for interaction analysis. Teacher talk comprised seven of the categories and was divided into indirect, category
one through four, and direct teacher influence, categories five through seven. Two categories, eight and nine, were concerned with student talk, and the tenth category was devoted to silence or confusion (3). The ten categories for Interaction Analysis were as follows (3, p. 12):

1. ACCEPTS FEELING: accepts and clarifies the feeling tone of the students in a nonthreatening manner. Feelings may be positive or negative. Predicting and recalling feelings are included.

2. PRAISES OR ENCOURAGES: praises or encourages student action or behavior. Jokes that release tension, not at the expense of another individual, nodding head or saying "uh huh?" or "go on" are included.

3. ACCEPTS OR USES IDEAS OF STUDENT: clarifying, building, or developing ideas or suggestions by a student. As teacher brings more of his own ideas into lay, shift to category five.

4. ASKS QUESTIONS: asking a question about content or procedure with the intent that a student answer.

5. LECTURES: giving facts or opinions about content or procedure; expressing his own idea; asking rhetorical questions.

6. GIVES DIRECTIONS: directions, commands, or orders with which a student is expected to comply.

7. CRITICIZES OR JUSTIFIES AUTHORITY: statement intended to change student behavior from nonacceptable to acceptable pattern; bawling someone out; stating why the teacher is doing what he is doing, extreme self-reference.
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. It "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.

The data, using Interaction Analysis technique, were gathered from a live classroom session or from a sound recording. The former was generally preferred. The observer attempted to categorize and record the verbal classroom behavior every three seconds, although it was acceptable to record twenty to twenty-five observations per minute. The observer's notes were a sequence of numbers written in columns, top to bottom, so that the original sequence of events was preserved. Marginal notes were used to explain class formations and any unusual circumstances. When there was a major change in the class formation, double lines were drawn under the last entry, and the time was recorded. A series of recorded behaviors between a set of double lines was called an episode. At the end of the observation period, usually about twenty minutes, the observer left the room and wrote up a general description
of each separate activity period, including any additional facts which might have been pertinent to the interpretation of the observational period (68) (29,p.19).

The data were then placed on a 10 by 10 matrix in the following manner. Each entry was tallied opposite the number of the tally preceding it and below its own number, e.g., if a three was followed by a four, a tally was made in row three, column four of the matrix. To assure symmetry, a ten was added at the beginning and end of each episode provided none was already there (68).

Next, the matrix was analyzed. Counts of tallies in certain areas of the matrix provided "scores" of particular interest. For example, the matrix yielded such information as: 1) the percentage of time the teacher talked, 2) the percentage of time the students talked, 3) the percentage of time spent in pause, silence, and confusion, 4) the continued use of acceptance and praise by the teacher, 5) the immediate responses of the teacher at the moment the students stopped talking, 6) the continued use of directions and criticism by the teacher, 7) the type of teacher statements that triggered student participation, 8) sustained student participation, 9) the persistence of the speaker in a particular communication, and 10) a crude indication of content orientation of the class activity (2) (27,pp.5-7).

Inherent in Interaction Analysis was the assumption
that indirect influence allowed greater freedom of participation. Direct influence restricted this freedom (27,p.5).

Flanders compared the patterns of verbal teacher behavior with achievement in seventh grade mathematics and social studies classes. He found significant differences between the verbal behavior of teachers in high-achieving classroom and those in low-achieving classrooms. Contrasting classroom climates, in terms of teacher behavior patterns, were summarized by Flanders as follows (71,p.15):

**Indirect Influence Pattern**

a) accepts, clarifies, and supports the ideas and feelings of students
b) praises and encourages
c) asks questions to stimulate student participation in decision making

**Direct Influence Pattern**

a) expresses or lectures about own ideas or knowledge
b) gives directions and orders
c) criticizes or deprecates student behavior with intent to change

As previously stated, Interaction Analysis was one of the most widely used systems for analyzing classroom behavior, and it had, without question, a great deal of potential. Nonetheless, there were shortcomings to this system, and the user should be aware of these. Interaction Analysis was designed
to be used only when the student(s) and teacher were engaged in verbal interaction, i.e., when non-verbal behavior was largely ignored. Effective observation was impossible when the teacher broke the classroom down into small groups with all of the interaction being from child to child. The system could not be utilized while the teacher was using audio-visuals or other instruments which made it unnecessary for the teacher to talk. No allowance was made for the kinds of questions teachers ask, and there was no specific indications about student response, e.g., no provision was made for indicating when one student asks a question of another student. Finally, such feelings as anger on the part of students were not revealed using Interaction Analysis. In fact, "no exact interpretation of much of student verbal behavior was provided for in the system" (2, p.205).

After a consideration of the shortcomings of Flanders' Interaction Analysis, John Hough (1960) modified it into a sixteen category system entitled, "The Observational System for Instructional Analysis." Hough developed the new system to test instructional hypotheses generated from learning theory (50).

The observational system contains the same four major sub-divisions as the original Flanders' system. However, it did provide separate "categories for
corrective feedback and for criticism or rejection of student behavior or ideas. The effects, on student learning, of corrective feedback may be distinguished from the effects of aversive stimulation" (50, p. 243). In addition, Hough expanded the Flanders' category of silence into three categories including: 1) Directed practice or activity, 2) Silence for contemplation, and 3) Demonstration. An attempt was made to distinguish between behaviors designed to facilitate learning and those which were not productive or had no great promise of being productive (50).

The Hough system for Instructional Analysis, like the Flanders' system, still was deficient in at least one dimension of classroom behavior. The teacher, non-verbal behaviors were largely ignored.

In 1961 Lewis, Newell, and Withall developed a system containing thirteen categories specifically oriented toward the description of classroom interaction as a process of communicative acts. Communicative acts were defined to include the exchange of information, directions, concepts, or evaluation between two persons. The new system was a modification of Bales' Interaction Process Analysis (62).

The categories developed by Lewis, et al. were:
1) Asks for information, 2) Seeks or accepts direction, 3) Asks for opinions, 4) Listens, 5) Gives information,
6) Gives suggestions, 7) Gives direction, 8) Gives opinions, 9) Gives analysis, 10) Shows positive feeling, 11) Inhibits communication, 12) Shows negative feeling and 13) No communication (62, pp. 212-214). These categories were meant to be mutually exclusive. They were not related in the form of a continuum as had been the case in previous studies such as Anderson and Brewer (4), Withall (89), Hughes (53) and Ryans (77).

The instrument was designed to categorize verbal behavior. Therefore, it could be applied during live classroom sessions or by tape recordings of a classroom session. The observer had to project himself into the role of the recipient of the communication act and decide on the intent of the person speaking. An arbitrary time interval was set at ten seconds. However, if it was inferred that the communication shifted in its intent during the ten second interval, more than one tally could be recorded (62).

The purposes of the study conducted by Lewis, Newell, and Withall were to test the usefulness of the observational system in discriminating between two experimental classes and to test observer agreement. Two classes were used; one was taught by the student-centered method, and one was taught by the case study method.
Based on the obtained data, the authors found the observer agreement to be approximately .97. They reported that the thirteen observational categories discriminated between the two instructional methods (62).

The first study to deal exclusively with the non-verbal communications of teachers was carried out by Charles Galloway in 1962 at the University of Florida (33). This exploratory study grew out of a concern that little attention had previously been given to the non-verbal dimension of teacher behavior, although several prominent educators had stated the importance of this dimension in the teaching-learning process (33, pp.1-7).

Galloway gathered data concerning teacher non-verbal communications in three ways including an observational schedule, narrative records, and rating of three expert judges. In addition, he gathered data on the pupil's perception of teacher attitude and feelings by administering the Davidson-Lang Adjectival Checklist (33, pp.9-10).

The observational schedule came largely from Galloway's review of the related literature. Galloway stated that, "this continuum was not taken directly from any one study, but appeared to be implicit in many of the researches" (33, p.59). It consisted of a
continuum for describing teacher non-verbal communication, which ran from encouraging to inhibiting. Categories representing encouraging behavior were enthusiastic support, helping and receptivity. Those which represented inhibiting teacher behavior were inattentive, unresponsive and disapproval. These categories were mirror reflections of one another, i.e., enthusiastic support was the opposite of disapproval; helping was the opposite of unresponsive and; receptivity was the opposite of inattentive. A seventh category of pro forma or neutral behaviors was also included. Such things as routine acts were placed in this category (33).

Observers were trained in advance to use the observation schedule. The technique they used to gather data consisted of viewing the classroom through a one-way screen and recording the non-verbal teacher behaviors. Special attention was given to the teacher's facial expressions, gestures and body movements. The observers worked in teams of two, and each observer attempted to place himself into the place of the pupil (s) to whom a communication was addressed. He then inferred the meaning of the communication and placed a tally in the appropriate category. The tallies (numbers of the categories) were written in a column, top to bottom, to preserve the sequence of the teacher behaviors. There was no arbitrary time interval placed upon the
observers; they categorized and recorded every teacher, non-verbal communication that they perceived (33,p.69).

Galloway gathered his data from six elementary classrooms, grades four through six, by means of observational schedules, narrative records, ratings by three expert judges, and the Davidson-Lang Adjectival Checklist. Based on these data, Galloway reported that the method of recording teacher behaviors in categories by trained observers, was superior to the other two methods. There was no significant correlation between the pupil's perception of their teachers and the teachers' rank on the encouraging to inhibiting continuum. Galloway found a significant correlation between the teachers' score on the observation schedule and the judges' judgments of narrative records. The judges' ranking of the teachers did not correlate with the experts' ranking of the teachers. In fact, the three experts did not agree among themselves. Finally, Galloway concluded that recording in categories and written observational records of teacher non-verbal communication held considerable promise for future research (33,pp.132-136).

Arno Bellack and associates completed part one of their research on the language of the classroom in 1963. The major purpose of this study was to describe the linguistic behaviors of secondary school teachers and
pupils. Teacher non-verbal behavior was completely ignored. A secondary purpose was to investigate the relationship between linguistic variables of classroom discourse and pupils' learning and attitude changes. Two major assumptions were inherent in this study. First, the primary function of language was the communication of meaning, and second, the various kinds of verbal discourse, within the classroom, might be described as "language games" (11) (71).

Instrument development centered in three areas pertaining to what teachers and pupils verbally communicate in the classroom. First, effort was given to the development of a system for classifying what the speaker was doing pedagogically with the words he spoke at a given time. Transcripts of classroom sessions provided the material for the development of these categories which became labeled as pedagogical moves. The categories and their definitions follow (11, p.4):

**Structuring.** Structuring moves serve the pedagogical function of setting the context for subsequent behavior by launching or halting-excluding interaction between pupils and teachers and by indicating the nature of the interaction. For example, teachers frequently begin a class period with a structuring move in which they focus attention on the topic or problem to be discussed during that session.

**Soliciting.** Moves in this category are designed to elicit a verbal response,
encourage persons addressed to attend to something, or elicit a physical response. All questions are solicitations, as are commands, imperatives, and requests.

Responding. These moves bear a reciprocal relationship to soliciting moves and occur only in relation to them. Their pedagogical function is to fulfill the expectation of soliciting moves. Thus, students' answers to teachers' questions are classified as responding moves.

Reacting. These moves are occasioned by a structuring, soliciting, responding, or another reacting move, but are not directly elicited by them. Pedagogically, these moves serve to modify (by clarifying, synthesizing or expanding) and/or to rate (positively or negatively) what has been said previously. Reacting moves differ from responding moves, in that while a responding move is always directly elicited by a solicitation, preceding moves serve only as the occasion for reactions. Rating by a teacher of a student's response, for example, is designated a reacting move.

When an analysis was made of these moves, it was found that they occurred in certain cycles, i.e., structuring and soliciting moves served to get a cycle underway. Responding and reacting were found to be reflexive in nature; they were elicited by the opening moves. This concept of teaching cycles made it possible for the researchers to describe more fully the teaching-learning process (11, pp. 4-5).

The second point of interest was the content of the speaker's statement at a given time. Analysis of transcripts revealed that teachers and pupils communicated four different types of meanings including substantive
meanings, substantive-logical meanings, instructional meanings, and instructional-logical meanings. These terms were defined in the following manner by the researchers (11,p.5).

Substantive meanings refer to the subject matter discussed in the class; that is, specific concepts such as multilateral trade and generalizations involving, for example, the relation between specialization and the factors of production. Substantive-logical meanings refer to the cognitive processes involved in dealing with the subject matter, such as defining, explaining, fact stating, interpreting, opining and justifying. Instructional meanings refer to the social-managerial aspects of the classroom, such as assignments, materials and routine procedures which are part of the instructional process. Instructional-logical meanings refer to distinctively didactic verbal processes such as those involved in rating negatively and positively, explaining procedures, and giving directions.

The third area considered was the feeling tone or emotion conveyed by the communication. Bellack, et al. categorized the emotional tone of the discourses into valence, strength and activity (11,p.5).

The data for their study were collected by testing pupils, using self-made instruments, and by analyzing and classifying transcriptions made from sound recordings of classroom sessions. The study included fifteen social studies teachers and 345 pupils in seven New York high schools. Each teacher was recorded for four class periods on four consecutive days. A total
of sixty recordings were made and analyzed (11).

Based on the data gathered, Bellack and associates reported the results of their study by means of a description of the discourse based on each of the major categories and some of the relationships among these categories. The researchers did not find greater learning, on the part of pupils, concerning the topics most often discussed (71).

Phase two of the research involved a study of the functions of moves and their recurrent patterns. A secondary aim was to study the relationship of linguistic variables to pupil learning. The earlier system of analysis was expanded to accomplish these aims (11,p.13).

The expanded category system included categories dealing with the functions of the four pedagogical moves and the ways in which the speakers carried out these functions in the classroom. The data were then obtained by analyzing the original verbatim transcriptions used in the first research. The system was so complex that several members of a coding team checked each other's analysis (11,p.14).

The researchers again reported a large number of results based on their analysis of the data, e.g., they found that the chief solicitor was the teacher; one pupil was usually expected to respond when the
teacher solicited; and the solicitor almost always expected the respondent to perform verbally and specified task (11).

Hilda Taba and associates created a category system for analyzing classroom cognitive processes based on an intensive study of related research and literature. Although this area had been dealt with by earlier researchers, Taba added the dimension of the logical quality to the content of thought. Inherent in this system was the idea that thought consisted of specific, describable processes which were learnable and, therefore, teachable (83) (82).

Three clusters of cognitive processes were identified. These were: 1) Concept formation, 2) Development of generalizations and inferences, and 3) Explanation and prediction of new phenomena. Each of these clusters was further seen as having a hierarchy of steps running from concrete to abstract, i.e., from the enumeration of concrete items to grouping items to the labeling or classifying of items (82,p.536).

Twenty elementary teachers and classrooms were involved in the study. Four classroom discussions were taped in each classroom, covering a pre-planned social studies curriculum. All of the teachers had been given prior training in the analysis of thought and how to decide on effective teaching strategies (83).
The tapes were then analyzed by means of "thought units." A "thought unit" was defined as a remark or a series of remarks which expressed a complete idea. Thus, time intervals were discarded (83, p. 529). In addition, a multiple rating system was used. The recordings were scored by three different ratings which included: 1) Designation or the source of the thought unit, 2) Function or how a thought functions in the context of the discussion, and 3) Levels of thought (83, pp. 530-532).

The authors reported, based on the analysis of the eighty sound recordings, that teacher behaviors had an enormous influence on the thinking of pupils. The data depicted the various strategies which the teachers employed, e.g., students returned to lower levels of thought when the teacher attempted to raise the thought level too early. If the teacher attempted to steer the pupils to the inferential level without proper attention being given to the body of needed information, the children returned to the information level (83, pp. 532-533).

Gladys Kleinman (58) conducted a study of teachers' questions and students' understanding of science in 1964. This was an exploratory study focused on the kinds of questions teachers ask. The categories of questions she developed were: 1) Neutral, 2) Rhetorical, 3) Factual, 4) Clarifying, 5) Associative, 6) Critical thinking, and
According to Kleinman, these categories represented a continuum from "lower type" questions to "higher type" questions.

Using the above categories, Kleinman identified three general science teachers who asked nine or more critical thinking questions during one class period. She also identified three general science teachers who asked no critical thinking questions during the same time interval. In a comparison of these two groups based on three additional observations of each, Kleinman concluded that teachers in the "high" group tended to ask fewer questions than those judged "low." However, those judged "high" tended to ask a greater number of higher level questions based on the designated continuum (58, pp. 311-312).

Using a bipolar scale similar to that developed by Ryans (77), the behavior of the teachers was compared. Kleinman concluded that there was a trend for "high" teachers to rank above average and "low" teachers to rank below average on the positive side of the bipolar scale (58, p. 311).

Observer agreement using the instrument was found to be from .85 to .90. Thus, Kleinman concluded that it was possible to identify and record a sample of teacher behaviors. She further concluded that the kinds of questions a teacher asks seemed to be fairly stable.
for each teacher. This conclusion agreed with the findings of Withall (89,p.360).

After a comparison of the student TOUS scores in the various general science classes, Kleinman stated, "one may cautiously conclude ... that teachers who ask critical thinking questions impart a better understanding of science to both seventh and eighth grade boys and girls of high ability" (58,p.316).

George Miller devised a category system for classifying teacher verbal behaviors based on a partial theory of instruction employing certain aspects of psychology and educational pedagogy. Teaching acts were divided into two major divisions including: 1) Teaching content or tasks and 2) Maintaining social order. The two categories of teaching acts were further divided into seven functions. The functions of developing content were: 1) Providing focus, 2) Developing the object of focus, 3) Giving information directly, and 4) Appraising pupil efforts. The functions of maintaining social order were: 1) Setting expectations for pupil behavior, 2) Implementing regulatory actions, and 3) Assessing pupil effort in the social order dimension. The seven functions were described as differences along a Responsive-Directive Scale (71,pp.32-33) (70,p.227).

Data were obtained from transcripts made from audio tapes of seventh and eighth grades social studies classes.
Half of the classes were instructed under teaching which was directive, and half were instructed under teaching which was responsive. Teacher statements were analyzed and recorded into the Responsive-Directive Scale. Pupil comments were classified according to the level of understanding. Pencil-and-paper instruments were used to measure pupil attitude and mastery of content facts.

Miller concluded that responsive teaching was more effective than directive teaching, i.e., pupils under responsive teaching, when compared to pupils under directive teaching, expressed more positive attitudes and achieved as much on the objective tests. The Responsive-Directive Scale proved to be a useful instrument for measuring the classroom, verbal behavior of teachers. The findings supported a portion of the partial theory of instruction which had been developed by Miller (71,p.34) (70).

Jal Parakh conducted one of the first researches dealing exclusively with the teacher-pupil interaction in science classes, especially laboratory classes. As a result of this research, he created a system for the first-hand systematic observation of teacher-pupil interaction in high school biology classes. The resulting category system consisted of sixteen major categories, included twenty-eight sub-categories and a "residual" category for behaviors which could not be
classified into the other forty-four categories. The theoretical framework for the category system was provided by a consideration of concepts from communication theory and social interaction (73) (74) (75).

During the development phase of the category system, Parakh observed eight biology classrooms once per month for four successive months. Magnetic tape recordings were made of the verbal behavior, and notes were taken of the non-verbal behavior. Verbatim transcripts were also made as needed. The recordings, notes, and transcripts were studied until common elements were envisioned and identified. After reviewing related literature and research, Parakh constructed a set of trial categories which he later modified into a forty-five item category system (74, pp.13-14).

Parakh stated that the first thirteen major categories consisting entirely of teacher behaviors, were grouped into three dimensions—evaluative, cognitive and procedural. However, the reader should not be surprised to find only eleven major categories in this section. These are as follows (74, pp.13-15):

**EVALUATIVE DIMENSION**

1. "Positive" Affective Evaluation
2. Evaluation of Substantive Responses
3. "Negative" Affective Evaluation
COGNITIVE DIMENSION

4. Substantive Information Giving (non-verbal)
5. Substantive Information Giving (verbal)
6. Substantive Information Seeking (verbal)
7. Substantive Information Seeking (non-verbal)

PROCEDURAL DIMENSION

8. Seeking Procedural Information (verbal)
9. Giving Procedural Information (verbal)
10. Performance of Routines and Services
11. Minimal Interaction


The final two major categories were silence and "not categorizable". Silence consisted of pauses of at least four seconds in duration. "Not categorizable" meant that the behavior did not fit into the above categories (74,p.14).

Parakh's system for observing and recording classroom interaction was designed to be used during live classroom sessions. The observer viewed the entire class period, and a five-second time interval was used for coding and recording the observed behaviors. The coded behavior was written in rows to preserve the original sequence, and brief notes were written in the margin to describe the kinds of class activities (74,p.18).
A graduate student was trained in the use of Parakh's system for observing and coding classroom interaction. Upon completion of this training, four classroom sessions and four laboratory sessions were used to determine observer agreement. Based on Scott's coefficient, a inter-observer agreement was reported to be .6 or above (74, p.17).

Since little inference was made, Parakh felt that there was not any need to argue validity. Therefore, validity of the instrument was largely ignored (74, p.17).

In phase two of the research Parakh used the developed system to describe and analyze the characteristics and patterns of teacher-pupil interactions in ten selected biology classrooms. The conclusions, based on the obtained data, were presented in graphic and tabular form. They consisted of the relative frequency of occurrence of each of the categories and an average or "composite teacher" (75, p.8).

Karl Openshaw and associates developed a taxonomy for the classification of teacher classroom behaviors during the years, 1963 to 1965 (71). It represented an effort designed to create a means for describing all observable, purposeful teacher behaviors in the classroom. It was assumed that the teacher's purpose was to teach, therefore, only behaviors that fulfilled a teaching function were considered. Their work was
prompted by a desire to improve teacher education programs. It was believed that a major difficulty with existing teacher education programs was that researchers had not identified those behaviors essential to the development of effective teacher education programs (71,p.1).

Openshaw, et al. began their study by thoroughly searching the literature in teacher education and other social process fields which had previously attempted to analyze and conceptualize various aspects of teacher classroom behavior. Based on this review of the literature and live classroom observations, an initial working taxonomy and several paradigms were projected to identify the essential elements of teacher behavior (71,p.2).

Once the initial categories were developed, a pilot study was conducted in Arizona. The instrument was modified and refined based on the findings of the pilot study. A major validation study followed, and the instrument was further refined. The final instrument divided teacher behaviors into four major dimensions as follows: 1) Source dimension, 2) Directive dimension, 3) Function dimension, and 4) Sign dimension. Each of these dimensions was described in terms of sub-categories of descriptive teacher behaviors. The encounter
served as the basic component of the teacher behaviors in the developed taxonomy. It was a unit of behavior that served as a recognizable function within a teaching situation. The four dimensions changed during the teaching sequence, and each change indicated a new encounter (71, pp. 2-6).

In this study it was assumed that teacher behaviors were aimed at accomplishing certain task areas. These areas were: 1) Subject matter or content (also beliefs, attitudes, way of organizing, and processes of instruction), 2) Maintenance of interpersonal relations, and 3) Facilitation of the learning process. The teacher behaviors that were directed towards the stated tasks constituted the dimension of function. The sign dimension represented modes of communication used by the teacher to accomplish the function dimension. The behaviors which communicated the target of the focus were categorized under the direction dimension. The source dimension represented the source of stimulation. It controlled the other three dimensions.

The taxonomy did not provide a means for measuring and recording pupil behavior. However, the authors did realize that a complete picture of teaching was impossible without a description of pupil behavior. Thus, student behaviors were considered by the observer
in order to classify teacher behaviors into the appropriate categories (71, pp. 2-6).

Based on the pilot and validation study, the authors concluded that further refinement was needed in the directive dimension. The same was true of several of the sub-categories, e.g., stimulate, routinize, explain, inform, elicit, check, and reinforcement-explain-inform. The concept of encounter needed revision. It was recommended that typescripts of oral teacher behaviors should be used to make these refinements (71, pp. 15-16).

**Personality and the Guilford-Zimmerman Temperament Survey**

Personality was an elusive term and a variety of definitions was evident in the literature, e.g., Allport identified approximately fifty different definitions of personality, and his list was probably not all-inclusive. One common definition of personality was stated in terms of a person's appearance and a set of specified rules on how to get along with others. This definition did not consider the actual behavior of the individual but rather the effects that personality had on others. Such a definition was usually referred to by psychologists as the "layman's definition" of personality (65, p. 3).

Personality originally came from a Greek word,
"persona", which referred to a mask worn by a Greek actor on the stage. The actor held the mask in front of his face and the audience knew the part he was playing (40,p.2).

In the writings of Cicero, personality was used in differing ways; all were related to the stage. First, personality was considered as a collection of personal qualities. It represented what the personality was really like, the actor. Second, personality was defined as the way a person appeared to others. In this situation, personality pertained to the mask. Third, personality was the societal role a person played, and, finally, personality was used to illustrate the character in the drama. In this latter sense, personality referred to qualities of distinction and dignity (40,p.3).

The definitions of personality were often classified into several categories of definitions rather than presented as quotes given by individual authors. These categories included stimulus, omnibus, integrative, hierarchical, totality and adjustmental definitions (65,p.4) (40,pp.3-5).

The stimulus category contained definitions that were "mask" definitions. They were adoptions of the idea that personality was one's social stimulus value. Personality in this sense was known or appreciated only through the affect it had on others. In other words, a
person had as many personalities as there were persons to perceive him (40, p. 3).

The sum total of one's behavior was the most representative definition of personality in the omnibus category. This definition was proposed by John Watson, the founder of behaviorism (65, p. 4). Such a definition was criticized because it lacked an organizing principle, i.e., nothing was just an aggregation of parts (40, p. 4).

The integrative definitions of personality suggested that it had some unifying core or principle. Such a core might be basic drives, needs, instincts, tendencies, or habits. Many times the unifying principle was not explicitly stated. The definitions implied that the whole was more than the sum of its parts (65, p. 5). Criticism of these definitions was aimed primarily at the characteristics which were listed (40, p. 4).

Hierarchical definitions saw personality as layers of traits or characteristics. Prime examples were the definitions by William James and Sigmund Freud. James saw personality as layers viewed from within. The layers included the material self, the social self, and the spiritual self. Freud saw personality as being structured into the id, ego, and super ego (65, pp. 5-6).

The definitions in the totality category carried the idea of integrative forward until the parts were almost
completely forgotten. It usually involved the general characterization or pattern of an individual's total behavior, e.g., dominative or integrative (40,p.4).

Definitions in the adjustmental category stressed personality in terms of man's adjustment to or ability to get along in his environment. Some of the definitions limited personality to various parts of the environment, e.g., social adjustment. Lund's definition was an example of the adjustmental method of describing personality. From this position, personality was viewed as "that organization of unique behavior equipment an individual has acquired under the special conditions of his development" (65,p.8). This definition perceived personality from the standpoint of learning theory.

One of the most common ways of describing personality was the trait approach. "A trait is any distinguishable, relatively enduring way in which one individual differs from another" (40,p.6). In other words, traits referred to consistent patterns of actions or underlying, depth characteristics of personality. When the psychologist spoke of the trait approach to personality, he was not referring to a specific theory of personality. He simply suggested a method for describing personality based on a person's behavior under various circumstances. This method of describing personality belonged in the
integrative category of personality definitions (60).

The definition or description of personality, using the trait approach, was that an individual's personality was composed of his own particular or unique pattern of traits. In other words, "Personality is the organization of stable structures [traits] within a person that disposes him to act in certain ways. These structures are in reality hypothetical constructs that are inferred from behavior" (60,p.49). Such a definition was based on the assumption, to which most psychologists agreed, that no two persons had the same identical personality: every individual's personality was unique. This does not mean that a particular trait did not apply to nor was characteristic of another person. It meant that a persons' traits, considered collectively, were different from all other persons' traits. Consequently, persons-as-a-whole were different from persons-as-a-whole, although they may have had some characteristic patterns of behavior or traits which were similar.

The use of traits to describe personality further assumed that an individual's traits, once developed, were consistent or stable through time, e.g., if a trait applied in one particular situation, it applied in others as well. Thus, traits were not only unique to the individual, but they were related to consistent patterns of reactions that were typical of the person. If the
above assumption cannot be made and traits have no
generality, then the use of traits could not be considered
as an appropriate way to describe a person's personality
(60).

The above assumption does not mean that a person's
actions or behaviors were always similar, far from it.
Nevertheless, traits did assist in the direction a
person's action took from situation to situation even
though the acts themselves appeared inconsistent. For
example, if a person had an underlying ambition to be
powerful, he might behave obsequiously to someone in
authority in one situation and publicly attack an
authority figure in another situation. Both of these
behaviors might be, depending on the circumstances,
behaviors which represented the desire for power (60,p.54).
Behaviors depended not only on the trait which a person
had but also on the situation in which the person found
himself, including the stimulus and the background
leading to the situation (40,p.50).

The idea of a trait and the naming of it came from
the observation of behavior. Behavior was observed in a
number of situations, and the traits were inferred from
these observations. Behaviors which illustrated a
particular type of trait were known as trait indicators.
The trait itself was not observed as it was an abstraction
which applied to a number of different behavioral characteristics. For example, a person who was observed on several occasions to be even tempered, optimistic, cheerful, and retained his composure in a difficult situation was said to have the trait of emotional stability. In this example, the trait was emotional stability, and the behaviors were the trait indicators of emotional stability. Thus traits were abstract generalizations of the similarity seen between a group of reactions (65,p.14) (40,p.83).

Traits themselves might be generalized according to a certain pattern of traits. A person who exhibited the traits of objectivity, expedition, and accommodated readily to new situations, and was indifferent to his physical welfare was labeled an extrovert. The trait, extrovert, was inferred and generalized from the preceding list of traits. Therefore, traits might be viewed at different levels of generality (60,p.53).

Carr and Kingsbury, in 1938, suggested three steps which were involved in identifying and naming traits (40,p.52). These steps were still considered by psychologists as the appropriate way to identify and name traits. First, observations were made of behavior. People differed in what they did, how they did a thing, and how well they did it; consequently, the clues to traits were found in the behaviors of people. However,
on close inspection, some common quality might be seen by observing various behaviors. This quality pertained to the action observed and was, therefore, given an adverbial name, e.g., cautiously, confidently, and cordially.

The second step involved applying the quality to the individual who committed the act. An adjectival form was then used, e.g., cautious, confident, and cordial.

After describing the action and finding that the quality belonged to a person, the trait was then referred to as a thing. It was given a name in the noun form. Thus, after a consideration of the three steps, traits became things and were spoken of as nouns, i.e., a person had the trait of cautiousness, confidence, and/or cordialness (40, p. 53).

Since there were at least 18,000 different traits described in the English language, it was not surprising to find both common and unique traits (60, p. 53). By this was meant that certain traits were found widely distributed throughout the population or among certain groups. These were common traits. Other traits applied only to an individual; these were unique traits. Although it was necessary to identify both kinds of traits in order to adequately describe personality, psychologists gave major attention to the former.
Common traits offered a higher degree of generality than did unique traits (40) (60, p. 57).

Many of the traits, although common to a large number of persons, were scalable. This meant that two persons, who exhibited the same trait, might differ in the degree that they exhibited the trait. For example, if the trait of tactfulness was represented by a straight line running from less tactful to more tactful, person A might be nearer the more tactful end of the line while person B was in the middle or was moderately tactful. In this example, the trait was common; nevertheless, each person exhibited the same trait to a different degree (40, p. 62).

How was each person's trait position on the continuum determined? One clue came from the frequency of occurrence of the trait indicator, or how many times a person exhibited a specific behavior in a given situation. A second clue was the intensity of occurrence of the behavior. This might be determined by the level of difficulty of certain problems on a test which the person could answer. The third clue involved the range of behavior in which a high degree of the trait was indicated. In other words, how many behaviors did the person exhibit which were related to the trait? Each of the above clues helped to determine a person's trait position (40, pp. 62-63).
Since a trait was inferred from the frequency of occurrence, from the intensity of occurrence, and from the frequency of behaviors related to the trait, it was obvious that a person could have minor fluctuations in his trait position from time to time. This minor fluctuation was known by psychologists as functional fluctuation. Therefore, a person usually fell consistently within a small range on the trait continuum rather than at a specific point. This phenomenon contributed to the unreliability of the measurement of traits (40, pp. 66-80).

An additional dimension of traits had to do with the number of types of behavior that could be categorized under a particular trait term. The smallest behavior fragment from which a trait could be inferred was known as a trait element. Each of the trait elements could be dealt with separately and treated as narrow traits. However, it was more convenient and economical to deal with a cluster of the traits which could be classified into a broad trait. Thus, traits might be broad or narrow depending on the number of trait elements necessary to infer the trait term (60, p. 58).

The procedure for inferring a broad trait from several narrow traits was usually accomplished through factor analysis. This was a statistical method used by many psychologists to identify patterns of traits that
"go together" or clusters of traits. Factor analysis depended upon the concept of correlation, e.g., if the relationship between a number of narrow traits was studied, it might be found that they were highly correlated with one another or that they had some quality in common. Several other traits might be found that were united by some different underlying factor. Thus, by the use of factor analysis, many traits might be reduced to a relatively small, manageable number of broader traits that were related to one another but were distinct from the other clusters of traits. This procedure was used by Cattell when he reduced 4,000 trait names to thirty-five clusters of traits (60, p. 60). It was also used by Guilford and Zimmerman when they developed the Guilford-Zimmerman Temperament Survey (41, p. 1).

It should be pointed out that factor analysis did have certain limitations as well as advantages. First, by selecting certain traits and by omitting others, important traits might be left out. Second, factor analysis did not answer the question of how traits were organized; it simply revealed that they were related or not related to one another statistically. Thus, there was a tendency to fragment the human being into a number of isolated attributes ignoring the organization of the whole. "However, the use of
factor analysis does provide an objective systematic approach to the assessment of traits and their relationship and has great usefulness in reducing the tremendous overlapping among the many trait names we use commonly in the description of personality" (60,p.62).

In determining the various traits of an individual, several things should be kept in mind. First, traits were inferred and, as such, were not open to direct inspection. Therefore, they could not be treated and measured like physical objects. Second, a person's traits might be different, or they might overlap depending on how he was viewed. By this was meant that there was the way a person really was. This was the person that psychologists wanted to measure, but the difficulty of this was just mentioned. Next, there was the way a person was as others saw him, and, finally, there was the person as he saw himself. The psychologist must turn to these last two positions in order to determine an individual's traits.

Traits could be determined through self-ratings and by the ratings of others. Self-ratings and ratings by others were primarily of two types. In one type, the person simply scaled himself or someone else on a number of traits by examining his past experience and making an inference concerning the traits. The second method was the personality-inventory approach.
It was designed to ask the examinee direct questions about himself or others regarding behaviors, dislikes, habits, and attitudes. Therefore, the personality-inventory required less inference since it was based on specific behaviors rather than on trait scales. Guilford preferred the self-rating, personality-inventory approach for determining an individual's traits. He felt that it was more analytical, specific, and gave a more nearly correct evaluation of a person's traits. Thus, the self-rating, personality inventory was the basic design of the Guilford-Zimmerman's Temperament Survey (40, pp. 56-61).

The Guilford-Zimmerman Temperament Survey (GZTS) was a self-report inventory that provided a general assessment of ten individual traits. These traits were: 1) General Activity, 2) Restraint, 3) Ascendance, 4) Sociability, 5) Emotional Stability, 6) Objectivity, 7) Friendliness, 8) Thoughtfulness, 9) Personal Relations and 10) Masculinity. Each of these traits was identified through the use of factorial analysis (41, pp. 2-3).

The GZTS consisted of 300 statements, approximately thirty for each trait, about actions and feelings. The individual responded to these items by indicating a yes or a no, depending on whether he saw the statement as being characteristic of himself or not. An uncertain category (?) was also provided for the individual who did not feel he could answer yes or no.
The purpose of the survey was to locate clusters of behaviors that hang together and were distinct from the other clusters. Thus, a person's trait position was determined from his response to the 300 statements (41).

The individual responses to the questions were scored by designating a "correct" response as one point and an "incorrect" response being equal to zero. This method of scoring was convenient and also kept the average proportions "passing" nearer .5, a level at which reliability could be higher (41, pp. 3-5).

A high score for a particular trait category indicated the positive qualities of that trait, and a low score indicated the negative qualities of that trait. Therefore, the trait was seen as being on a continuum ranging from zero to thirty points.

The statements were made in the affirmative rather than in the form of questions. Personal pronouns were avoided wherever possible. They further felt that the avoidance of the personal pronouns reduced individual resistances and increased the operation of the projective principle. Such statements were believed to be less personal to the examinee. Thus the ideas of a confession, on the part of the examinee, were reduced. Yes and no responses were used rather than true and false responses. Guilford and Zimmerman felt that the affirmative form made it possible for the statements to be more direct
and simple. The use of yes and no was preferred to true and false because the authors felt that when true and false were used the examinee often became concerned about the actual truth of the statements rather than giving his own spontaneous response (*H, pp. 4-5*).

The reliability of the individual trait scores, using the Kuder Richardson formula, was based on a sample of 523 male and 389 female college students. The separate reliabilities ran from .75 to .85, clustering at approximately .80 (*H, pp. 5-6*).

The standard error of measurement for this instrument ranged from 2.2 to 2.6. From these values, it was probable (two to one) that any obtained score was within 2.5 units of the "true" score for the individual (*H, p. 5*).

Guilford and Zimmerman felt that the survey's validity was assured because of the factor analysis and the item analysis studies of the individual items. Practical validity was assured based on correlation studies with previous personality inventories, although the exact correlations nor the instruments were not presented in the manual for the GZTS (*H, pp. 6-8*).

The authors presented the intercorrelations of the ten trait scores, and these generally were low. This
indicated the prevailing uniqueness of the individual trait scores (41, p. 6).

The GZTS had several characteristics which differentiated it from other personality inventories. First, it was based on the responses of normal people, not the maladjusted or institutionalized as does the Minnesota Multiphasic Personality Inventory. Second, the scales were determined by factor and item analysis. Third, the responses were taken at face value, weighting of the individual items was not used. Finally, the examinee answered as few or as many statements as he liked. He was not forced to respond to any or all of the statements (84, p. 387).

It should be pointed out that all personality inventories, including the GZTS, did have certain limitations as well as advantages. They used only samples of behavior, and therefore, an adequate sample of behavior was not necessarily obtained. Then there was the problem of interpretation. The scores often meant different things, depending on who was doing the interpretation. There was also the problem of falsification. An examinee, depending on his background and experience, might make the scores come out according to his own liking (65, p. 19). Regardless of these limitations, Guilford believed that the self-report inventory was a valuable and useful
instrument. It provided valid and reliable measures of selected personality traits (40).

The GZTS was a fairly new instrument. It was a modern version of the **Guilford-Martin Inventory** (35, p. 548). Nevertheless, the GZTS had been used extensively in personality research. For example, Gowan and Gowan administered the survey to 337 candidates for teaching credentials. He reported that the prospective teachers scored higher than the norms in restraint, ascendance, sociability, emotional stability, objectivity, friendliness and personal relations (39). Leeds reported similar findings in a research involving 300 public school teachers in South Carolina (61).

Guilford reported several findings which seemed to be consistent in a survey of researches using the GZTS. Librarians tended to score low in the areas of ascendance and general activity. Nurses, when compared to teachers, scored high in sociability, emotional stability, friendliness, and masculinity. Teachers scored higher than college students in the areas of friendliness, restraint, and emotional stability. They scored lower than students in general activity and ascendance (40, p. 186). Thus, Guilford's review of researches using the GZTS was not contradictory to the findings presented by Gowan and Gowan (39) and Leeds (61).

The GZTS was used by Jones and Bendig in two
separate researches in an attempt to distinguish between good and poor teachers. Jones measured forty-six female secondary school teachers on five traits assessed by the GZTS. Teachers were judged by student teacher grades and ratings by principals and the placement bureau. Only the trait of general activity was found to discriminate between the two groups (35, pp. 548-549).

Bendig's population consisted of college instructors who had been rated by their students. He reported that there was no significant correlation between the ten traits measured with the GZTS and the student's ratings of their instructors (35, p. 549).

At least three attempts have been made to correlate the trait scores of the GZTS to other instruments. First, Leeds compared the GZTS to the Minnesota Teacher Attitude Inventory (MTAI) scores of some 300 teachers in North Carolina (61). He reported that seven of the ten factors correlated positively with the MTAI scores. The general activity, restraint, and thoughtfulness areas proved to be the three exceptions. Ferguson repeated the research except that he used practice teachers. He found a much lower correlation than did Leeds (35, p. 550). Based on the conclusions of these two studies, Getzels and Jackson concluded that the correlations between the two instruments were partially dependent on the populations studied (35, p. 550).
Gowan developed the Teacher Prognosis Scale and then he attempted to compare his instrument with the GZTS (35,p.549). He applied both instruments to the teaching candidates at UCLA. He reported that seven of the GZTS scales correlated with the positive scale of the Teacher Prognosis Scale. The areas of general activity, thoughtfulness, and masculinity failed to correlate. He further reported that emotional stability, objectivity, friendliness and personal relations revealed significant negative correlations with the negative scale of the Teacher Prognosis Scale. Thus, the four GZTS scales correlated significantly and consistently with the Teacher Prognosis Scale (35,p.549).

Correlation of Personality Traits and Teacher Behavior

A large number of researches was evident in the literature which attempted to relate teacher personality traits to teacher classroom behavior. This was especially true in the area of teacher personality characteristics and their relationship to teaching effectiveness (71,p.5). Several extensive and excellent bibliographies were available on this subject. Four of these bibliographies were as follows: 1) Barr (1948), 2) Domas and Tiedeman (1950), 3) Morsh and Wilder (1954), and 4) Barr (1961) (10) (24) (71) (9). More than a thousand studies were reported in the Domas and Tiedeman bibliography alone.
In addition, to these bibliographies, Getzels and Jackson complied a list in excess of 800 references on the subject of teacher personality and teacher behavior while writing, "The Teacher's Personality and Characteristics," in the Handbook of Research on Teaching (35).

Most of the studies dealing with the development of instruments and systems for systematically observing and recording classroom behavior, reviewed earlier in this chapter, have been based on various personality traits, i.e., the studies by Anderson and Brewer (4), Withall (89), Bales (7), Cornell, Lindvall, and Saupe (23), Cogan (22), Hughes (53), Medley and Mitzel (67), Wright (90), Ryans (77), Flanders (29), Hough (50), Galloway (33), Taba (82), Kleinman (58), Miller (70), Parakh (74) and Openshaw, et al. (71) were all, either directly or indirectly, concerned with the characteristics of teachers. It became apparent that the literature was too extensive to mention all of the literature related to the study of teacher personality and its relation to teacher classroom behavior. Therefore, the remaining section of this chapter is devoted to those specific researches which attempt to correlate teacher personality traits to teacher classroom behavior, which was observed and recorded using some systematic observational and recording device.
Although all of the related research was not to be reviewed, it seemed appropriate that some reason for such a gigantic interest in the subject of teacher personality and teacher classroom behavior be at least partially explained. Some of this interest was explained by the following statements by Getzels and Jackson (35, p. 506).

The personality of the teacher is a significant variable in the classroom. Indeed, some would argue it is the most significant variable. The educational impact of an Ichabod Crane or a Socrates, is surely not due solely to what he knows, or even to what he does, but in a very real sense to what he is. There has always been a concern with the personal qualities of teachers, and recently this concern has become the basis for a growing body of research.

An additional reason for the present interests lay in the fact that, after a half-century of prodigious research, very little was known for sure about teacher personality and its relationship to teacher classroom behavior (35, p. 574).

Henry McGee (66) sought to answer the following question: could teacher classroom behavior be predicted by scores obtained from teacher scores on a scale for measuring authoritarian trends? He limited his sample to one hundred eighty-four young and inexperienced elementary and secondary school teachers in Oakland, California. The approach attempted to measure factually
the authoritarian syndrome, without making value judgments, and to compare these facts to the live observations of teachers who were engaged in the act of teaching. The Classroom Observation Record and an accompanying Glossary were used to categorize and record the teacher classroom behavior (35) (66, pp. 93-101).

The personality data were collected by means of a questionnaire (F-scale) for measuring the "secret" thoughts, which the ordinary individual will not reveal to others and/or even admit to himself. The questionnaire contained thirty statements to which teachers were asked to agree or disagree. The responses were converted into scores, and a high score indicated a great amount of the authoritarian trait. A low score represented a small amount of the authoritarian trait (66, pp. 96-97).

The Classroom Observation Record, which the author developed, provided the teacher behavior data. It consisted of thirteen categories of teacher behavior. Each category was created from a purely theoretical framework. The categories were as follows (66, p. 113):

<table>
<thead>
<tr>
<th>ALOOF</th>
<th>APPROACHABLE</th>
</tr>
</thead>
<tbody>
<tr>
<td>UNRESPONSIVE</td>
<td>RESPONSIVE</td>
</tr>
<tr>
<td>DOMINATIVE</td>
<td>INTEGRATIVE</td>
</tr>
<tr>
<td>IRRESPONSIBLE</td>
<td>RESPONSIBLE</td>
</tr>
<tr>
<td>HARSH</td>
<td>KINDLY</td>
</tr>
<tr>
<td>IMMATURE</td>
<td>MATURE</td>
</tr>
<tr>
<td>INFLEXIBLE</td>
<td>ADAPTABLE</td>
</tr>
<tr>
<td>INSENSITIVE</td>
<td>SENSITIVE</td>
</tr>
<tr>
<td>NARROW</td>
<td>BROAD</td>
</tr>
<tr>
<td>PARTIAL</td>
<td>FAIR</td>
</tr>
</tbody>
</table>
The instrument and these categories were remarkably similar to those developed and used by Ryans (77).

The accompanying Glossary of behaviors was likewise developed based on a review of literature related to the authoritarian personality. Nevertheless, one additional requirement was made of each behavior. It had to be a behavior that could be observed in the classroom. A review of the related researches provided the necessary evidence that the behavior was observable (66,p.110). Examples of the observable behaviors for one category follows (66,p.116):

HARSH
1. Teacher was "personal" in praise and criticism of the work of each member; teacher ridiculed a pupil, depreciated a pupil's efforts.
2. Teacher was hypercritical; faultfinding; teacher was abusive.
3. Teacher used threats; lost temper; was cross; permitted pupils to laugh at mistakes of others.
4. Teacher was severe; grabbed, shook or otherwise "manhandled" a child.

KINDLY
1. Teacher was "objective" and factminded; was considerate of pupils.
2. Teacher was benevolent and friendly; teacher found good things to call attention to in a pupil.
3. Teacher was self controlled.
4. If teacher expressed aggression, it was mild and adequate to the situation.

Two observers visited the classroom simultaneously.
and recorded those behaviors which were described in the Glossary of the Classroom Observation Record. Then they rated the teacher on a seven point scale for each of the thirteen teacher behavior categories. A third observer was used as a means for determining the reliability or the amount of observer agreement (66, pp. 97-130).

Based on the data obtained from the questionnaire (F-scale) and the observations of teacher classroom behavior, McGee reported that the things a teacher checks on a questionnaire and the way he behaves in class are essentially the same, i.e., "teachers' classroom behavior on an Authoritarian-Equalitarian dimension can be predicted with fair accuracy on the F-scale" (66, p. 144). There was an overall correlation between the two variables of .58 which was significant at the .005 level (35, p. 523). McGee further reported that the reliability of the F-scale was .86 using a split-half reliability formula. The overall reliability of the observers was .90 (66, pp. 123-130).

The relationship between the dominative-supportive dimension of personality to student teacher classroom behavior was researched by Dorothy Candland in 1956 (19). She administered the MTAI and the F-scale to measure personality and Withall's system for the observation and classification of the student teachers' classroom
verbal behavior. Eighteen student teachers were involved in the study (19,p.914).

Candland concluded that student teachers, who scored high on the MTAI and the F-scale, tended to verbalize on a "teacher-centered" level. She further reported that the scores on the MTAI and the F-scale were effective predictors of the classroom, social-emotional climate (19,p.915).

One of the many researches by Ryans and associates was concerned with the relationship between teacher personality traits to teacher classroom behavior (77). The study involved two hundred seventy-five elementary teachers who were observed and rated using the Classroom Observation Record and the accompanying Glossary of behaviors. The top and bottom twenty-seven per cent of the teachers were selected with respect to behavior patterns X, Y, Z, and P, and given the Thurstone Temperament Schedule (TTS), the Minnesota Multiphasic Personality Inventory (MMPI), and the Allport-Vernon Study of Values (AVSV).

The two groups of teachers, consisting of forty-one each, were then compared on the basis of their observed classroom behavior and their scores on the three instruments. Ryans concluded from these data that the personal traits, measured by the scales of the MMPI and the AVSV, were unrelated to classroom behavior patterns
X, Y, Z, and P (74, p. 134). Only one difference was found to be significant at the five per cent level after comparing sixty-eight different comparisons of the high and low means involved in the eleven scales of the MMPI and the six scales of the AVSV. Ryans reported a significant difference between the high and low criterion groups with respect to pattern X when a comparison was made between the impulsive, dominant and social scales of the TTS. The high Z criterion group scored higher than the low group on the vigorous, impulsive, dominant and sociable scales. The high P criterion group achieved higher mean scores than the lower group on the dominant and sociable scales. No significant difference was found between the two groups with respect to pattern Y. However, Ryans stated that the TTS was regarded as an unreliable instrument (77, pp. 134-135).

Bowers and Soar conducted a research beginning in 1959 and ending in 1961 which compared the classroom behavior and various personality traits of teachers who had been exposed to a summer workshop in human relations to teachers who had not attended the workshop. Inherent in the study was the idea that many teachers did not wish to teach autocratically, but did so because of the lack of skill and/or understanding on how to do otherwise. The study involved fifty-four elementary school teachers
in Nashville and Davidson County, Tennessee (15).

The teacher classroom behavior was observed and recorded using OSCAR, which had previously been developed by Medley and Mitzel (67). Personality data were gathered through administering the Bowers Teacher Opinion Inventory, the Minnesota Teacher Attitude Inventory, the Survey of Educational Leadership Practices and the Minnesota Multiphasic Personality Inventory to the elementary teachers. The data were then compared statistically to determine if any relationships existed. All of this was accomplished prior to the summer workshop. Half of the teachers were then given a summer workshop on human relations and, at the completion of this workshop, the above instruments were administered a second time to the entire group of elementary teachers (15).

After an analysis of the data was made, Bowers and Soar reported several findings which related personality and attitude test scores to teacher classroom behavior. Emotional climate correlated positively (.29) with the Minnesota Teacher Attitude Inventory. It correlated positively and negatively with several personality measures of the Minnesota Multiphasic Personality Inventory; for example, it correlated .2 with Psychopathic Deviate, .167 with Psychasthenia, .128 with Paranoia and -.238 with Schizophrenia. Social structure correlated
- 508 with Psychopathic Deviate and - 358 with Schizophrenia (15, p.71). The authors concluded the following concerning the comparison of verbal emphasis to the personality scales (15, pp.71-72).

Teachers at either extreme on the Pt [Psychasthenia scale] tended to encourage more pupil interaction in their classroom. Although generally the higher the score on Ma [Hypomania scale] the higher the Ve verbal emphasis score, teachers having the very highest Ma scores tended to rely less on verbal emphasis . . . . Teachers who might be characterized as impulsive and irresponsible, or withdrawn and lacking in self-confidence tended to rely on written verbal methods. . . . Teachers who were just above the mean [on Po] had the fewest subgroups in classrooms, and teachers who were either above or below the mean had a larger number of group activities . . . . Relatively few subgroups were found in classrooms of teachers characterized either as immature, irresponsible, and asocial (pd), or insecure and lacking self-confidence (Sc).

Bowers and Soar did not find any significant differences, with respect to overall changes in scores in the three behavior dimensions when they compared the experimental and the control group. However, later analysis by Johnson and Pay revealed that the summer workshop did affect teacher personality as measured by MMPI scores (68, p.285).

A research was conducted by Travers and associates in an effort to examine the relationship between teacher classroom behavior and the needs of teachers. It was hoped that the research would provide the researchers
with enough information to predict teacher classroom behavior based on the measured needs of the teachers. They felt that such information would be especially useful in developing a teacher education program (86).

Two groups, consisting of one hundred eighteen female, elementary school teachers, grades kindergarten through six, were used in the study. Travers and associates administered seven instruments, which were either selected or developed by the researchers to measure achievement, affiliation, recognition, and control, to the elementary teachers. These instruments were: 1) The Utah Study of Behavior, 2) The Test of Personal Preference for Educational Objectives, 3) The Test of Reactions to Educational Situations, 4) The Teacher Preference Schedule, and 5) The Van Pitt Series Wishes Test. A self-rating scale was used which called for self-ratings with respect to thirty characteristics. A questionnaire was also administered, but little use was made of it during the analysis of data (86,pp.01-7.02).

The data concerning teacher behavior were collected in two ways. First, a modified version of Withall's system for analyzing teacher statements was used. Second, a rating scale was developed and used for recording the observer's assessment of thirty-five characteristics of behavior for each teacher (86, p.7.02).
In general, Travers and associates were not successful in that they did not find predictors which would accurately and consistently predict classroom teacher behavior, although a fairly lengthy discussion of the results was presented. Negative correlations were found between the control and affiliation dimensions and between affiliation ratings and achievement ratings. This was interpreted to mean that controlling teachers appeared to be cold and aloof with respect to children. Teachers who were particularly concerned with achievement activities were not seen as being concerned with the development of personal relationships with children (86, pp. 7.05-7.06).

A fairly consistent correlation was reported between controlling teacher behavior and the control measure derived from the Teacher Preference Schedule. However, the relationship between the two groups of teachers on the scales of the Teacher Preference Schedule were somewhat different. The authors concluded by stating that "the best prediction of teacher behavior may very well result from tests which ask him [the teacher], in effect, how he behaves in such situations" (86, pp. 7.07-7.08).

Fowler and Soar researched the relationships between teacher personality characteristics and attitudes to teacher-pupil behavior and emotional climate in the
elementary classroom (30). The study was conducted to test two hypotheses: 1) classroom behaviors are influenced by teacher behaviors, and 2) teacher behaviors are related to personality characteristics and attitudes of the teacher (30,p.258).

Criterion and predictor data were collected from fifty-three elementary schools in South Carolina. The predictor data were obtained from the Minnesota Teacher Attitude Inventory (MTAI), the Survey of Educational Leadership Practices (Survey), and the Minnesota Multiphasic Personality Inventory. The criterion data were collected using the Observation Schedule and Record (OScAR), the Russell Sage Social Relations Test (RSSR), Interaction Analysis (IA), Principal's Rank and the Hostility-Affection Schedule (HA), which was developed by the authors (30,pp.258-260).

Based on an analysis of the obtained data, Fowler and Soar stated that there was a meaningful relationship between the personality characteristics and attitudes of the teacher and the classroom behaviors of both teachers and pupils. The exact correlations were not presented. The data were converted to normalized T scores and the intercorrelation matrix was calculated. Forty variables were then selected for a centroid factor extractions and the varimax rotation. The researchers reported that better predictors and measures
of classroom behavior were needed (30, pp. 261-270).

A study, conducted by Robert Hanny at The Ohio State University, represented an attempt to examine the difference, if any, in the verbal behavior of pre-service teachers and their scores on the Dogmatism Scale and the Teaching Situation Reaction Test (TSRT) (46). The verbal behavior was determined through a simulated teaching experience using a modified version of Flanders' Interaction Analysis (50).

The sample for the study was drawn from a population that Hough had previously studied (46, p. 57). One group, consisting of one hundred fifty-two prospective teachers, had been given training in the use of interaction analysis. A similar group was chosen which had not been given interaction analysis training. The two groups were further selected into the top and bottom twenty-seven per cent with respect to the two personality instruments (46, p. 59).

Hanny concluded that generally there was no significant difference in the verbal behavior of the high and low groups who had previous interaction analysis training. He reported that the more dogmatic subjects, not trained in interaction analysis, tended to use more direct verbal behavior than those who scored low in dogmatism. This same group had less extended talk in their simulated teaching experience than the group that
had scored low on the Dogmatism Scale and the TRST. Finally, he concluded that the personality factors seemed to have a greater relationship to the verbal behaviors of those persons not trained in interaction analysis (46,p.118).

Student teachers in science were studied by Bruce and McLeod in an effort to identify relationships between verbal behavior patterns and personal traits (17)*. Behavioral indices were obtained through the use of the Flanders ten category system for analyzing and coding classroom verbal behavior. Measurements of personality, interest, and ability were accomplished through the use of paper-and-pencil instruments, the Allport-Vernon-Lindzy Study of Values and the Opinion-Attitudes-Interest Survey (17,p.5).

Data were collected over a three year period for student teachers completing the undergradutate science teacher preparation program at Cornell University. Based on this data, Bruce and McLeod concluded that the personality and interest measures seemed to be potentially the best possible predictors of classroom verbal behavior. They especially lauded the personality measures associated with the tendency to acquiesce, achiever motivation, and frankness, the social science interest scale and theoretical orientation natural science interest scales. In addition, the
following generalized statements were made (17,p.8):

. . . (1) persons who tend toward use of indirect teacher influence also tend toward frankness and openness, tend away from acquiescence and tend toward lower achievement motivation; (2) persons who tend toward use of indirect teacher influences also tend toward higher theoretical orientation and away from high interest in the natural sciences; (3) these same persons tend toward higher interests in the social sciences. No patterns seem evident in the case of persons who tend toward higher use of direct teacher influences.

Summary of Background and Related Literature

The related literature and research reviewed in the chapter were separated into three sections. Section one dealt with those researches which were concerned with the development of systems for systematically observing, categorizing, and recording teacher classroom behavior. These researches have been presented in chronological order, beginning with Horn (49) in 1914 and ending with Openshaw and associates (71) in 1966.

Section two of this chapter was devoted to a discussion of the many definitions of personality and the use of traits to describe personality. Attention was given to the definition of a trait as well as some of the characteristics of a trait. The Guilford-Zimmerman Temperament Survey was described in detail. In addition, attention was given to the use of the
GZTS and its correlation to other personality scales.

Section three dealt with those researches which specifically attempted to correlate teacher or student teacher classroom behavior to selected personality traits. The researches in this section were limited to those studies which used some systematic observational and recording device to measure and record teacher classroom behavior. These researches were presented in chronological order beginning in 1955 and ending in 1966.
CHAPTER III
DESIGN OF THE STUDY

The design of this study is in part parallel with two other studies, one by Mr. Jack Matthews and one by Mr. Abe LeVon Balzer. All three researchers were represented during the planning conferences with the various school administrators from the Greater Cincinnati Area. Mr. Matthews' research was concerned with physics teachers and developed independently following the setting up of the video equipment during the pilot taping. Mr. Balzer's research was concerned with biology teachers, and his procedures were parallel with the present research throughout the collection of behavioral data. At this point each researcher developed his own design and tested his own hypotheses. The studies were written independently and, consequently, are not the same except for the Biology Teacher Behavior Inventory, which was jointly developed.

The remainder of this chapter is divided into nine sections as follows: 1) Selection of Pilot Sample; 2) Pilot Recordings; 3) Instrument Development; 4) Description of Instrument; 5) Method of Encoding

119
behavioral Data; 6) Inter-observer Agreement, 7) Selection of Study Sample; 8) Data Collection; and 9) Data Analyses.

In the first section, an account is given of the initial contacts made with the various school systems and the selection of the teachers for the pilot study. A description of the schools and teachers is presented. Section two describes the video tape recording of the pilot sample. Sections three and four explain the development of the category system and provide a description of the total instrument. The method for encoding the behavioral data is discussed in section five. The method of obtaining inter-observer agreement is presented in section six. The collection of data is dealt with in section eight. The final section contains the method used to analyze the personality and behavioral data.

Selection of Pilot Sample

Dr. John S. Richardson, Research Adviser, made the initial contact with the Cincinnati Public Schools through Dr. Paul Miller, the Superintendent of the Cincinnati Public Schools. At that time, Dr. Richardson and Dr. Miller arranged a conference so that the researchers could explain the nature of their research
and determine if the Cincinnati Public Schools were willing to cooperate in the research.

The conference was held in Cincinnati between three administrators from the Cincinnati Public Schools, Dr. John S. Richardson, and two researchers from The Ohio State University. A letter (Appendix D) had been prepared by Dr. Richardson which contained a general description of the requested research opportunities and resources. This letter, along with a verbal explanation of the intended research, was presented at the conference. In addition, the administrators were assured that no value judgments were going to be made of the observed teachers.

The requests made by the researchers were agreed upon during the conference; however, eight biology teachers were to be selected and contacted for approval. This responsibility was delegated to Mr. Kenneth Vordenburg, Secondary Science Administrative Supervisor of the Cincinnati Public Schools. Mr. Vordenburg selected and contacted eight biology teachers from the Cincinnati Public Schools. Then he met with the teachers and discussed his understanding of the researchers' request. All eight biology teachers gave their tentative approval, but each voiced a desire to further discuss the research with the researchers before the video tape recording was to begin.
A second conference was conducted a few weeks later involving three administrators from the Cincinnati Public Schools, Dr. Richardson, and the researchers from The Ohio State University. At this meeting, a list of teachers, who had been selected and who had given tentative approval, were presented by the science supervisor. The teachers were then individually contacted by the researchers and/or Dr. Richardson to further confirm their cooperation and to answer any questions regarding the research.

A third meeting was held with the Administrative Supervisors of the Cincinnati Public Schools because the researchers felt that there were not enough BSCS (Biological Science Curriculum Study) biology teachers in the original sample. Three school systems in the Greater Cincinnati Area were contacted by Mr. Vordenburg. The individual superintendents, principals, and three biology teachers were then contacted by the researchers, and all agreed to take part in the research.

Thus, the final pilot sample consisted of eleven biological science teachers from nine secondary schools in the Greater Cincinnati Area. The teachers were selected by either their superintendent or their science supervisor. Then the teachers were contacted individually by the researchers. At that time, the
purpose and methods of the research were explained, and each teacher was given a free choice to participate or not to participate in the study. In addition, the teachers were assured of having a free choice to drop out of the research even after the pilot tapes were made. They were further assured that persons other than the researchers and research advisors would not be allowed to view the tapes without permission of the individual teacher concerned. Every biology teacher contacted, once the purpose and method of the research were clear, chose to participate in the pilot study.

**Pilot Recordings**

Prior to and during the actual video tape recording of the pilot sample, the researchers spent considerable time in becoming familiar with the recording equipment. The video tape recording equipment consisted of the following: 1) video recorder with power cord, 2) camera with lens and cap, 3) microphone with stand, 4) monitor with UHF antenna, 5) recording tape, 6) tripod, 7) video connection cable, 8) power cords, 9) eight-conductor cable, 10) empty take-up reel, 11) camera adjustment tool, 12) microphone extension cord, 13) video recorder carrying case, 14) monitor carrying case, 15) monitor dust cover, 16) camera carrying case, and 17) user's
manual (34, p. 3). Early practice was accomplished during one of the methods courses at The Ohio State University.

Two problems were realized as a result of this recording. First, it became evident that a larger image was required if a teacher's facial expressions were to be studied. The problem was eliminated by means of a zoom lens replacing the regular camera lens. Thus, it became possible to place the camera at the rear of the classroom and still allow the researcher to zoom in on the teacher's facial expressions.

The second problem encountered was the video tape recorder's sound system. The system was adequate when the teacher stood in more or less one position. However, it was impossible to record the teacher as he moved around the room speaking to individuals or small groups. The problem was overcome by means of a wireless microphone, pocket transmitter, and a FM tuner. The microphone was clipped to the teacher's lapel and plugged into the transmitter. The transmitter was placed in the teacher's pocket. Signals from the transmitter were picked up on the FM tuner and fed into the video recorder. This modification made it possible to record the teacher's voice regardless of his position in the classroom. It also provided a more adequate record of the student responses.

Thirteen video tape recordings, each one class
period in length, were made of the eleven biology teachers during their regular class sessions. Each teacher was notified in advance of the recording by telephone and each was asked not to prepare any differently from the way he would for a normal class presentation. At the completion of each recording session, the teacher and class involved were invited to view the video tape recording. Each teacher viewed at least a partial recording of himself.

The thirteen pilot tapes represented eleven biology teachers from the Greater Cincinnati Area. This included the video tape recordings of eight men and three women teachers. Both BSCS and non-BSCS teachers, by administrative definition, were included. The BSCS teachers taught the blue, green, yellow, and special materials versions of BSCS. The non-BSCS teachers taught academic, general and basic classes of biology. The schools were located in both inner-city and suburban areas. Consequently, the students taught represented an extremely wide range of socioeconomic backgrounds.

Instrument Development

The pilot tapes were scanned repeatedly by the researchers. Every teacher verbal and non-verbal classroom behavior perceived was written individually on a three-by-five card. The cards were sorted and
placed into piles. Each pile contained a list of behaviors that the researchers felt were similar or related in their intent. These piles, after numerous revisions, were used to identify and define the individual categories, which collectively became the Biology Teacher Behavior Inventory (Appendix A). For example, the cards in one pile included the following: 1) looks up from work, 2) stops walking, 3) turns and stares, 4) asks student to report after class, 5) maintains or returns to authoritarian position, 6) asks student to take his seat, and 7) states that time is running out. These behaviors were seen as intending to make the classroom more orderly or formal. The motives of the teachers were not inferred but rather the intent of the observed behavior. The behaviors tended to structure, regulate, or otherwise keep the student behavior and attention within limits. Consequently, the control category of the Biology Teacher Behavior Inventory was developed and defined. The other categories were developed in a similar manner resulting in an inductive observational system for describing teacher classroom behavior.

The development of the categories was inductive, i.e., it progressed from a list of individual behaviors to the individual categories and finally into the Biology Teacher Behavior Inventory. The actual list of behaviors
in each pile was combined and became the **Glossary of Teacher Classroom Behaviors**, a notable part of the **Biology Teacher Behavior Inventory**.

**Description of Instrument**

The **Biology Teacher Behavior Inventory** is composed of three parts, category system, definitions, and glossary of teacher classroom behaviors. The category system in its completed form consists of the following: 1) Management, 2) Control, 3) Release, 4) Goal Setting, 5) Content Development, 6) Affectivity, and 7) Undecided.

The management category is subdivided into routine management, laboratory management, and study management. Content development is subdivided into teacher centered and student centered. Teacher centered and student centered content development is subdivided into the following seven subcategories: 1) Procedure, 2) Knowledge, 3) Scientific Process, 4) Tentativeness, 5) Generalizations, 6) Articulation, and 7) Facilitates Communication. Each of these subcategories is further divided into five modes of communication. These are as follows: 1) States, 2) Asks, 3) Shows, 4) Acknowledges, and 5) Clarifies. The Affectivity category is divided into Negative Affectivity and Positive Affectivity. The Undecided category is included to handle the teacher behaviors which can not be placed into one of
the other six categories due to the behavior itself or failure in the video recorder to properly record the behavior.

The complete category system, definitions and glossary of behaviors, is presented in Appendix A.

Method of Encoding Behavioral Data

The method of encoding consisted of identifying as many behaviors as the observer could perceive, classifying these behaviors into the category system, and recording the behaviors in rows, top to bottom, on a Data Record. The video tapes were replayed as frequently as the observer felt necessary. There was no time limit placed on the initial observing, classifying and recording of behavior. An attempt was made to keep a running account of a teacher's classroom behaviors, i.e., to identify, classify, and record every teacher classroom behavior.

The behaviors were classified according to inferred intent and according to verbal, non-verbal, congruent, or contradictory forms of expression. Verbal behavior was defined as the oral language that a teacher uses in the teaching-learning situation. It did not include facial expressions, voice timbre, or voice inflections. Non-verbal behavior was that segment of teacher classroom behavior other than the use of oral language. It
included anything a teacher did which could be inferred as having an influence on the teaching-learning situation. Non-verbal behavior included such things as the use of silence, gestures, facial expressions, timbre and inflections of voice, and the spacial relationship with students. Congruent was used when a verbal and non-verbal behavior were simultaneously observed, and they were in agreement with one another or one was used to stress, reinforce, or amplify the other. Contradictory behavior was also defined as a simultaneous verbal and non-verbal behavior. However, one behavior was seen as being inconsistent with the other.

Symbols, the letters and numerals of the outline of the Biology Teacher Behavior Inventory, were used to facilitate the recording of data onto the Data Record. For example, a "lc" was written in the verbal column of the Data Record when the teacher gave verbally a homework assignment. The other data were coded in a similar manner.

In order to condense the voluminous quantity of data that were obtained by recording every perceived teacher behavior, the researchers decided to use a time interval. In addition to wanting to condense the data, the researchers felt that a time interval would provide a more accurate description of a teacher's classroom behavior. For example, if a teacher exhibited
a management behavior for one minute and a control behavior for only ten seconds, the precise situation would not be accurately described by saying that one management and one control behavior were observed. By adding a time dimension, the data would become more accurate in its description of a teacher's classroom behavior.

The time interval that was decided upon was found in the following manner. First, a five-second interval was used, but it was found that many teacher behaviors were not completed in five seconds. Next, the researchers tried a fifteen-second interval, and they found that too many behaviors were being lost, i.e., the interval was too long. Finally, a ten-second interval was tried. It proved not to be so long that most of the "short" behaviors were lost but also long enough to condense the data. Thus, the ten-second time interval was adopted.

An audio tape was prepared to "gong" every ten seconds with a xylophone, wooden hammer and a stopwatch. The video tapes, which had previously been encoded, and audio tape were simultaneously played without stopping. The observer followed the completed Data Record as the video tape replayed and drew a horizontal line every ten seconds or when the "gong" sounded. This procedure was followed until the entire video tape recording was replayed. In this manner, the encoded behaviors were
separated into ten-second intervals on the Data Record.

Next, each ten-second interval on the encoded Data Record was examined and the predominant behavior for every interval was recorded on the Master Data Record (Appendix C). Predominance was determined by the behavior which consumed the largest portion of the ten-second interval. Thus, the predominant behavior for each time interval was determined in a more objective manner than some of the earlier researches dealing with the study of teacher classroom behavior.

Once completed, the Master Data Record became the final record of the teacher classroom behavior. Such data were used to obtain inter-observer agreement and to correlate with the teachers' selected personality trait scores.

Inter-Observer Agreement

The thirteen pilot tapes were divided into five-minute intervals by means of a stopwatch and tape counter on the video tape recorder. The tape counter was used to indicate the amount of tape used in recording or play-back. The intervals were numbered and placed on cards, one card for each five-minute interval. The cards were placed into a box and fifteen cards were drawn at random. The fifteen, five-minute samples of teacher classroom behavior, drawn at random from the pilot
tapes, were re-recorded into three thirty-minute video tapes and set aside to be used for inter-observer agreement. This was accomplished after the development of the Biology Teacher Behavior Inventory and the method of encoding the behavioral data.

After a minimum of forty hours of additional training, the observers learned the category system and the symbols that represented each category and subcategory. This early training consisted of viewing tapes and verbally discussing the classification of behavior into the Biology Teacher Behavior Inventory. Later, the observers, independently classified the behaviors and wrote them on a Data Record. After the behaviors were recorded, the observers replayed the video tapes and discussed any differences that existed in the encoding process. Minor revisions in the instrument resulted from these training periods.

Once the category system and method of encoding was learned, the observers independently encoded each of the fifteen, five-minute samples of behavior set aside for inter-observer agreement. The Data Records were compared and inter-observer agreement was calculated using the Scott formula (78) for inter-observer agreement.
The Scott formula used was as follows (78, p. 323):

\[ \pi = \frac{P_0 - P_e}{1 - P_e} \]

P₀ was the proportion of agreement, and Pₑ was the proportion of agreement expected by chance. P₁ was the amount that two observers exceeded chance agreement divided by the amount perfect agreement exceeded chance.

Inter-observer agreement was rechecked at the midpoint of data collection and again at the end of data collection. This procedure was decided upon in order to determine if the original inter-observer agreement would deteriorate with time. Each time, two five-minute samples of teacher behavior were drawn at random from tapes which had not been previously reviewed. The four samples were drawn at the midpoint of data collection. The data were encoded independently by each observer, and the Scott formula (78) was used to calculate inter-observer agreement.

Selection of the Study Sample

Seven of the eleven biology teachers were selected by the researchers to take part in the final study. An eighth teacher who had not taken part in the pilot taping was added. The teachers were selected by means of two criteria: 1) on the basis of what they taught,
and 2) accessibility of the school. Four BSCS teachers and four non-BSCS teachers were chosen, representing five schools and two school systems in the Greater Cincinnati Area.

Each of the eight teachers was contacted a second time, in person, and asked if he or she would take part in the research. It was explained that each would be video taped five times during the final study, and each was asked to fill out the Guilford-Zimmerman Temperament Survey, something which had not been mentioned during the pilot taping sessions. In addition, each was asked if the researchers could tape the classes at random, i.e., just come by and tape without the teacher having prior notice. It was explained that if the teacher did not want to be taped that day he had the freedom to prorogue the taping. If such an event occurred, the researchers would return again at some other unannounced time. The researchers would not tape on days when a test was being administered or when a movie was going to last the entire period. Such procedures would help prevent the teachers from making special preparations which differed from his or her normal preparations, but it still provided the teacher with a refusal on days in which he or she simply did not want to be taped. All eight of the biology teachers consented to continue with the study.
The four teachers who took part in the pilot taping but were not chosen to take part in the final study were personally contacted and given an explanation for their not being chosen. Each was thanked for his contribution to the research, particularly his contribution to the development of the Biology Teacher Behavior Inventory.

Data Collection

This section is divided into two parts. Part one deals with the collection of behavioral data, and part two deals with the collection of personality data.

Behavioral Data

Forty tapes, five for each teacher, were made of the classroom and laboratory presentations of the eight biology teachers over a three month period. Each tape was one class period in length. The periods ranged from forty-five to fifty-eight minutes each. It was decided that any tape less than forty minutes in length, regardless of the reason, would not be used in the collection of the behavioral data. Less than forty minutes was not considered as providing the researchers with an adequate picture of the teacher behaviors for that particular class period. Forty minute tapes allowed the researchers a more flexible time schedule to compensate for teachers who were scheduled in a different
part of the building the previous period and for malfunctioning of the video equipment. Thus, the forty video tapes were all equal to or greater than forty minutes in length and recorded over a three-month interval.

Each tape was collected at random without the teachers having prior knowledge of when the taping was to occur. There were two exceptions to this procedure. One of the biology teachers turned his class over to a student teacher after the first three video tapes had been completed. The student teacher was scheduled to teach the remainder of the three months planned for video taping. Therefore, the teacher was asked to teach on two occasions. These two sessions were video taped. The other thirty-eight tapes were made at random.

During the taping, the researchers encountered a problem with the sound system. One of the local FM radio stations was located near the school, and it interfered with the transmitter and FM receiver used for the video taping. After consulting a local sound system expert, a 300 Ohm twin-lead antenna wire was strung around the perimeter of the classroom. This eliminated the problem. The FM station was "masked" out allowing the sound from the transmitter and wireless microphone, carried by the teacher, to be picked up on the FM tuner and fed into the video recorder without interference from the local FM station.
Each of the forty video tapes was reviewed, and the individual behaviors were encoded, using the *Biology Teacher Behavior Inventory* on Data Records. Next, time intervals were determined, and the predominant behaviors for each interval were placed on a Master Data Record. Then, a Master Data Record was prepared for each teacher containing the total sample of his behavior over the three month time interval. This consolidated record of behavior for each teacher was the behavioral data used in the analysis of data.

**Personality Data**

The ten selected personality traits were determined by administering the *Guilford-Zimmerman Temperament Survey* to each of the eight biology teachers participating in the research. The details for taking this Survey were discussed with the teachers prior to the first taping session. At that time, the teachers were given verbal instructions on how to complete the Survey. Then, they were given a copy of the survey, containing a set of written instructions, along with an answer sheet and a stamped envelope. The instructions were as follows (41,p.1):

**INSTRUCTIONS:** In this booklet you will find a number of statements. Read each statement carefully. If the statement seems to be true, or if you agree with it mark answer "Yes" on your answer sheet. If the statement is more false
than true, or if you disagree with it, mark "No." If you cannot decide between "Yes" and "No," you may mark answer "?" BUT AVOID DOING THIS IF POSSIBLE.

Be sure to answer every item. There are no "right" or "wrong" answers in the usual sense of a high score being necessarily the best. The purpose of this Survey will be served best if you describe yourself and state your opinions as accurately as possible.

You may notice that many items are similar. Actually, no two items are exactly alike.

Notice that the numbering of items on the answer sheet follows across the rows rather than down the columns.

Upon completion of the Survey, the teachers mailed the survey booklets and the answer sheets to the researcher in the provided envelopes. These envelopes were set aside and not opened until all the behavioral data were collected.

The Survey consisted of 300 items, thirty for each of the traits, to which the teacher was to react with either a "Yes" or a "No". If the teacher was undecided he could answer "?", although it was suggested that this be avoided if possible.

After the behavioral data had been collected and recorded, the answer sheets of the Guilford-Zimmerman Temperament Survey were hand scored by assigning a "positive one" to the "Yes" or "No" response that was identified as the socially approved response. The other two responses were considered as being of zero value.
This system of scoring was reported by the authors of the Survey as having the important purpose of keeping "the average portion 'passing' an item nearer .50, at which level reliability can be highest" (42,p.5).

The possible trait scores actually represented a continuum or bipolarity. A small score represented a negative quality of the trait while a high score indicated the positive quality of the particular trait.

The ten traits measured by the Guilford-Zimmerman Temperament Survey were as follows: 1) General Activity (G), 2) Restraint (R), 3) Ascendance (A), 4) Sociability (S), 5) Emotional Stability (E), 6) Objectivity (O), 7) Friendliness (F), 8) Thoughtfulness (T), 9) Personal Relations (P), and 10) Masculinity (M) (42,pp.2-3).

General activity referred to a person's drive, energy, and activity. Positive qualities of this trait were indicated by a person who exhibited plenty of vigor and vitality and started each new project with a great deal of enthusiasm. A person who preferred a slow and deliberate pace and consistently paused for rest during every activity characterized the negative qualities of the general activity trait.

Restraint referred to a person's control or lack of control over his thoughts, feelings, and actions. For example, a restrained person was seen by himself and others as being very serious minded, and he never made
decisions on the spur of the moment. He always stopped and analyzed his thoughts and feelings before taking action. A person who was less restrained, on the other hand, was seen as a carefree individual who played practical jokes and thoroughly enjoyed a lively party. He was seen as a "happy-go-lucky" individual.

Ascendance referred to the governing or controlling influence exhibited by an individual. Trait indicators of a person with a high degree of ascendance included bluffing when in difficulty or speaking out in meetings to oppose those persons who he felt were wrong. It involved persuading others and being conspicuous. Submissiveness, following and hesitation to speak were indicators for the negative qualities of this trait.

Sociability involved, on the one hand, having many friends, liking social activities, and seeking social contacts. On the other hand, it involved shyness, dislike of social activities, and avoiding social contacts. The high and low qualities of this trait illustrate a "contrast between the person who is at ease with others, enjoys their company and readily establishes intimate rapport, versus the withdrawn, reserved person who is hard to get to know" (42,p.9).

A high quality of emotional stability was characterized by the person who was optimistic, cheerful
and had good mental health. Trait indicators were composure, feeling in good health, and evenness of moods, interest, and energy. A low quality of this trait manifested itself in fluctuations of mood, interest, and energy, pessimism, excessive daydreaming, excitability, and feelings of guilt, loneliness, or worry.

A high score in objectivity meant less egoism, whereas a low score meant touchiness or hypersensitivity. Being "thickskinned" was an indicator of the positive qualities of this trait. An extremely high score was characterized by a person who could not feel sympathetic with other persons because of his lack of sensitivity.

Friendliness referred to a person with a lack of fighting tendencies to the point of pacifism versus a healthy, realistic handling of frustration and injuries. Respect for others, acceptance of domination, and tolerance of hostile action were indicators of the positive side of this trait. Belligerence, hostility, resentment, and desire to dominate were the negative qualities.

The positive qualities of thoughtfulness were characterized by the person who was reflective, interested in thinking, philosophically inclined, and had mental poise. The negative qualities included being a poor observer, lacking in tact, and disliking reflection and planning.
A high score in personal relations was reflected by a person who was tolerant and had faith in social institutions. Hypercriticalness, suspicion, and self-pity characterized the other extreme of this trait.

Masculinity, on the positive side, meant the person behaved in ways characteristic of men. He was seen as being hardboiled, having resistance to fear, and having little interest in clothes and styles. A person with a low score in masculinity was inclined to be interested in feminine activities and vocations. He tended to be sympathetic, fearful, easily disgusted, and romantic.

Analyses of Data

During the planning of this research several persons, including Dr. John Richardson, Dr. Robert Wherry, and Dr. Ransom Whitney, were consulted concerning the analyses of data, and the consensus was to use inspection and nonparametric statistics. Nonparametrics were decided upon because the sample chosen did not meet all of the conditions necessary for parametric statistics. The sample of biology teachers used was extremely small, and they were not drawn at random from the total population.

The collection of data was accomplished by means of the processes already described. Then, the degree of association or correlation between the teacher classroom
behavior and the personality trait scores was determined by means of the Spearman Rank Correlation Coefficient (79). The formula was as follows (79, p. 204):

\[
rs = 1 - \frac{6 \sum d_1^2}{N^3 - N}
\]

where \(d_1\) was the difference between the two ranks, and \(N\) was the number of subjects.

Four steps were involved in the calculation of the correlation coefficients. First, observations on the \(X\) and \(Y\) variables were independently ranked. At this point, the behavioral data were reduced to proportions because the lengths of each taping session were not perfectly equivalent. Second, \(d_1\) was calculated by subtracting the \(Y\) rank from the \(X\) rank. Next, \(d_1\) was squared and summed for the \(N\) cases. Finally, these calculations were substituted into the formula, and the individual correlation coefficients were determined.

Each correlation coefficient was subjected to a test of significance to determine if the two variables were associated at the .05 and .01 levels of probability. A table of critical values of \(rs\), where \(N\) was between four and thirty, was used to make the tests of significance (79, p. 284).
CHAPTER IV

THE STUDY

This chapter contains the following sections: 1) Purposes of the Study, 2) Review of Procedures, 3) Handling of Data, 4) Hypothesis One, 5) Hypothesis Two, 6) Findings Not Directly Related to the Hypotheses, and 7) Summary.

Purposes of the Study

The purposes of this study were as follows: 1) To develop a reliable category system for first hand systematic observation of high school biology teachers in both classroom and laboratory situations; and 2) To determine the relationship between selected personality traits and the verbal and non-verbal behaviors exhibited by high school biology teachers in both classroom and laboratory instructional situations.

Review of Procedures

In order to meet the stated purposes, thirteen video tape recordings, each one class-period in length, were made of eleven biology teachers from the Greater Cincinnati Area. The tapes were recorded during the
teachers' regular laboratory and classroom presentations. The sample of teachers included BSCS and non-BSCS biology teachers.

The thirteen pilot recordings were used to develop the Biology Teacher Behavior Inventory and the method of encoding the behavioral data. A complete description of the procedures used in developing the instrument and method of encoding is presented in Chapter III.

Fifteen, five-minute samples of behavior were drawn at random from the pilot tapes and re-recorded onto three, thirty-minute video tapes. These samples of teacher classroom behavior were used to calculate inter-observer agreement. Inter-observer agreement was rechecked, at the midpoint and end of data collection, using samples of teacher classroom behavior which had not been previously reviewed.

Once the instrument, the method of encoding, and inter-observer agreement were established, eight biology teachers, four BSCS and four non-BSCS, were chosen to take part in the final study. Each of these teachers was personally contacted, prior to the first taping session, and given a through explanation of the purposes of the study. They were assured that the tapes would not be available to persons other than the researchers and their advisors without permission of the teacher concerned.
Forty video tape recordings, five for each teacher, were made at random over a three month interval. Each tape was one class period in length, and the periods ranged from forty-five to fifty-eight minutes in length.

The teacher classroom behaviors were encoded from the forty video recordings onto individual Data Records, and finally consolidated onto a Master Data Record for each teacher. These consolidated records of teacher classroom behavior were used in the analyses of data.

The eight biology teachers were given the Guilford-Zimmerman Temperament Survey (GZTS) to obtain measures of the selected personality traits. These data were then correlated with the behavioral data using the Spearman Rank Correlation Coefficient (79,p.204).

The rationale for using the GZTS was as follows:

1. Getzels and Jackson stated that "...results with the GZTS are somewhat more consistent than those with other instruments, the MMPI, for example ..." (35,p.550).

2. The GZTS was a self-report inventory. Guilford (40) has had considerable experience in the development of instruments to measure personality traits, and he stated that the self-report was a valuable and useful instrument for measuring personality. He further stated that the GZTS provided a valid and reliable measure of selected personality traits.
3. The reliability of the GZTS was high. Total-score reliabilities, based on samples of 523 male college students and 389 female students, and the half-score reliabilities, based on 100 men, were between .75 and .85 (41,p.5).

4. The standard error of measurement was small, i.e., 2.2 to 2.6 (41,p.5).

5. Intercorrelations of the ten traits were low. This indicated the prevailing uniqueness of the individual trait scores (41,p.6).

6. The GZTS was based upon the responses of normal people rather than of the overtly maladjusted or the institutionalized (84,p.387).

7. Responses to the survey were taken at face value, i.e., weighting of the individual items was not used.

8. The traits were determined by factor and item analyses. According to Lazarus, the use of factor analysis provided an objective, systematic approach to the assessment of personality traits (60,p.62).

9. Saunders reported in the Fifth Mental Measurements Yearbook that the GZTS was a useful tool for personality research. He especially lauded its efficiency in the collection of personality data (18,pp.65-66).
The rationale for the use of the Guilford-Zimmerman Temperament Survey was discussed in greater detail in Chapter II.

Handling of Data

The behavioral data from the Master Data Records were reduced to proportions because the lengths of the taping sessions were not equivalent. Table 1 illustrates the need for this computation. Such a procedure enabled the researcher to make comparisons between the teachers and to apply statistical tests to the behavioral and the personality data.

The total observation time for each of the eight biology teachers ranged from 240.5 to 265.5 minutes. This was equivalent to 1,443 and 1,593 ten-second time intervals, respectively. The average observation time for all eight biology teachers was 251.5 minutes for the five taping sessions. The total observation time for all eight biology teachers was 2,009.1 minutes or 12,056 ten-second intervals.

After the behavioral data were reduced to proportions, the teachers' scores were ranked from one to eight in each category and subcategory. The proportions of the communication acts and forms of expression were also ranked among the eight teachers. Next, the personality data were ranked for each of the
ten traits. Finally, the various ranks were punched on IBM cards, and correlations were computed between the personality and behavioral data. Significant correlations were determined through the use of a table of critical values for the Spearman Rank Correlation Coefficients (79, p. 284). The computer program for the Spearman Rank Correlation was made available by The Ohio State University Computer Center.

TABLE 1

<table>
<thead>
<tr>
<th>Teacher</th>
<th>Total Observational Time (minutes)</th>
<th>Total Number of Ten-Second Time Intervals</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>248.8</td>
<td>1,493</td>
</tr>
<tr>
<td>2</td>
<td>247.6</td>
<td>1,488</td>
</tr>
<tr>
<td>3</td>
<td>240.5</td>
<td>1,443</td>
</tr>
<tr>
<td>4</td>
<td>250.6</td>
<td>1,504</td>
</tr>
<tr>
<td>5</td>
<td>258.1</td>
<td>1,549</td>
</tr>
<tr>
<td>6</td>
<td>254.0</td>
<td>1,524</td>
</tr>
<tr>
<td>7</td>
<td>244.0</td>
<td>1,464</td>
</tr>
<tr>
<td>8</td>
<td>265.5</td>
<td>1,593</td>
</tr>
<tr>
<td>Total</td>
<td>2,009.1</td>
<td>12,056</td>
</tr>
</tbody>
</table>

As previously stated, the degree of association between the behavioral and personality data was calculated by means of a nonparametric statistic, the
Spearman Rank Correlation Coefficient. Nonparametrics were decided upon early in the development of the research design after consultation with several statisticians and the research adviser. Reasons for this decision were based on the small sample size, \( N=8 \), and the sample was not drawn at random from a normal population of biology teachers.

**Hypothesis One**

Hypothesis One, that a reliable category system for first hand systematic observation of the verbal and non-verbal behaviors of high school biology teachers, in both classroom and laboratory instructional situations, can be developed, is supported by the following discussions of the development and use of the Biology Teacher Behavior Inventory, method of encoding, and inter-observer agreement.

**Biology Teacher Behavior Inventory**

The Biology Teacher Behavior Inventory is composed of three related but distinct sections. The Categories and Subcategories of Teacher Classroom Behavior are found in section one. Section two is made up of the Definitions of Categories and Subcategories of Teacher Classroom Behavior, and section three is composed of the Glossary of Teacher Classroom Behaviors. Appendix A contains the complete instrument.
Contrary to most category systems presently available for studying teacher behaviors, the Biology Teacher Behavior Inventory was developed in an inductive manner. First, the pilot tapes were reviewed several times, and every behavior that influenced the teacher-learning situation was written separately onto three by five cards. The cards were sorted and placed into piles. Each pile contained a list of teacher behaviors, verbal and non-verbal, that were related or similar in their intent. The piles of cards were reorganized numerous times until seven categories of teacher behavior were identified and defined. The categories were as follows: 1) Management, 2) Control, 3) Release, 4) Goal Setting, 5) Content Development, 6) Affectivity, and 7) Undecided. The individual teacher behaviors were not only used to identify and define the categories and subcategories but were organized into the Glossary of Teacher Classroom Behaviors, an essential component of the Biology Teacher Behavior Inventory.

The management category was concerned with teacher behaviors that regulated the routine "housekeeping" activities which were used in the operation of the biological science classroom. In addition, this category included those behaviors in which the teacher made assignments, since those behaviors comprised
an aspect of management in the learning situation.

After a further study of the list of management behaviors was accomplished, the management category was subdivided into routine, laboratory, and study management. Routine management was assigned to those behaviors of the teacher associated with the routine management of any classroom. Behaviors involved in the control of the physical environment and administrative details were illustrative of this category. For example, calling the roll, erasing the board, and adjusting the lighting were considered as routine management.

Laboratory management was assigned to those teacher behaviors associated with preparation for, maintenance and supervision of, or clean up from biological science laboratory, demonstration, or classroom activities. Looks for or readies supplies or equipment, observes or supervises laboratory activities, and asks students to clean up or to turn off equipment were examples of laboratory management.

Study management involved teacher behaviors such as assigning, explaining, or repeating of class assignments. In addition, study management included observation and supervision of directed study.

The control category included such teacher behaviors as use of silence, gestures to promote silence, points
student to his seat, and maintains or returns to authoritarian position. Control was concerned with those behaviors that made the classroom more orderly or formal. They tended to structure, regulate or otherwise keep student behavior and attention within limits, i.e., teacher behaviors that intended to have the students follow a recommended course of action.

Those teacher behaviors that intended to make student behavior less formal and orderly were included in the release category. They tended to allow greater student control of attention and discipline, i.e., those teacher behaviors that increased the informality and permissiveness in the classroom. Examples of teacher behaviors illustrating this category were ignoring control, laughing, accepting a student joke, correcting own mistake, apologizing for error made earlier, and the removal of formal barriers.

The goal setting category included those teacher behaviors which explicitly dealt with the stating, explaining, implying, or clarifying of the purposes or goals for a given individual or classroom activity.

The teacher behaviors which dealt primarily with subject matter in the science classroom were placed in the content development category. These behaviors were based upon efforts to achieve objectives related to
content, whether they were cognitive, psychomotor, or affective.

The content development category was subdivided into teacher centered and student centered content development. Teacher centered referred to the teacher behavior concerned with content development when the attention of most of the students was on the teacher or when the teacher was attempting to obtain the attention of most of the students. In addition, behaviors comprising teacher assertiveness in relation to individual or groups of students were considered as teacher centered even though the remainder of the students were involved in student centered activities. All other teacher behaviors dealing primarily with subject matter were considered as student centered content development.

Teacher centered and student centered content development were further divided into procedures, knowledge, scientific process, tentativeness of knowledge, generalizations, articulation of content, and facilitates communication. Each of these subdivisions was communicated by the teacher in any of the following five acts: 1) States, 2) Asks, 3) Shows, 4) Acknowledges, and 5) Clarifies. Combinations of the communication acts were possible within content development, e.g., a teacher could state and show while
developing content in a teacher centered or student centered situation.

Those behaviors of the teacher concerned with instruction in procedural aspects of the content were placed into the procedures subcategory of content development. Instructions in laboratory and problem solving procedures were illustrative of this subcategory.

Knowledge included the teacher behaviors which pertained to giving and receiving information at a low cognitive level. The principal concern of this subcategory was that of knowledge of specific aspects of content such as facts, definitions, and terminology as contrasted with observation, interpretation, extrapolation, application, analysis, synthesis, and evaluation.

The behaviors of the teacher which pertained to such cognitive processes as observation, interpretation, extrapolation, application, analysis, synthesis, and evaluation were characteristic of the scientific process subcategory of content development.

Tentativeness of knowledge was used when the teacher stated or distinctly implied a state of change regarding scientific knowledge. "The DNA molecule is believed by scientists to have these characteristics" was a teacher statement which illustrated the tentativeness of knowledge subcategory.
Generalizations included those teacher behaviors which were of considerable scope or breadth as contrasted with specificity and depth of other content considerations being undertaken. Operationally, these behaviors were explicitly described by the teacher or identified by the observer based on his acquaintance with teacher behavior and the content under consideration.

Articulation of content involved those behaviors through which the teacher attempted to establish continuity across topical areas or time. Articulation or integration of topical areas could be within biology or between biology and other areas of knowledge. When generalizations or summarizations were used as means of articulation of content, the behaviors were classified on the basis of the latter intent.

Behaviors in which the teacher attempted to make clear and distinct the nature of his communication to students were considered as belonging in the facilitates communication subcategory of content development. These behaviors were distinguished from explanations and illustrations of content in that the latter pertained to examples and elaborations, given to aid understanding of the nature of the content. Hand motions and voice pitch intended to draw attention to content were seen as facilitating communication.
However, when such non-verbal behaviors illustrated content, they were categorized as such, not as facilitation of communication.

The affectivity category was subdivided into positive and negative affectivity. It included those behaviors that elicited, corrected, and/or reinforced contributions to the teaching-learning process by an individual or group of students.

Positive affectivity involved those teacher behaviors that elicited and reinforced, in a positive manner, contributions by an individual or group of students to the teaching-learning process. These behaviors took the form of teacher recognition, encouragement, and/or praise; they were based on the positive aspects of teacher motivation and evaluation.

Negative affectivity included those teacher behaviors that elicited, corrected, and reinforced, in a negative manner, contributions made by an individual or group of students to the teaching-learning process. These behaviors took the form of corrective feedback, criticism, reprimands, accusations, admonition, and/or willful disregard. They were based on the negative aspects of teacher motivation and evaluation.

The undecided category was used for those teacher behaviors whose intent could not be inferred and categorized into the other categories in the system.
In summary, the development of the **Biology Teacher Behavior Inventory** was inductive, i.e., it progressed from a list of individual teacher behaviors to individual categories and finally into a category system. The actual list of teacher classroom behaviors, categories and subcategories, and definitions were combined, resulting in an inductive observational system for describing teacher classroom behavior. The complete instrument is presented in Appendix A.

**Encoding Process**

The method of encoding consisted of identifying, classifying, and recording of teacher classroom behavior onto a Data Record. Each video tape recording was replayed as much and as often as necessary to identify and classify every perceived teacher behavior which influenced the teaching-learning situation. The behaviors were classified into the **Biology Teacher Behavior Inventory** according to inferred intent and according to the form of expression.

The possible forms of expressing behavior were verbal, congruent, non-verbal, and contradictory. Verbal behavior was defined as the oral language that a teacher used in the teaching-learning situation. Non-verbal behavior was that segment of teacher classroom behavior other than the use of oral language. It
included silence, gestures, facial expressions, timbre and inflections of voice, and the spatial relationship with students. Congruent was defined as simultaneous verbal and non-verbal behaviors which were in agreement with one another, i.e., one was used to stress, reinforce, or amplify the other. Contradictory behavior was defined as simultaneous verbal and non-verbal behaviors that were inconsistent with one another.

Once the behavior was identified and classified, it was recorded on a Data Record under the proper form of expression. A running account was made of the teachers' classroom behavior in rows, top to bottom, on the Data Record. This method of recording preserved the sequence of behaviors and indicated the quantity of behaviors in each form of expression.

A time interval was used to condense the voluminous quantity of behavioral data and to provide a more accurate description of the teacher classroom behavior. A ten-second time interval was decided upon after trying several other time intervals. The ten-second time interval proved long enough to condense the data, but it was not so long that most of the "short" behaviors were lost.

Once a tape was encoded onto the Data Record, it was simultaneously replayed with an audio recorder,
which "gonged" every ten seconds. The encoded Data Record was followed, and a horizontal line was drawn, dividing the record into ten-second time intervals. Next, each time interval was examined, and the predominant behavior was recorded on a Master Data Record. Predominance was determined by the behavior which consumed the largest portion of the ten-second interval. Thus, the predominant behavior for each time interval was determined in a more objective manner than the methods used by other researchers.

Inter-observer Agreement

Prior to the completion of the Biology Teacher Behavior Inventory, fifteen, five-minute time intervals were drawn at random from the pilot tapes and rerecorded onto three, thirty-minute video tapes. These tapes were set aside and used for inter-observer agreement after the instrument and method of encoding were developed and learned by the researchers.

Each five-minute sample of behavior was independently observed and encoded by two observers onto a Data Record. The ten-second, time intervals were determined, and the predominant behaviors were recorded on an Observer Agreement Data Record (Appendix E). Inter-observer agreement was calculated using the Scott formula for inter-observer
agreement (78). Table 2 reports the inter-observer agreement for the fifteen, five-minute samples of teacher classroom behavior.

**TABLE 2**

**INTER-OBSERVER AGREEMENT<sup>a</sup>**

<table>
<thead>
<tr>
<th>Interval</th>
<th>$\pi$</th>
<th>Interval</th>
<th>$\pi$</th>
<th>Interval</th>
<th>$\pi$</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>.77</td>
<td>6</td>
<td>.77</td>
<td>11</td>
<td>.92</td>
</tr>
<tr>
<td>2</td>
<td>.84</td>
<td>7</td>
<td>.84</td>
<td>12</td>
<td>.85</td>
</tr>
<tr>
<td>3</td>
<td>.84</td>
<td>8</td>
<td>.85</td>
<td>13</td>
<td>.86</td>
</tr>
<tr>
<td>4</td>
<td>.91</td>
<td>9</td>
<td>.93</td>
<td>14</td>
<td>.89</td>
</tr>
<tr>
<td>5</td>
<td>.85</td>
<td>10</td>
<td>1.00</td>
<td>15</td>
<td>.80</td>
</tr>
</tbody>
</table>

<sup>a</sup>Overall inter-observer agreement was .92.

The inter-observer agreement, calculated for each of the fifteen, five-minute samples of teacher classroom behavior, ranged from .77 to 1.0. However, the overall inter-observer agreement was calculated by combining the data from each of the fifteen samples and was found to be .92.

Inter-observer agreement was rechecked at the midpoint of data collection and again at the end of data collection. Each time, two, five-minute samples of teacher classroom behavior were used, and the inter-observer agreement was calculated to be .95.
and .93. The four samples were drawn at random from tapes which had not previously been reviewed.

Summary of Hypothesis One

In order to accept Hypothesis One, the Biology Teacher Behavior Inventory must meet the definition of a category system, and the reliability and degree of objectivity should be established for the instrument and method of encoding.

In this study, a category was defined as a class or division into which specific behaviors were classified. The boundaries or limits of a category were explicit, i.e., a category included certain behaviors and excluded all others. Collectively, the categories became a category system, and the system was to be exhaustive of all teacher classroom behaviors identified as influencing the teaching-learning situation.

The Biology Teacher Behavior Inventory met the stated definition of a category system. This was largely due to the manner in which the instrument was developed. Individual teacher behaviors were identified, and those that were related or similar were combined to identify and define each category. The list of behaviors was organized into a glossary of behaviors for each category and subcategory and provided, in addition to the discursive definition, a descriptive
definition of each category and subcategory. These explicit definitions accounted for the mutual exclusiveness of the individual categories and subcategories. Additional evidence for mutual exclusiveness of the categories and subcategories was the high inter-observer agreement obtained in the study.

An undecided category was added to the instrument to further insure that the system would be exhaustive of all teacher classroom behaviors identified as influencing the teaching-learning situation. This category included those behaviors whose intent could not be inferred and categorized into the other categories of the system. The use of the undecided category was extremely small, .09 per cent of the total behaviors in the various categories, and was largely accounted for by technical difficulties with the video recording equipment. Such a finding suggested that the other six categories may be exhaustive by themselves. Certainly, from the standpoint of instrument development and logic, all seven categories were inclusive of all the perceived, teacher classroom behaviors that influenced the teaching-learning situation.

Reliability has been used in at least three ways in the development and use of category systems for the study of teacher classroom behavior. These were as
follows: 1) Reliability Coefficient, 2) Coefficient of Observer Agreement or Inter-observer Agreement, and 3) Stability Coefficient. However, reliability was defined in this study as inter-observer agreement and was calculated by means of the Scott formula (78) for inter-observer agreement.

Inter-observer agreement in this study was found to be .92 for fifteen, five-minute samples of teacher classroom behavior (Table 2). Reliability was rechecked at midpoint and again at the end of data collection and found to be .95 and .93, respectively.

Objectivity, as it has been used in previous studies of teacher classroom behavior, referred to the ease of discrimination, i.e., could independent observers, after a period of training, obtain satisfactory agreement with each other on the identification and encoding of teacher classroom behaviors? Ease of discrimination depended on the difficulty of judgments required by the instrument, method of encoding, and the degree to which the behavioral basis of the discrimination was spelled out.

The Biology Teacher Behavior Inventory and method of encoding illustrated objectivity by the high level of agreement reached between two independent observers (Table 2). Overall inter-observer agreement was calculated to be .92 for fifteen, five-minute samples
of teacher classroom behavior and .95 and .93 for two, ten-minute samples of behavior.

The reasons for these high levels of agreement stemmed back to the development of the instrument and method of encoding. First, a video tape recorder was used to "capture" teacher classroom behavior. Therefore, the behaviors could be observed as often and as much as the observer desired. Second, the instrument was inductively developed, i.e., teacher behaviors were identified and became the basis on which the categories and subcategories were identified and defined. Finally, the method of encoding enabled the predominant behaviors for each ten-second time interval to empirically, rather than subjectively, determined.

Thus, Hypothesis One, that a reliable category system for first hand systematic observation of the verbal and non-verbal behaviors of high school biology teachers, in both classroom and laboratory instructional situations, can be developed, is accepted. The Hypothesis is accepted based on the preceding discussions of the development, description, and use of the Biology Teacher Behavior Inventory and method of encoding with respect to the stated definition of a category system, inter-observer agreement, and objectivity.
Hypothesis Two

Hypothesis Two, that there is a significant positive correlation between selected personality traits and the verbal and non-verbal behaviors exhibited by high school biology teachers in both classroom and laboratory instructional situations, is partially supported and partially rejected by the following discussions of the collection, presentation, and analyses of data.

Collection and Handling of Data

In an effort to test Hypothesis Two, forty video tape recordings, five for each teacher, were made of eight biology teachers in the Greater Cincinnati Area. The tapes were made at random and, except on two occasions, without the teacher having prior knowledge of the taping date. Both laboratory and classroom instruction periods were recorded, and each tape was one class period in length. The tapes were analyzed using the Biology Teacher Behavior Inventory and the method of encoding developed for testing Hypothesis One. The analysis of the forty video tapes resulted in the behavioral data used to test Hypothesis Two.

The selected personality data for each teacher were obtained by administering the Guilford-Zimmerman Temperament Survey to each of the eight teachers.
A complete description of the procedure used in administering and scoring the Survey and a description of each trait are presented in Chapter III. The traits measured were as follows: 1) General Activity (G), 2) Restraint (R), 3) Ascendance (A), 4) Sociability (S), 5) Emotional Stability (E), 6) Objectivity (O), 7) Friendliness (F), 8) Thoughtfulness (T), 9) Personal Relations (P), and 10) Masculinity (M) (42, pp.2-3). 

The behavioral data and the personality data, for each teacher, were correlated by means of the Spearman Rank Correlation Coefficient (79). The formula was as follows (79, p.204): 

\[ r_s = 1 - \frac{6 \sum d_i^2}{N^3 - N} \]

where \( d_i \) was the difference between the two ranks, and \( N \) was the number of subjects.

Significance at the .05 and .01 levels was determined by means of a table of critical values for \( r_s \) when \( N=8 \), i.e., a correlation was significant at the .05 level when it was equal to or exceeded .64 (79, p.284). A correlation was significant at the .01 level when it was equal to or exceeded .83. Therefore, the observed values of \( r_s \), less than .64, were considered as arising by chance.
Presentation of Data

Table 3 presents the correlation coefficients between the ten selected personality traits, as measured by the Guilford-Zimmerman Temperament Survey, and the categories of teacher classroom behavior.

TABLE 3

CORRELATION COEFFICIENTS BETWEEN SELECTED PERSONALITY TRAITS AND CATEGORIES OF TEACHER CLASSROOM BEHAVIOR

<table>
<thead>
<tr>
<th>Traits</th>
<th>Categories</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
</tr>
</thead>
<tbody>
<tr>
<td>G</td>
<td>-0.19</td>
<td>-0.02</td>
<td>0.52</td>
<td>0.02</td>
<td>0.19</td>
<td>0.52</td>
<td></td>
</tr>
<tr>
<td>R</td>
<td>0.14</td>
<td>0.19</td>
<td>-0.24</td>
<td>0.19</td>
<td>-0.14</td>
<td>-0.19</td>
<td></td>
</tr>
<tr>
<td>A</td>
<td>-0.17</td>
<td>-0.74a</td>
<td>0.10</td>
<td>-0.07</td>
<td>0.17</td>
<td>-0.07</td>
<td></td>
</tr>
<tr>
<td>S</td>
<td>-0.05</td>
<td>-0.26</td>
<td>0.24</td>
<td>-0.26</td>
<td>0.05</td>
<td>0.22</td>
<td></td>
</tr>
<tr>
<td>E</td>
<td>0.40</td>
<td>0.17</td>
<td>-0.64a</td>
<td>-0.79a</td>
<td>-0.40</td>
<td>0.17</td>
<td></td>
</tr>
<tr>
<td>O</td>
<td>-0.12</td>
<td>-0.62</td>
<td>0.21</td>
<td>-0.24</td>
<td>0.12</td>
<td>0.24</td>
<td></td>
</tr>
<tr>
<td>F</td>
<td>-0.29</td>
<td>0.19</td>
<td>-0.31</td>
<td>0.05</td>
<td>0.29</td>
<td>-0.45</td>
<td></td>
</tr>
<tr>
<td>T</td>
<td>0.12</td>
<td>0.17</td>
<td>-0.31</td>
<td>0.21</td>
<td>-0.12</td>
<td>-0.61</td>
<td></td>
</tr>
<tr>
<td>P</td>
<td>-0.52</td>
<td>-0.38</td>
<td>0.07</td>
<td>-0.14</td>
<td>0.52</td>
<td>0.15</td>
<td></td>
</tr>
<tr>
<td>M</td>
<td>0.43</td>
<td>-0.14</td>
<td>-0.26</td>
<td>-0.52</td>
<td>-0.43</td>
<td>-0.17</td>
<td></td>
</tr>
</tbody>
</table>

Significant at the .05 level.

From an inspection of Table 3, it is evident that the range of positive correlations, between the personality traits and the categories of teacher classroom behavior, is from .02 to .52. However, none of the positive correlations are significant at either the .05 or .01 level.
The negative correlations in Table 3 range from -.02 to -.79. Emotional stability correlates -.79 and -.64, respectively, with the goal setting and release categories of teacher classroom behavior. Ascendance correlates -.74 with the control category. All three of these correlations are significant at the .05 level. None of the negative correlations are significant at the .01 level.

Table 4 reports the correlation coefficients between the selected personality traits and the major subcategories of teacher classroom behavior.

An examination of this Table reveals a correlation of .69 between emotional stability and study management, and a correlation of .67 between objectivity and positive affectivity. Thoughtfulness and friendliness correlate -.76 and -.64, respectively, with positive affectivity. Each of these correlations is significant at the .05 level; however, none of the correlations are significant at the .01 level.

Table 5, page 171, reports the correlation coefficients between the selected personality traits and the subcategories of content development. From this Table, it is evident that there are nine significant correlations. General activity, restraint, thoughtfulness, and masculinity correlate .69, -.76, -.67, and
Friendliness correlates -.69 and -.81 with congruent, routine and laboratory management. Emotional stability and masculinity correlate .88 and .83, respectively, with verbal, laboratory management, and emotional stability correlates .74 with non-verbal, study management.

**TABLE 4**

CORRELATION COEFFICIENTS BETWEEN SELECTED PERSONALITY TRAITS AND MAJOR SUBCATEGORIES OF TEACHER CLASSROOM BEHAVIOR

<table>
<thead>
<tr>
<th>Traits</th>
<th>1a</th>
<th>1b</th>
<th>1c</th>
<th>5a</th>
<th>5b</th>
<th>6a</th>
<th>6b</th>
</tr>
</thead>
<tbody>
<tr>
<td>G</td>
<td>0.16</td>
<td>-0.21</td>
<td>-0.43</td>
<td>0.19</td>
<td>-0.19</td>
<td>0.55</td>
<td>0.10</td>
</tr>
<tr>
<td>R</td>
<td>-0.48</td>
<td>0.19</td>
<td>0.17</td>
<td>-0.14</td>
<td>-0.14</td>
<td>0.26</td>
<td>0.14</td>
</tr>
<tr>
<td>A</td>
<td>0.12</td>
<td>0.05</td>
<td>0.24</td>
<td>0.17</td>
<td>-0.57</td>
<td>0.48</td>
<td>-0.36</td>
</tr>
<tr>
<td>S</td>
<td>0.36</td>
<td>-0.05</td>
<td>0.00</td>
<td>0.05</td>
<td>-0.10</td>
<td>0.45</td>
<td>-0.24</td>
</tr>
<tr>
<td>E</td>
<td>0.26</td>
<td>0.21</td>
<td>0.69a</td>
<td>-0.40</td>
<td>0.17</td>
<td>0.14</td>
<td>0.02</td>
</tr>
<tr>
<td>O</td>
<td>0.38</td>
<td>0.07</td>
<td>0.14</td>
<td>0.12</td>
<td>-0.36</td>
<td>0.67a</td>
<td>-0.12</td>
</tr>
<tr>
<td>F</td>
<td>-0.43</td>
<td>-0.52</td>
<td>0.33</td>
<td>0.29</td>
<td>-0.07</td>
<td>-0.64a</td>
<td>-0.38</td>
</tr>
<tr>
<td>T</td>
<td>-0.17</td>
<td>0.10</td>
<td>0.07</td>
<td>-0.12</td>
<td>-0.40</td>
<td>-0.76a</td>
<td>-0.17</td>
</tr>
<tr>
<td>P</td>
<td>0.33</td>
<td>-0.57</td>
<td>0.05</td>
<td>0.52</td>
<td>-0.12</td>
<td>0.14</td>
<td>-0.05</td>
</tr>
<tr>
<td>M</td>
<td>0.24</td>
<td>0.45</td>
<td>0.60</td>
<td>-0.43</td>
<td>0.12</td>
<td>0.12</td>
<td>-0.43</td>
</tr>
</tbody>
</table>

*Significant at the .01 level.

The correlation coefficients between selected personality traits and the subcategories of the control, release, and goal setting categories of teacher classroom behavior are presented in Table 6, page 172. This Table reveals the following correlations which are significant at the .01 level: ascendance correlates -.93 with verbal
### TABLE 5
CORRELATION COEFFICIENTS BETWEEN SELECTED PERSONALITY TRAITS AND SUBCATEGORIES OF MANAGEMENT

<table>
<thead>
<tr>
<th>Traits</th>
<th>( laV )</th>
<th>( laB )</th>
<th>( laN )</th>
<th>( lbV )</th>
<th>( lbV )</th>
<th>( lbN )</th>
<th>( lcV )</th>
<th>( lcB )</th>
<th>( lcN )</th>
</tr>
</thead>
<tbody>
<tr>
<td>G</td>
<td>0.69(^a)</td>
<td>0.12</td>
<td>0.26</td>
<td>-0.29</td>
<td>-0.14</td>
<td>-0.19</td>
<td>-0.26</td>
<td>0.07</td>
<td>-0.21</td>
</tr>
<tr>
<td>R</td>
<td>-0.76(^a)</td>
<td>-0.33</td>
<td>-0.57</td>
<td>0.26</td>
<td>0.07</td>
<td>0.19</td>
<td>-0.19</td>
<td>-0.52</td>
<td>0.17</td>
</tr>
<tr>
<td>A</td>
<td>0.33</td>
<td>0.31</td>
<td>0.05</td>
<td>0.48</td>
<td>0.10</td>
<td>0.10</td>
<td>0.24</td>
<td>0.24</td>
<td>-0.19</td>
</tr>
<tr>
<td>S</td>
<td>0.90(^b)</td>
<td>0.33</td>
<td>0.38</td>
<td>0.12</td>
<td>0.02</td>
<td>0.00</td>
<td>0.07</td>
<td>0.38</td>
<td>-0.05</td>
</tr>
<tr>
<td>E</td>
<td>0.36</td>
<td>0.21</td>
<td>0.19</td>
<td>0.88(^b)</td>
<td>0.33</td>
<td>0.33</td>
<td>0.24</td>
<td>-0.12</td>
<td>0.74(^a)</td>
</tr>
<tr>
<td>O</td>
<td>0.60</td>
<td>0.55</td>
<td>0.38</td>
<td>0.45</td>
<td>0.29</td>
<td>0.05</td>
<td>0.31</td>
<td>0.50</td>
<td>-0.14</td>
</tr>
<tr>
<td>F</td>
<td>0.14</td>
<td>-0.69(^a)</td>
<td>-0.40</td>
<td>-0.21</td>
<td>-0.81(^a)</td>
<td>-0.33</td>
<td>0.14</td>
<td>-0.29</td>
<td>0.07</td>
</tr>
<tr>
<td>T</td>
<td>-0.67(^a)</td>
<td>-0.24</td>
<td>-0.21</td>
<td>-0.29</td>
<td>-0.07</td>
<td>0.05</td>
<td>0.10</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td>P</td>
<td>0.52</td>
<td>0.14</td>
<td>0.50</td>
<td>-0.26</td>
<td>-0.38</td>
<td>-0.55</td>
<td>0.60</td>
<td>0.50</td>
<td>-0.29</td>
</tr>
<tr>
<td>M</td>
<td>0.64(^a)</td>
<td>0.36</td>
<td>0.10</td>
<td>0.83(^b)</td>
<td>0.43</td>
<td>0.50</td>
<td>0.17</td>
<td>0.33</td>
<td>0.43</td>
</tr>
</tbody>
</table>

\(^a\)Significant at the .05 level.

\(^b\)Significant at the .01 level.

**Notes:**

A "V" is used to designate verbal behavior. A "B" is used to designate congruent behavior, and a "N" is used to designate non-verbal behavior.
<table>
<thead>
<tr>
<th>Traits</th>
<th>Subcategories of Control, Release, and Goal Setting</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2V</td>
</tr>
<tr>
<td>G</td>
<td>0.07</td>
</tr>
<tr>
<td>R</td>
<td>-0.02</td>
</tr>
<tr>
<td>A</td>
<td>-0.93b</td>
</tr>
<tr>
<td>S</td>
<td>-0.29</td>
</tr>
<tr>
<td>E</td>
<td>-0.21</td>
</tr>
<tr>
<td>O</td>
<td>-0.71a</td>
</tr>
<tr>
<td>F</td>
<td>0.00</td>
</tr>
<tr>
<td>T</td>
<td>0.33</td>
</tr>
<tr>
<td>P</td>
<td>-0.24</td>
</tr>
<tr>
<td>M</td>
<td>-0.48</td>
</tr>
</tbody>
</table>

^aSignificant at the .05 level.
^bSignificant at the .01 level.

Notes:

A "V" is used to designate verbal behavior. A "B" is used to designate congruent behavior, and a "N" is used to designate non-verbal behavior.
control; personal relations correlates -.86 with non-verbal release; and emotional stability correlates -.83 with congruent goal setting. At the .05 level of significance, restraint and non-verbal release correlate .64; ascendance correlates -.67 with non-verbal control; and objectivity correlates -.71 with verbal control.

The correlation coefficients between the selected personality traits and the subdivisions of content development are presented in Table 7, page 174. Three of the possible subdivisions of content development are not included because of a lack of tallies in each subdivision.

After an inspection of Table 7, it is evident that there are no significant positive correlations between the personality traits and the subdivisions of content development at either the .05 or .01 levels. However, personal relations correlates -.79 with both the teacher centered, tentativeness of knowledge and student centered, scientific process, subdivisions of content development. Both of these negative correlations are significant at the .05 level.

Table 8, page 175, reports the significant correlation coefficients between the selected personality traits and the subcategories of teacher centered and student centered, content development. These
<table>
<thead>
<tr>
<th>Traits</th>
<th>5a1-</th>
<th>5a2-</th>
<th>5a3-</th>
<th>5a4-</th>
<th>5a5-</th>
<th>5a6-</th>
<th>5a7-</th>
<th>5b1-</th>
<th>5b2-</th>
<th>5b3-</th>
<th>5b7-</th>
</tr>
</thead>
<tbody>
<tr>
<td>G</td>
<td>0.00</td>
<td>0.36</td>
<td>0.14</td>
<td>-0.29</td>
<td>0.05</td>
<td>0.05</td>
<td>0.17</td>
<td>-0.05</td>
<td>-0.14</td>
<td>-0.17</td>
<td>0.19</td>
</tr>
<tr>
<td>R</td>
<td>-0.02</td>
<td>-0.45</td>
<td>0.31</td>
<td>0.36</td>
<td>0.02</td>
<td>-0.40</td>
<td>0.33</td>
<td>-0.29</td>
<td>0.02</td>
<td>0.40</td>
<td>0.10</td>
</tr>
<tr>
<td>A</td>
<td>0.38</td>
<td>-0.14</td>
<td>0.52</td>
<td>-0.48</td>
<td>-0.10</td>
<td>-0.05</td>
<td>0.31</td>
<td>-0.52</td>
<td>-0.02</td>
<td>0.05</td>
<td>-0.05</td>
</tr>
<tr>
<td>S</td>
<td>0.02</td>
<td>0.24</td>
<td>0.05</td>
<td>-0.36</td>
<td>-0.19</td>
<td>0.29</td>
<td>0.00</td>
<td>0.07</td>
<td>0.02</td>
<td>-0.14</td>
<td>0.10</td>
</tr>
<tr>
<td>E</td>
<td>-0.24</td>
<td>-0.62</td>
<td>0.29</td>
<td>-0.05</td>
<td>-0.38</td>
<td>-0.19</td>
<td>0.40</td>
<td>0.19</td>
<td>-0.07</td>
<td>0.24</td>
<td>0.12</td>
</tr>
<tr>
<td>O</td>
<td>0.00</td>
<td>-0.02</td>
<td>0.50</td>
<td>-0.38</td>
<td>-0.02</td>
<td>0.02</td>
<td>0.31</td>
<td>-0.21</td>
<td>-0.02</td>
<td>-0.02</td>
<td>0.02</td>
</tr>
<tr>
<td>F</td>
<td>0.48</td>
<td>0.43</td>
<td>-0.55</td>
<td>-0.48</td>
<td>-0.07</td>
<td>0.60</td>
<td>-0.31</td>
<td>-0.12</td>
<td>-0.29</td>
<td>-0.48</td>
<td>0.50</td>
</tr>
<tr>
<td>T</td>
<td>0.07</td>
<td>0.02</td>
<td>-0.62</td>
<td>0.36</td>
<td>0.00</td>
<td>0.19</td>
<td>-0.62</td>
<td>0.26</td>
<td>0.24</td>
<td>-0.02</td>
<td>-0.21</td>
</tr>
<tr>
<td>P</td>
<td>0.26</td>
<td>0.57</td>
<td>-0.24</td>
<td>-0.79a</td>
<td>0.29</td>
<td>0.48</td>
<td>-0.21</td>
<td>-0.02</td>
<td>-0.43</td>
<td>-0.79a</td>
<td>-0.60</td>
</tr>
<tr>
<td>M</td>
<td>-0.26</td>
<td>-0.29</td>
<td>0.12</td>
<td>0.12</td>
<td>-0.55</td>
<td>0.26</td>
<td>0.05</td>
<td>0.24</td>
<td>0.38</td>
<td>0.36</td>
<td>0.26</td>
</tr>
</tbody>
</table>

aSignificant at the .05 level.
TABLE 8

CORRELATION COEFFICIENTS BETWEEN SELECTED PERSONALITY TRAITS AND SUBCATEGORIES OF TEACHER CENTERED AND STUDENT CENTERED CONTENT DEVELOPMENT

<table>
<thead>
<tr>
<th>Traits</th>
<th>Subcategory</th>
<th>Form of Expression</th>
<th>Corr. Coefficient</th>
</tr>
</thead>
<tbody>
<tr>
<td>G</td>
<td>5a2)e)</td>
<td>Congruent</td>
<td>0.83^b</td>
</tr>
<tr>
<td>R</td>
<td>5a2)e)</td>
<td>Congruent</td>
<td>-0.86^b</td>
</tr>
<tr>
<td></td>
<td>5a3)a)</td>
<td>Verbal</td>
<td>0.88^b</td>
</tr>
<tr>
<td></td>
<td>5a4)a)</td>
<td>Verbal</td>
<td>0.69^a</td>
</tr>
<tr>
<td></td>
<td>5b1)c)</td>
<td>Non-verbal</td>
<td>-0.74^a</td>
</tr>
<tr>
<td>A</td>
<td>5a1)-</td>
<td>Non-verbal</td>
<td>0.74^a</td>
</tr>
<tr>
<td></td>
<td>5a1)c)</td>
<td>Non-verbal</td>
<td>0.69^a</td>
</tr>
<tr>
<td></td>
<td>5a2)b)</td>
<td>Verbal</td>
<td>0.67^a</td>
</tr>
<tr>
<td></td>
<td>5a3)b)</td>
<td>Verbal</td>
<td>0.67^a</td>
</tr>
<tr>
<td></td>
<td>5a7)a)</td>
<td>Verbal</td>
<td>0.71^a</td>
</tr>
<tr>
<td></td>
<td>5a7)e)</td>
<td>Congruent</td>
<td>0.69^a</td>
</tr>
<tr>
<td>S</td>
<td>5a2)e)</td>
<td>Congruent</td>
<td>0.76^a</td>
</tr>
<tr>
<td></td>
<td>5a3)a)</td>
<td>Verbal</td>
<td>-0.67^a</td>
</tr>
<tr>
<td></td>
<td>5b1)c)</td>
<td>Non-verbal</td>
<td>0.64^a</td>
</tr>
<tr>
<td>E</td>
<td>5a2)e)</td>
<td>Verbal</td>
<td>-0.64^a</td>
</tr>
<tr>
<td></td>
<td>5a3)b)</td>
<td>Verbal</td>
<td>0.64^a</td>
</tr>
<tr>
<td>O</td>
<td>5a2)b)</td>
<td>Verbal</td>
<td>0.74^a</td>
</tr>
<tr>
<td></td>
<td>5a7)a)</td>
<td>Verbal</td>
<td>0.88^b</td>
</tr>
<tr>
<td></td>
<td>5a7)e)</td>
<td>Congruent</td>
<td>0.69^a</td>
</tr>
<tr>
<td>F</td>
<td>5a6)-</td>
<td>Verbal</td>
<td>0.71^a</td>
</tr>
<tr>
<td></td>
<td>5a3)b)</td>
<td>Congruent</td>
<td>-0.83^b</td>
</tr>
<tr>
<td></td>
<td>5a3)e)</td>
<td>Congruent</td>
<td>-0.74^a</td>
</tr>
<tr>
<td></td>
<td>5a6)a)</td>
<td>Verbal</td>
<td>0.69^a</td>
</tr>
<tr>
<td></td>
<td>5a7)-</td>
<td>Congruent</td>
<td>-0.79^a</td>
</tr>
<tr>
<td>T</td>
<td>5a3)e)</td>
<td>Verbal</td>
<td>-0.76^a</td>
</tr>
<tr>
<td></td>
<td>5a7)a)</td>
<td>Verbal</td>
<td>-0.91^b</td>
</tr>
<tr>
<td></td>
<td>5a7)-</td>
<td>Verbal</td>
<td>-0.71^a</td>
</tr>
<tr>
<td>P</td>
<td>5a3)a)</td>
<td>Verbal</td>
<td>-0.90^b</td>
</tr>
<tr>
<td></td>
<td>5a4)a)</td>
<td>Verbal</td>
<td>-0.98^b</td>
</tr>
<tr>
<td>M</td>
<td>5a6)b)</td>
<td>Verbal</td>
<td>0.71^a</td>
</tr>
</tbody>
</table>

^aSignificant at the .05 level.

^bSignificant at the .01 level.
Subcategories of content development include both the appropriate communication act and form of expression.

Table 9 shows the correlation coefficients between the selected personality traits and the subcategories of affectivity. Non-verbal and contradictory, positive affectivity and non-verbal, negative affectivity are not included in this Table because of a lack of tallies in each of these subcategories.

**TABLE 9**

CORRELATION COEFFICIENTS BETWEEN SELECTED PERSONALITY TRAITS AND SUBCATEGORIES OF AFFECTIVITY

<table>
<thead>
<tr>
<th>Trait</th>
<th>6aV</th>
<th>6aB</th>
<th>6bV</th>
<th>6bB</th>
<th>6bC</th>
</tr>
</thead>
<tbody>
<tr>
<td>G</td>
<td>0.52</td>
<td>0.52</td>
<td>0.14</td>
<td>-0.07</td>
<td>0.43</td>
</tr>
<tr>
<td>R</td>
<td>-0.36</td>
<td>-0.17</td>
<td>0.12</td>
<td>0.21</td>
<td>0.10</td>
</tr>
<tr>
<td>A</td>
<td>0.57</td>
<td>0.45</td>
<td>-0.29</td>
<td>-0.71a</td>
<td>-0.14</td>
</tr>
<tr>
<td>S</td>
<td>0.55</td>
<td>0.36</td>
<td>-0.14</td>
<td>-0.52</td>
<td>0.02</td>
</tr>
<tr>
<td>E</td>
<td>0.10</td>
<td>0.10</td>
<td>0.12</td>
<td>-0.40</td>
<td>-0.19</td>
</tr>
<tr>
<td>O</td>
<td>0.81a</td>
<td>0.57</td>
<td>-0.05</td>
<td>-0.57</td>
<td>-0.07</td>
</tr>
<tr>
<td>F</td>
<td>-0.67a</td>
<td>-0.55</td>
<td>-0.29</td>
<td>-0.45</td>
<td>-0.45</td>
</tr>
<tr>
<td>T</td>
<td>-0.74a</td>
<td>-0.74a</td>
<td>-0.26</td>
<td>0.33</td>
<td>-0.36</td>
</tr>
<tr>
<td>P</td>
<td>0.24</td>
<td>0.12</td>
<td>-0.02</td>
<td>-0.33</td>
<td>-0.45</td>
</tr>
<tr>
<td>M</td>
<td>0.29</td>
<td>-0.02</td>
<td>-0.29</td>
<td>-0.76a</td>
<td>-0.24</td>
</tr>
</tbody>
</table>

*Significant at the .05 level.

Notes:

A "V" is used to designate verbal behavior.
A "B" is used to designate congruent behavior, and a "C" is used to designate contradictory behavior.
It is evident from Table 9 that a significant correlation of .81 exists between objectivity and verbal, positive affectivity. The Table further reveals a significant correlation of -.67 and -.74, respectively, between friendliness and thoughtfulness and verbal, positive affectivity. Ascendance correlates -.71 with congruent, negative affectivity; thoughtfulness correlates -.74 with congruent, positive affectivity; and masculinity correlates -.76 with congruent, negative affectivity. None of the correlations are significant at the .01 level.

Table 10 presents the correlation coefficients between the selected personality traits and the communication acts within the content development category of teacher classroom behavior. This Table reveals five correlations which are significant at the .05 level. Personal relations and restraint correlate .79 and -.71 with shows. Objectivity, friendliness, and thoughtfulness correlate .71, -.69, and -.64, respectively, with asks. None of the correlations are significant at the .01 level.

The correlation coefficients between the selected personality traits and the forms of expression are presented in Table 11.
TABLE 10
CORRELATION COEFFICIENTS BETWEEN SELECTED PERSONALITY TRAITS AND COMMUNICATION ACTS WITHIN CONTENT DEVELOPMENT

<table>
<thead>
<tr>
<th>Traits</th>
<th>States</th>
<th>Asks</th>
<th>Shows</th>
<th>Acknowledges</th>
<th>Clarifies</th>
</tr>
</thead>
<tbody>
<tr>
<td>G</td>
<td>0.19</td>
<td>0.12</td>
<td>0.21</td>
<td>0.05</td>
<td>0.10</td>
</tr>
<tr>
<td>R</td>
<td>-0.29</td>
<td>0.14</td>
<td>-0.71a</td>
<td>0.40</td>
<td>0.40</td>
</tr>
<tr>
<td>A</td>
<td>-0.07</td>
<td>0.62</td>
<td>0.26</td>
<td>0.24</td>
<td>0.31</td>
</tr>
<tr>
<td>S</td>
<td>0.10</td>
<td>0.26</td>
<td>0.57</td>
<td>-0.12</td>
<td>-0.17</td>
</tr>
<tr>
<td>E</td>
<td>-0.57</td>
<td>0.50</td>
<td>0.36</td>
<td>0.19</td>
<td>0.07</td>
</tr>
<tr>
<td>O</td>
<td>-0.05</td>
<td>0.71a</td>
<td>0.40</td>
<td>-0.19</td>
<td>-0.52</td>
</tr>
<tr>
<td>F</td>
<td>0.45</td>
<td>-0.69a</td>
<td>0.19</td>
<td>-0.05</td>
<td>-0.43</td>
</tr>
<tr>
<td>T</td>
<td>0.10</td>
<td>-0.64a</td>
<td>-0.50</td>
<td>-0.05</td>
<td>-0.43</td>
</tr>
<tr>
<td>P</td>
<td>0.52</td>
<td>-0.24</td>
<td>0.79</td>
<td>-0.19</td>
<td>-0.33</td>
</tr>
<tr>
<td>M</td>
<td>-0.33</td>
<td>0.57</td>
<td>0.33</td>
<td>-0.05</td>
<td>-0.24</td>
</tr>
</tbody>
</table>

*Significant at the .01 level.

TABLE 11
CORRELATION COEFFICIENTS BETWEEN SELECTED PERSONALITY TRAITS AND FORMS OF EXPRESSION

<table>
<thead>
<tr>
<th>Traits</th>
<th>Verbal</th>
<th>Congruent</th>
<th>Non-Verbal</th>
<th>Contradictory</th>
</tr>
</thead>
<tbody>
<tr>
<td>G</td>
<td>-0.05</td>
<td>0.29</td>
<td>0.07</td>
<td>0.57</td>
</tr>
<tr>
<td>R</td>
<td>-0.02</td>
<td>-0.48</td>
<td>0.29</td>
<td>-0.05</td>
</tr>
<tr>
<td>A</td>
<td>-0.19</td>
<td>0.43</td>
<td>-0.14</td>
<td>-0.10</td>
</tr>
<tr>
<td>S</td>
<td>-0.14</td>
<td>0.43</td>
<td>-0.05</td>
<td>0.19</td>
</tr>
<tr>
<td>E</td>
<td>-0.21</td>
<td>-0.29</td>
<td>0.40</td>
<td>-0.17</td>
</tr>
<tr>
<td>O</td>
<td>0.24</td>
<td>0.62</td>
<td>-0.21</td>
<td>0.07</td>
</tr>
<tr>
<td>F</td>
<td>0.57</td>
<td>-0.48</td>
<td>-0.05</td>
<td>-0.50</td>
</tr>
<tr>
<td>T</td>
<td>0.17</td>
<td>-0.24</td>
<td>-0.19</td>
<td>-0.50</td>
</tr>
<tr>
<td>P</td>
<td>0.40</td>
<td>0.40</td>
<td>-0.60</td>
<td>-0.36</td>
</tr>
<tr>
<td>M</td>
<td>-0.38</td>
<td>0.17</td>
<td>0.19</td>
<td>-0.12</td>
</tr>
</tbody>
</table>
An inspection of Table 11 reveals that there are no significant correlations between the personality traits and the forms of expression.

Summary of Hypothesis Two

Hypothesis Two, that there is a significant positive correlation between selected personality traits and the verbal and non-verbal behaviors exhibited by high school biology teachers in both classroom and laboratory instructional situations, is accepted in the cases listed in Table 12.

TABLE 12

SIGNIFICANT, POSITIVE CORRELATIONS BETWEEN SELECTED PERSONALITY TRAITS AND THE VERBAL AND NON-VERBAL BEHAVIORS OF BIOLOGY TEACHERS

<table>
<thead>
<tr>
<th>Correlation Coefficients</th>
<th>Traits</th>
<th>Categories and Subcategories</th>
<th>Form of Expression</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.69^a</td>
<td>G</td>
<td>Routine Management</td>
<td>Verbal</td>
</tr>
<tr>
<td>0.83^b</td>
<td>G</td>
<td>Teacher Centered Knowledge, Clarifies</td>
<td>Congruent</td>
</tr>
<tr>
<td>0.64^a</td>
<td>R</td>
<td>Release</td>
<td>Non-Verbal</td>
</tr>
<tr>
<td>0.88^b</td>
<td>R</td>
<td>Teacher Centered Scientific Process, States</td>
<td>Verbal</td>
</tr>
<tr>
<td>0.69^a</td>
<td>R</td>
<td>Teacher Centered Tentativeness of Knowledge, States</td>
<td>Verbal</td>
</tr>
<tr>
<td>0.74^a</td>
<td>A</td>
<td>Teacher Centered Procedures</td>
<td>Non-verbal</td>
</tr>
<tr>
<td>0.67^a</td>
<td>A</td>
<td>Teacher Centered Knowledge, Asks</td>
<td>Verbal</td>
</tr>
<tr>
<td>0.67^a</td>
<td>A</td>
<td>Teacher Centered Scientific Process, Asks</td>
<td>Verbal</td>
</tr>
<tr>
<td>Correlation Coefficients</td>
<td>Categories and Subcategories</td>
<td>Form of Expression</td>
<td></td>
</tr>
<tr>
<td>--------------------------</td>
<td>------------------------------</td>
<td>--------------------</td>
<td></td>
</tr>
<tr>
<td>0.71&lt;sup&gt;a&lt;/sup&gt; A</td>
<td>Teacher Centered</td>
<td>Verbal</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Facilitates Communication, States</td>
<td></td>
<td></td>
</tr>
<tr>
<td>0.69&lt;sup&gt;a&lt;/sup&gt; A</td>
<td>Teacher Centered</td>
<td>Non-verbal</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Procedures, Shows</td>
<td></td>
<td></td>
</tr>
<tr>
<td>0.69&lt;sup&gt;a&lt;/sup&gt; A</td>
<td>Teacher Centered</td>
<td>Congruent</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Facilitates Communication, Clarifies</td>
<td></td>
<td></td>
</tr>
<tr>
<td>0.90&lt;sup&gt;b&lt;/sup&gt; S</td>
<td>Routine Management</td>
<td>Verbal</td>
<td></td>
</tr>
<tr>
<td>0.76&lt;sup&gt;a&lt;/sup&gt; S</td>
<td>Teacher Centered</td>
<td>Congruent</td>
<td></td>
</tr>
<tr>
<td>0.64&lt;sup&gt;a&lt;/sup&gt; S</td>
<td>Student Centered</td>
<td>Non-verbal</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Procedures, Shows</td>
<td></td>
<td></td>
</tr>
<tr>
<td>0.69&lt;sup&gt;a&lt;/sup&gt; E</td>
<td>Study Management</td>
<td>All</td>
<td></td>
</tr>
<tr>
<td>0.88&lt;sup&gt;b&lt;/sup&gt; E</td>
<td>Laboratory Management</td>
<td>Verbal</td>
<td></td>
</tr>
<tr>
<td>0.74&lt;sup&gt;a&lt;/sup&gt; E</td>
<td>Study Management</td>
<td>Non-verbal</td>
<td></td>
</tr>
<tr>
<td>0.64&lt;sup&gt;a&lt;/sup&gt; E</td>
<td>Teacher Centered</td>
<td>Verbal</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Scientific Process, Asks</td>
<td></td>
<td></td>
</tr>
<tr>
<td>0.67&lt;sup&gt;a&lt;/sup&gt; O</td>
<td>Positive Affectivity</td>
<td>All</td>
<td></td>
</tr>
<tr>
<td>0.81&lt;sup&gt;a&lt;/sup&gt; O</td>
<td>Positive Affectivity</td>
<td>Verbal</td>
<td></td>
</tr>
<tr>
<td>0.71&lt;sup&gt;a&lt;/sup&gt; O</td>
<td>Asks</td>
<td>All</td>
<td></td>
</tr>
<tr>
<td>0.74&lt;sup&gt;a&lt;/sup&gt; O</td>
<td>Teacher Centered</td>
<td>Verbal</td>
<td></td>
</tr>
<tr>
<td>0.88&lt;sup&gt;b&lt;/sup&gt; O</td>
<td>Teacher Centered</td>
<td>Verbal</td>
<td></td>
</tr>
<tr>
<td>0.69&lt;sup&gt;a&lt;/sup&gt; O</td>
<td>Teacher Centered</td>
<td>Congruent</td>
<td></td>
</tr>
<tr>
<td>0.71&lt;sup&gt;a&lt;/sup&gt; F</td>
<td>Teacher Centered</td>
<td>Verbal</td>
<td></td>
</tr>
<tr>
<td>0.69&lt;sup&gt;a&lt;/sup&gt; F</td>
<td>Teacher Centered Articulation of Content</td>
<td>Verbal</td>
<td></td>
</tr>
<tr>
<td>0.71&lt;sup&gt;a&lt;/sup&gt; P</td>
<td>Shows</td>
<td>All</td>
<td></td>
</tr>
<tr>
<td>0.79&lt;sup&gt;a&lt;/sup&gt; P</td>
<td>Routine Management</td>
<td>Verbal</td>
<td></td>
</tr>
<tr>
<td>0.64&lt;sup&gt;a&lt;/sup&gt; M</td>
<td>Laboratory Management</td>
<td>Verbal</td>
<td></td>
</tr>
<tr>
<td>0.33&lt;sup&gt;b&lt;/sup&gt; M</td>
<td>Teacher Centered Articulation of Content Asks</td>
<td>Verbal</td>
<td></td>
</tr>
</tbody>
</table>

<sup>a</sup>Significant at the .05 level.
<sup>b</sup>Significant at the .01 level.
Table 12 lists all of the positive, significant correlations between the selected personality traits and the verbal and non-verbal, classroom behavior of the eight high school biology teachers used in this study. The Table is a summary of the correlations that support Hypothesis Two.

Hypothesis Two is not accepted in all the other possible combinations not listed in Table 12. The other correlation coefficients are either significant, negative correlations or are not significant at either the .05 or .01 levels.

Findings Not Directly Related to the Hypotheses

Table 13 reveals the percentage of behaviors in each category based on the total number of ten-second, time intervals. These percentages are presented for the individual teachers as well as for the total group.

From Table 13, it is evident that the biology teachers in this study spent the majority of their time in the area of content development and management. Only 5.85 per cent of their time was devoted to the other categories.
Table 14 points out the percentages of teacher behaviors in each major subcategory of teacher classroom behavior. These percentages are based on the total number of ten-second, time intervals for each and all teachers.

A review of Table 14 reveals that the majority of teacher behaviors, within content development, are teacher centered. It further shows that the largest percentage of time for all teachers is spent in giving and receiving information at low cognitive levels. The management category is more evenly distributed among its subcategories. The teacher spent 10.43, 17.94, and 15.90 per cent, respectively, in routine, laboratory, and study management.
<table>
<thead>
<tr>
<th>Subcategories</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>1-8</th>
</tr>
</thead>
<tbody>
<tr>
<td>Teachers</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1a</td>
<td>9.97</td>
<td>14.80</td>
<td>8.80</td>
<td>19.68</td>
<td>6.32</td>
<td>6.23</td>
<td>10.38</td>
<td>7.59</td>
<td>10.43</td>
</tr>
<tr>
<td>1b</td>
<td>8.64</td>
<td>24.22</td>
<td>9.49</td>
<td>17.42</td>
<td>21.43</td>
<td>0.00</td>
<td>45.49</td>
<td>17.45</td>
<td>17.94</td>
</tr>
<tr>
<td>5a</td>
<td>43.13</td>
<td>37.55</td>
<td>61.46</td>
<td>41.08</td>
<td>34.85</td>
<td>74.80</td>
<td>26.98</td>
<td>55.36</td>
<td>47.08</td>
</tr>
<tr>
<td>5b</td>
<td>4.75</td>
<td>4.30</td>
<td>2.07</td>
<td>2.46</td>
<td>3.29</td>
<td>0.32</td>
<td>4.64</td>
<td>0.62</td>
<td>2.78</td>
</tr>
<tr>
<td>5-1</td>
<td>7.03</td>
<td>4.84</td>
<td>20.23</td>
<td>13.43</td>
<td>9.23</td>
<td>8.00</td>
<td>12.15</td>
<td>6.65</td>
<td>10.11</td>
</tr>
<tr>
<td>5-3</td>
<td>0.26</td>
<td>5.72</td>
<td>0.76</td>
<td>7.38</td>
<td>5.29</td>
<td>9.71</td>
<td>5.25</td>
<td>14.12</td>
<td>6.16</td>
</tr>
<tr>
<td>5-4</td>
<td>0.13</td>
<td>0.26</td>
<td>0.00</td>
<td>0.00</td>
<td>0.19</td>
<td>0.13</td>
<td>1.43</td>
<td>0.18</td>
<td>0.29</td>
</tr>
<tr>
<td>5-5</td>
<td>1.00</td>
<td>0.47</td>
<td>0.48</td>
<td>0.46</td>
<td>0.00</td>
<td>1.44</td>
<td>0.00</td>
<td>1.06</td>
<td>0.62</td>
</tr>
<tr>
<td>5-6</td>
<td>4.82</td>
<td>2.96</td>
<td>9.56</td>
<td>0.59</td>
<td>3.55</td>
<td>1.44</td>
<td>0.54</td>
<td>2.76</td>
<td>3.25</td>
</tr>
<tr>
<td>5-7</td>
<td>8.50</td>
<td>11.30</td>
<td>3.32</td>
<td>15.62</td>
<td>11.68</td>
<td>25.82</td>
<td>8.53</td>
<td>17.57</td>
<td>12.92</td>
</tr>
<tr>
<td>6a</td>
<td>0.00</td>
<td>0.80</td>
<td>0.27</td>
<td>1.39</td>
<td>0.12</td>
<td>0.72</td>
<td>0.34</td>
<td>0.62</td>
<td>0.53</td>
</tr>
<tr>
<td>6b</td>
<td>1.40</td>
<td>0.60</td>
<td>0.00</td>
<td>0.46</td>
<td>0.19</td>
<td>3.01</td>
<td>0.34</td>
<td>0.69</td>
<td>0.84</td>
</tr>
</tbody>
</table>
The percentages of communication acts within the content development category are illustrated in Table 15. The percentages are presented for the individual teachers as well as for the total group and are based on the total number of behaviors in content development by each teacher and the group.

### TABLE 15
PERCENTAGE OF COMMUNICATION ACTS WITHIN CONTENT DEVELOPMENT

<table>
<thead>
<tr>
<th></th>
<th>States</th>
<th>Asks</th>
<th>Shows</th>
<th>Acknowledges</th>
<th>Clarifies</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>69.51</td>
<td>2.23</td>
<td>7.83</td>
<td>18.88</td>
<td>1.53</td>
</tr>
<tr>
<td>2</td>
<td>52.73</td>
<td>18.16</td>
<td>5.95</td>
<td>19.13</td>
<td>4.01</td>
</tr>
<tr>
<td>3</td>
<td>80.04</td>
<td>4.14</td>
<td>8.94</td>
<td>4.79</td>
<td>2.07</td>
</tr>
<tr>
<td>4</td>
<td>38.53</td>
<td>15.89</td>
<td>11.69</td>
<td>25.93</td>
<td>7.94</td>
</tr>
<tr>
<td>5</td>
<td>49.23</td>
<td>13.87</td>
<td>3.89</td>
<td>29.44</td>
<td>3.55</td>
</tr>
<tr>
<td>6</td>
<td>53.18</td>
<td>5.41</td>
<td>0.87</td>
<td>33.10</td>
<td>7.42</td>
</tr>
<tr>
<td>7</td>
<td>46.22</td>
<td>11.66</td>
<td>11.23</td>
<td>24.83</td>
<td>6.04</td>
</tr>
<tr>
<td>8</td>
<td>44.73</td>
<td>21.30</td>
<td>5.94</td>
<td>21.30</td>
<td>6.72</td>
</tr>
<tr>
<td>1-8</td>
<td>55.37</td>
<td>10.99</td>
<td>6.50</td>
<td>22.10</td>
<td>5.02</td>
</tr>
</tbody>
</table>

From Table 15, it is evident that 55.37 per cent of the biology teachers' time is spent in stating content to the students. In the area of content development, the teachers acknowledged students 22.10 per cent of the time. Asks, shows, and clarifies were used 10.99, 6.50, and 5.02 per cent, respectively, to communicate content to the biology students.

Table 16 reveals the percentages of teacher
classroom behaviors used in the verbal, congruent, non-verbal, and contradictory forms of expression. The percentages are presented for the individual teachers and the total group. Calculations are based on the total number of teacher classroom behaviors.

**TABLE 16**

PERCENTAGE OF TEACHER BEHAVIORS IN THE VARIOUS FORMS OF EXPRESSION

<table>
<thead>
<tr>
<th>Teacher</th>
<th>Verbal</th>
<th>Congruent</th>
<th>Non-verbal</th>
<th>Contradictory</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>48.82</td>
<td>17.81</td>
<td>33.35</td>
<td>0.00</td>
</tr>
<tr>
<td>2</td>
<td>24.83</td>
<td>41.11</td>
<td>33.91</td>
<td>0.13</td>
</tr>
<tr>
<td>3</td>
<td>41.30</td>
<td>34.65</td>
<td>24.04</td>
<td>0.00</td>
</tr>
<tr>
<td>4</td>
<td>28.19</td>
<td>25.93</td>
<td>45.81</td>
<td>0.06</td>
</tr>
<tr>
<td>5</td>
<td>32.21</td>
<td>13.75</td>
<td>53.97</td>
<td>0.06</td>
</tr>
<tr>
<td>6</td>
<td>45.34</td>
<td>18.37</td>
<td>35.82</td>
<td>0.45</td>
</tr>
<tr>
<td>7</td>
<td>22.33</td>
<td>23.77</td>
<td>53.82</td>
<td>0.06</td>
</tr>
<tr>
<td>8</td>
<td>34.90</td>
<td>34.46</td>
<td>30.57</td>
<td>0.06</td>
</tr>
<tr>
<td>1-8</td>
<td>34.76</td>
<td>26.18</td>
<td>38.94</td>
<td>0.10</td>
</tr>
</tbody>
</table>

Table 16 reveals that the majority of the biology teachers' time, 38.94 per cent, are spent in non-verbal behaviors. Verbal, congruent, and contradictory behaviors consumed, respectively, 34.76, 28.18, and .10 per cent of the total, teacher classroom behavior in this study. These figures are not in agreement with the findings presented in other studies of teacher classroom behavior. This disagreement is discussed in Chapter V.

A further examination of the percentages in Table
16 points out that non-verbal behaviors were totally or partially involved in 65.20 per cent of the total, teacher classroom behavior. Verbal behaviors were involved in 61.04 per cent of the total, teacher classroom behavior. These percentages are based on the fact that congruent and contradictory forms of expression are composed of both verbal and non-verbal behaviors.

Summary

Chapter IV was divided into six major sections. Section One contained the purposes of the study. The procedures and handling of data were reviewed in Section Two and Three. Hypothesis One was accepted in Section Four based on the correlation coefficients between the selected personality traits and the behavioral data. Section Six was devoted to the presentation of some findings not directly related to the study.
CHAPTER V

SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

The first part of this chapter contains a review of the present study. It includes a summary and a conclusion with respect to each hypothesis. This is followed by a discussion pertaining to the comparison of certain aspects of the present study to other studies of teacher classroom behavior and the implications of the present study for future research. The final portion of the chapter is devoted to the recommendations for future studies.

Design of the Study

A complete description of the design of the present study is presented in Chapters III and IV.

Pilot Taping

Thirteen video tape recordings, each one class period in length, were made of eleven biology teachers during their regular classroom and laboratory presentations. The sample of teachers was composed of men and women who taught BSCS and non-BSCS biology in the Greater Cincinnati Area.
Instrument Development

The recordings were reviewed many times until each teacher behavior, perceived as influencing the teaching-learning situation, was identified and separately written on a three by five card. These cards, containing the individual behaviors, were sorted and placed into piles. After numerous revisions, each pile contained a list of verbal and non-verbal teacher behaviors that were similar or related in their intent. The lists were then used to identify and define the individual categories of teacher classroom behavior. Thus, the category system was developed in an inductive manner. It progressed from a list of individual behaviors to the individual categories and finally into the Biology Teacher Behavior Inventory.

Description of Instrument

The Biology Teacher Behavior Inventory is composed of three parts, including a list of categories and subcategories, definitions, and glossary of teacher classroom behaviors. The seven categories are as follows: 1) Management, 2) Control, 3) Release, 4) Goal Setting, 5) Content Development, 6) Affectivity, and 7) Undecided. The instrument in its completed form is found in Appendix A.
Method of Encoding

The method developed for encoding the behavioral data consisted of three steps. First, the observer identified every teacher behavior that he perceived as influencing the teaching-learning situation. This was accomplished by replaying the video tapes as frequently as the observer desired. Second, the observer classified the behaviors into the category system according to the inferred intent of the behavior and according to the form of expression. The possible forms of expression were verbal, congruent, non-verbal and contradictory. Finally, the categorized behaviors were recorded under the appropriate form of expression in rows, top to bottom, on a Data Record.

In order to condense the voluminous quantity of data obtained by recording every perceived teacher behavior that influenced the teaching-learning situation, the researchers decided to use a time interval. After trying several time intervals, a ten-second interval was adopted because it proved long enough to condense the data. At the same time, the ten-second time interval was not so long that it discarded most of the teacher behaviors which were of a short duration.

The ten-second, time interval was determined in the following manner. First, an audio tape was prepared to "gong" every ten seconds with a xylophone, wooden hammer,
and a stopwatch. Next, a video tape, which had previously been encoded onto a Data Record, and the audio tape were simultaneously played without stopping. The observer followed the encoded Data Record, and every time the "gong" sounded, a horizontal line was drawn on the Data Record. This procedure was continued until the entire video tape recording was reviewed, and the encoded Data Record was divided into ten-second, time intervals.

Once the encoded Data Record was divided into ten-second time intervals, the predominant behavior for each interval was determined and recorded onto a Master Data Record. Predominance was determined by the behavior which consumed the largest portion of the ten-second interval. Thus, the predominant behavior for each interval was determined in a more objective manner than some of the earlier researches dealing with the study of teacher classroom behavior.

Inter-observer Agreement

Prior to the development of the method of encoding the behavioral data, the researchers divided the thirteen pilot tapes into five-minute time intervals by means of a stopwatch and the tape counter on the video tape recorder. Fifteen, five-minute samples of behavior were then drawn at random and re-recorded onto three,
thirty-minute video tapes. These tapes were set aside and later used to determine the reliability or inter-observer agreement.

Once the Biology Teacher Behavior Inventory and method of encoding were developed and learned by the researchers, each five-minute sample of behavior was independently observed and encoded onto a Data Record. The ten-second time intervals were determined, and the predominant behaviors were recorded onto an Observer Agreement Data Record. Inter-observer agreement was calculated using the Scott formula for inter-observer agreement (78, p. 323). Table 2 reported the inter-observer agreement for the fifteen samples of behavior. The over-all inter-observer agreement was found to be .92.

Inter-observer agreement was rechecked at the midpoint and again at the end of data collection using tapes which had not been previously reviewed. Inter-observer agreement was calculated and found to be .95 and .93.

Collection of Data

Eight biology teachers, four BSCS and four non-BSCS, were chosen to take part in the second phase of this study. The sample included men and women teachers from the Greater Cincinnati Area.
Five video tape recordings, each one class period in length, were made of each teacher during his regular classroom and laboratory instructional periods. The tapes were made at random over a three month interval. All except two of the video tapes were made without giving the teacher prior notice of when the taping was to occur.

The forty tapes were observed and encoded onto Data Records using the Biology Teacher Behavior Inventory and method of encoding discussed earlier. The ten-second intervals were determined, and the predominant behaviors were recorded onto a Master Data Record for each teacher. The data from these Master Data Records, were later used to determine the correlation coefficients between the teachers' classroom behavior and personality scores.

The personality data were collected by administering the Guilford-Zimmerman Temperament Survey to each of the eight biology teachers. The Survey measured the following ten traits: 1) General Activity (G), 2) Restraint (R), 3) Ascendance (A), 4) Sociability (S), 5) Emotional Stability (E), 6) Objectivity (O), 7) Friendliness (F), 8) Thoughtfulness (T), 9) Personal Relations (P), and 10) Masculinity (M) (42, pp. 2-3).

Handling of Data

The behavioral data from the Master Data Records
were reduced to proportions because the lengths of the taping sessions were not equivalent. Table 1 reported the total observational time for each teacher.

After the frequencies of predominant behavior for each teacher were converted to proportions of the total number of predominant behaviors for each teacher, the teachers' scores were ranked from one to eight in each category and subcategory. The personality data were also ranked among the eight teachers for each of the ten traits.

The correlation coefficients or degrees of association, between the ranked behavioral and personality data, were calculated by means of a nonparametric statistic, the Spearman Rank Correlation Coefficient (79,p.204). The significant correlations, at the .05 and .01 levels, were determined through the use of a table of critical values for the Spearman Rank Correlation Coefficient (79,p.284).

Hypothesis One

A reliable category system for first-hand systematic observation of the verbal and non-verbal behaviors of high school biology teachers, in both classroom and laboratory instructional situations, can be developed.

Summary with Respect to Hypothesis One

The Biology Teacher Behavior Inventory and the
method of encoding developed and used in this study supported Hypothesis One. That is, the instrument met the stated definition of a category system, and the reliability, defined as inter-observer agreement, was found to be in excess of .90. In addition, a high degree of objectivity was achieved in both the instrument and method of encoding.

The Biology Teacher Behavior Inventory met the stated definitions of a category system largely because of the manner in which it was developed. Individual teacher behaviors were used to identify and define the categories and subcategories and were later combined into a glossary of teacher classroom behaviors. Therefore, the boundaries of each category were explicit, i.e., each category contained certain behaviors and excluded all others. In addition, the category system was logically exhaustive of all teacher classroom behaviors, identified as influencing the teaching-learning situation, because the Undecided category was added. This category included those teacher behaviors whose intent could not be inferred and categorized into the other categories of the system.

Actually, the category system was largely exhaustive of all teacher classroom behaviors identified in this study without the use of the Undecided category. Table 13 revealed that the tallies in this category
accounted for only .09 per cent of the 12,056 ten-second intervals of classroom behavior recorded for the eight biology teachers.

Objectivity was defined as the ease of discrimination, i.e., could independent observers, after a period of training, obtain satisfactory agreement with each other on the identification and encoding of teacher classroom behaviors. The study illustrated objectivity by the high level of agreement reached by the two observers (Table 2). The over-all inter-observer agreement for fifteen, five-minute samples of teacher classroom behavior was .92.

The reasons for this high level of agreement stemmed back to the development of the instrument and the method of encoding. First, a video tape recorder was used to "capture" teacher classroom behavior. Consequently, the behaviors could be observed as often and as much as the observer desired. Second, the instrument was inductively developed, i.e., teacher behaviors were identified and became the basis on which the categories and subcategories were identified and defined. Finally, the method of encoding enabled the predominant behaviors for each ten-second, time interval to be empirically, rather than subjectively determined.

A complete discussion of Hypothesis One and the
Conclusion with Respect to Hypothesis One

It was concluded that a reliable category system for the first-hand systematic observation of the verbal and non-verbal behaviors of high school biology teachers, in both classroom and laboratory situations, was developed. This conclusion was supported by the discussions of the development, description, and use of the **Biology Teacher Behavior Inventory** and method of encoding with respect to the stated definition of a category system, inter-observer agreement, and the degree of objectivity.

The **Biology Teacher Behavior Inventory** and method of encoding developed and used in this study may be appropriate for the study of the classroom behaviors of any sample of biology teachers. The instrument and method of encoding were developed from a study of thirteen video tape recordings of eleven teachers in the pilot study. The sample represented a wide spectrum of biology teachers including BSCS and non-BSCS biology. The non-BSCS biology teachers taught academic, general and basic biology. The instrument and method of encoding were used in the study of eight biology teachers, one of which did not take part in the pilot study.

Many behaviors were identified and categorized in the
study which were not seen during the study of the pilot tapes. The inclusion of the "new" teacher and these additional behaviors did not require any modifications in the instrument or the method of encoding. However, until more evidence has been accumulated, the generalizations must be limited, i.e., the Biology Teacher Behavior Inventory and the method of encoding developed and used in this study must be limited to the use with the same or a similar sample of biology teachers.

**Hypothesis Two**

There is a significant positive correlation between selected personality traits and the verbal and non-verbal behaviors exhibited by high school biology teachers in both classroom and laboratory instructional situations.

**Summary with Respect to Hypothesis Two**

Table 12 reported that nine of the selected personality traits correlated significantly, in a positive manner, with some aspect of the verbal and non-verbal, classroom behavior of the eight biology teachers. These traits were as follows: 1) General Activity (G), 2) Restraint (R), 3) Ascendace (A), 4) Sociability (S), 5) Emotional Stability (E), 6) Objectivity (O), 7) Friendliness (F), 8) Personal
Relations (P), and 9) Masculinity (M). Only thoughtfulness (T) failed to exhibit a positive, significant correlation with some aspect of teacher classroom behavior.

The following positive correlations, significant at the .01 level, are revealed from an inspection of Table 12.

1. General activity correlated .83 with the teacher centered, knowledge, clarifies subcategory of content development for the congruent form of expression.

2. Restraint correlated .88 with the teacher centered, scientific process, states subcategory of content development for the verbal form of expression.

3. Sociability correlated .90 with verbal, routine management.

4. Emotional stability correlated .88 with verbal, laboratory management.

5. Objectivity correlated .88 with the teacher centered, facilitates communication, states subcategory of content development for the verbal form of expression.

6. Masculinity correlated .83 with verbal, laboratory management.

The following positive correlations, significant at the .05 level, are revealed from an inspection of Table 12.
1. General activity correlated .69 with verbal, routine management.

2. Restraint correlated .64 with non-verbal release.

3. Restraint correlated .69 with the teacher centered, tentativeness of knowledge, states subcategory of content development for the verbal form of expression.

4. Ascendance correlated .74 with the teacher centered, procedures subcategory of content development for the non-verbal form of expression.

5. Ascendance correlated .67 with the teacher centered, knowledge, asks subcategory of content development for the verbal form of expression.

6. Ascendance correlated .67 with the teacher centered, scientific process, asks subcategory of content development for the verbal form of expression.

7. Ascendance correlated .71 with the teacher centered, facilitates communication, states subcategory of content development for the verbal form of expression.

8. Ascendance correlated .69 with the teacher centered, procedures, shows subcategory for the non-verbal form of expression.

9. Ascendance correlated .69 with the teacher centered, facilitates communication, clarifies subcategory of content development for the congruent form of expression.
10. Sociability correlated .76 with the teacher centered, knowledge, clarifies subcategory of content development for the congruent form of expression.

11. Sociability correlated .64 with student centered, procedures, shows subcategory of content development for the non-verbal form of expression.

12. Emotional stability correlated .69 with study management for all of the possible forms of expression.

13. Emotional stability correlated .74 non-verbal, study management.

14. Emotional stability correlated .64 with the teacher centered, scientific process, asks subcategory of content development for the verbal form of expression.

15. Objectivity correlated .67 with positive affectivity for all of the possible forms of expression.

16. Objectivity correlated .81 with verbal, positive affectivity.

17. Objectivity correlated .71 with the asks subdivision of content development for all possible forms of expression.

18. Objectivity correlated .74 with the teacher centered, knowledge, asks subcategory of content development for the verbal form of expression.

19. Objectivity correlated .69 with the teacher centered, facilitates communication, states subcategory
of content development for the congruent form of expression.

20. Friendliness correlated .71 with the teacher centered, articulation of content subcategory of content development for the verbal form of expression.

21. Friendliness correlated .69 with the teacher centered, articulation of content, states subcategory of content development for the verbal form of expression.

22. Personal relations correlated .79 with the shows subdivision of content development for all of the possible forms of expression.

23. Masculinity correlated .64 with verbal, routine management.

24. Masculinity correlated .71 with the teacher centered, articulation of content, asks subcategory of content development for the verbal form of expression.

Conclusion with Respect to Hypothesis Two

Hypothesis Two, that there is a significant positive correlation between selected personality traits and the verbal and non-verbal behaviors exhibited by high school biology teachers in both classroom and laboratory instructional situations, is accepted for the cases listed in Table 12. Hypothesis Two is not accepted in all the other possible combinations of personality traits and teacher classroom behaviors not listed in Table 12.
The other correlation coefficients were either significant negative correlations or were not significant at either the .05 or .01 levels.

It was concluded from the statistical findings in Table 12 that there were significant positive correlations between the selected personality traits and certain verbal and non-verbal, teacher classroom behaviors. However, these findings are highly suspect, i.e., it may well be that chance accounted for the significant correlations. Approximately twelve hundred correlation coefficients were calculated. Therefore, on the basis of chance alone, one would expect sixty significant correlations at the .05 level and twelve significant correlations at the .01 level. There were fewer significant correlations found in this study than one would expect to find by chance. Such statements do not mean that the correlations that were found do not exist in reality, but it does suggest that these correlations should be checked again with other and larger samples of biology teachers before significant relationships, not due to chance, can be attributed to these correlations. Thus, without further research, it does not seem reasonable to generalize the findings in Hypothesis Two to other or similar populations of biology teachers.
Discussion

This section is devoted to a comparison of certain aspects of the present study to other studies of teacher classroom behavior. It also includes implications of the present study for future research in the areas of instrument development, use of video recording equipment, forms of expression and use of the Data Record, non-verbal behaviors, method of selecting predominant behaviors, and the correlation of personality traits and teacher classroom behaviors. A complete description of these topics is included in Chapters II, III, and IV.

Instrument Development

The Biology Teacher Behavior Inventory was developed completely in an inductive manner while most of the earlier efforts at developing category systems to measure classroom behavior by systematic observation, including those by Cornell and associates (23), Cogan (22), Miller (70), Hughes (53), Smith and Meux (81), Wright (90), Ryans (77), Flanders (27), Hough (50), Parakh (73), and Openshaw (71), were at least partially deductive. The term, "partially," is used because some of the researchers observed classrooms prior to or while they were developing their instruments. For example, Parakh (73) spent considerable time in
observing the teaching-learning situation prior to instrument development, but he went to the literature before he finally conceptualized his category system. In general, the earlier researchers formulated their category systems from such things as communication theories, reviews of literature, objectives of teaching, and partial theories of instruction. As a result, many teacher behaviors were overlooked, i.e., the formulated category systems were not inclusive of all the teacher classroom behaviors that influenced the teaching-learning situation.

By using an inductive approach, the Biology Teacher Behavior Inventory was formulated on a broader base than some of the other category systems, i.e., it was more inclusive of teacher classroom behaviors. For example, verbal, non-verbal, and combinations of these were included in the instrument because they had been observed prior to instrument development. Some researchers, using a deductive approach, simply left certain behaviors out of their category systems or decided that silence always meant the lack of teacher behaviors. Others called teaching procedures, such as demonstrations, teacher behaviors without actually observing that demonstrations usually involve several teacher behaviors. Consequently, many of the earlier category systems seemed to have a built in disregard
for certain teacher behaviors, and therefore, they were not as inclusive as the Biology Teacher Behavior Inventory.

Evidence of the Biology Teacher Behavior Inventory's inclusiveness was the small number of tallies in the Undecided category and the high level of inter-observer agreement found in the present study. The Undecided category received only .09 per cent of the total number of tallies for the eight teachers (Table 13), and inter-observer agreement was found to be in excess of .90 (Table 2). Thus, the present study suggested that an inductive approach to the development of a category system to measure classroom behavior by systematic observation was superior to a deductive approach.

Video Tape Recorder

After modifications were made in the sound system, the video tape recorder made significant contributions to the present study. It enabled the researchers to "capture" permanent records of teacher classroom behavior. The recorder allowed the researchers to identify behaviors that might have been ignored had they used narrative records, audio recordings, or live observations. The recorder provided the researchers with records of classroom behavior that, until recently, were not available to researchers. Thus, the
contributions made by the use of the video tape recorder suggest its usefulness in other studies of classroom behavior.

Forms of Expression and the Data Record

Teacher classroom behaviors were identified in this study by the manner in which they were expressed, i.e., they were seen as being verbal, congruent, non-verbal, and contradictory. The Data Record (Appendix B) was developed so that a running account of these forms of expression could be preserved. Previous studies of teacher behavior, such as those by Withall (89), Hughes (53), Flanders (27), and Parakh (73), either did not include all of the forms of expression or did not develop a means of recording them so they could be identified once the encoding process was complete. Therefore, the verbal, congruent, non-verbal, and contradictory behaviors were ignored or lost, and the resulting description of teacher behavior was incomplete.

The findings in the present study suggest that the verbal, congruent, non-verbal, and contradictory behaviors are not difficult to identify and record. The encoded record provided information concerning the classroom behavior of teachers that had not been included, or at least was not identifiable, in other studies of teacher classroom behavior. Thus, the
identification and the methods to record these forms of expression offer promise for further study of teacher classroom behavior.

Non-verbal Behaviors

Several researchers, including Withall (89), Flanders (27), and Miller (70), have assumed or implied that the verbal behavior of the classroom teacher was an adequate sample of his total behavior in the classroom. They simply ignored non-verbal behaviors. However, this assumption cannot be supported by the writer of the present study. From an inspection of Table 16, it was evident that the majority of the biology teachers' time was spent in performing non-verbal behaviors, i.e., in the present study, non-verbal behaviors accounted for 38.94 per cent of the teacher classroom behavior as contrasted to 34.76 per cent for verbal behaviors. A further analysis of the Table revealed that non-verbal behaviors were totally or partially involved in 65.20 per cent of the classroom behavior of the eight biology teachers.

Parakh (73) studied the classroom behavior of ten biology teachers, and Galloway (33) studied the classroom behavior of six elementary teachers. Both researchers supported the findings of the present study to some degree, i.e., pedagogically relevant non-verbal
behaviors were an important part of the teachers' classroom behavior in both studies. Parakh reported that non-verbal behaviors constituted 21 to 56 per cent of the laboratory behavior of the ten biology teachers (74,p.4). Galloway developed a category system for non-verbal behaviors, and he reported that two teams of observers recorded non-verbal behaviors into the category system with reliabilities of .91 and .94 (33,p.131).

From the findings in the present study and those reported by Parakh (73) and Galloway (33), it can be seen that teacher non-verbal behavior should not be ignored. If an adequate description is to be made of teacher classroom behavior, the description must include non-verbal as well as verbal behavior.

Selection of Predominant Behaviors

Many researchers have been content to observe classroom behavior and then, after a predetermined time interval, record the behavior which they felt dominated that particular interval. Under such conditions, the observer had to keep a mental account of the behaviors that took place during the interval so that he could accurately identify, classify, and record the predominant behavior for the time interval. Obviously, by trying to keep a mental picture of the classroom
events, the observer ran the risk of responding in terms of a general retrospective impression rather than responding in terms of the behaviors which were actually taking place.

The present study introduced a more objective means of selecting the predominant behavior for a time interval. It involved the encoding of every teacher behavior, perceived as influencing the teaching-learning situation, onto a Data Record. This procedure was made possible through the use of a video tape recorder. Then, the video tape was replayed, and the ten-second intervals were marked on the Data Record. The predominant behavior for each interval was determined by the behavior which consumed the greatest portion of the interval. Thus, the methods used to select predominant behaviors in the present study reduced the possibility of the observer responding in a retrospective impression rather than in terms of the actual teacher behaviors.

Since objectivity is extremely desirable in studies of teacher classroom behavior, it is suggested that the method used to select predominant behaviors in this study be extended to other studies of classroom behavior.
Correlation of Personality Traits and Teacher Classroom Behavior

Even though considerable time and energy have been spent in the investigation of teacher personality and teacher classroom behavior, little is known about teacher personality and its relationship to teacher classroom behavior. Efforts directed towards finding significant correlations between selected personality traits and teacher classroom behavior have generally been unsuccessful. For example, Ryans (74) did not find any relationships between patterns of teacher classroom behavior and the personal traits of teachers. Bowers and Soar (15) reported several findings which related personality and attitude test scores to teacher classroom behavior; however, the correlations were extremely low. Travers and associates (86) were not able to find predictors which would accurately and consistently predict classroom behavior. Fowler and Soar (30) reported that there was a meaningful relationship between personality characteristics and attitudes of the teacher and the classroom behaviors of both teachers and pupils, but they did not present the exact correlations.

The findings in the present study offer more promise in the search for significant relationships between teacher personality and teacher classroom
behavior than the findings in much of the earlier research. That is, the present study reported significant correlations between selected personality traits and teacher classroom behavior. Even though these findings must be reexamined before generalizations can be made, it can be stated that high correlations do exist between selected personality traits and teacher classroom behavior. On the basis of most of the earlier findings, such a statement can not be made.

Thus, the Biology Teacher Behavior Inventory and Guilford-Zimmerman Temperament Survey have promise for future studies of the relationship between teacher personality and teacher classroom behavior.

Recommendations for Future Studies

The small number of contradictory behaviors recorded in the present study suggests that they constitute only a small portion of teacher classroom behavior. It might be that the sample was unique. The teachers were not drawn at random from the total population of teachers. The Biology Teacher Behavior Inventory and method of encoding might not have been sensitive enough to contradictory behaviors. But, even if the number of contradictory behaviors found in the present study were representative of the number committed by all teachers, it might well be that such
behaviors, although relatively infrequent, have a pronounced influence on the teaching-learning situation. Therefore, it is recommended that further studies be made of the contradictory behavior of biology teachers and the effects of these behaviors on the learning of students.

In the present study, the teacher behaviors encoded into the management category composed nearly one-half of the total teacher classroom behaviors. The management category was subdivided into only three subdivisions. Therefore, in order to provide a more descriptive account of teacher classroom behavior, it is recommended that this category receive additional study and refinement.

The range of applicability for the Biology Teacher Behavior Inventory should be established. Therefore, its use with other samples of biology teachers and in other areas of science is recommended.

A more complete measure of the objectivity of the Biology Teacher Behavior Inventory and the method used to encode the behavioral data is desired. In order to achieve this, it is recommended that the instrument and the method of encoding be taught to and used by other researchers.

The video tape recorder makes it possible to apply several category systems and various methods of encoding
to the same teaching-learning situation. Therefore, the development of supplementary systems for the analysis of classroom behaviors to be used with the Biology Teacher Behavior Inventory is recommended.

Numerous possibilities exist involving the use of the Biology Teacher Behavior Inventory as a supervisory tool. Are the Biology Teacher Behavior Inventory and video tape recorder effective tools for self supervision? Of what value is such an instrument for the secondary school supervisor of science? What can such an instrument contribute to an in-service program? Does the Biology Teacher Behavior Inventory offer promise as a valuable tool for the college supervisor? Is it possible to change the classroom behavior of experienced teachers? What was the direction of the change, if any? These are but a few of the many questions which hold promise for future studies involving the use of the Biology Teacher Behavior Inventory.

From the successful use of the video tape recorder in the present study, it is recommended that this instrument be used in other studies of classroom behavior. The video tape recorder offers possibilities for research that were impossible prior to its development. Granted, there are many technical problems involved in the use of the video tape recorder, but as technology advances, these problems should be eliminated.
It is recommended that additional studies be made of the selected personality traits and the classroom behavior of biology teachers using the Guilford-Zimmerman Temperament Survey and the Biology Teacher Behavior Inventory. Such studies should be conducted using larger samples of biology teachers and larger samples of classroom behavior. From these studies, it would be possible to support or reject the correlations found in the present study between teacher personality and teacher classroom behavior.

From the findings in the present study, it is recommended that other category systems for the study of classroom behavior be inductively developed. Such a procedure might result in category systems which are more inclusive of all classroom behaviors, i.e., category systems that do not have a built in disregard for certain classroom behaviors.
APPENDIX A

BIOLOGY TEACHER BEHAVIOR INVENTORY
CATEGORIES OF TEACHER CLASSROOM BEHAVIOR

1. Management
   a. Routine Management
   b. Laboratory Management
   c. Study Management

2. Control

3. Release

4. Goal Setting

5. Content Development
   a. Teacher Centered
      1) Procedures
         a) states
         b) asks
         c) shows
         d) acknowledges
         e) clarifies
      2) Knowledge
         a) states
         b) asks
         c) shows
         d) acknowledges
         e) clarifies
      3) Scientific Process
         a) states
         b) asks
         c) shows
         d) acknowledges
         e) clarifies
      4) Tentativeness of Knowledge
         a) states
b) asks
c) shows
d) acknowledges
e) clarifies

5) Generalizations

a) states
b) asks
c) shows
d) acknowledges
e) clarifies

6) Articulation of Content

a) states
b) asks
c) shows
d) acknowledges
e) clarifies

7) Facilitates Communication

a) states
b) asks
c) shows
d) acknowledges
e) clarifies

b. Student Centered

1) Procedures

a) states
b) asks
c) shows
d) acknowledges
e) clarifies

2) Knowledge

a) states
b) asks
c) shows
d) acknowledges
e) clarifies

3) Scientific Process

a) states
b) asks
c) shows
d) acknowledges
  e) clarifies

4) Tentativeness of Knowledge
  a) states
  b) asks
  c) shows
  d) acknowledges
  e) clarifies

5) Generalizations
  a) states
  b) asks
  c) shows
  d) acknowledges
  e) clarifies

6) Articulation of Content
  a) states
  b) asks
  c) shows
  d) acknowledges
  e) clarifies

7) Facilitates Communication
  a) states
  b) asks
  c) shows
  d) acknowledges
  e) clarifies

6. Affectivity
   a. Positive Affectivity
   b. Negative Affectivity

7. Undecided
DEFINITIONS OF THE CATEGORIES, SUBCATEGORIES, AND SUBDIVISIONS OF TEACHER CLASSROOM BEHAVIOR

Category 1: **Management**: Those behaviors that regulate the routine "housekeeping" activities which are used in the operation of the biological science classroom. In addition, this category includes those behaviors in which the teacher makes assignments, since those behaviors comprise an aspect of management in the learning situation.

a. **Routine Management**: Those behaviors of the teacher associated with the routine management of any classroom. Behaviors involved in the control of the physical environment and the execution of administrative details are illustrative of this subcategory.

b. **Laboratory Management**: Those behaviors of the teacher associated with preparation for, maintenance and supervision of, or clean-up from biological science laboratory, demonstration, or classroom activities.

c. **Study Management**: Those behaviors of the teacher which specify assignments or provide for directed study. The achievement of
these assignments is presumably intended to facilitate achievement of content objectives. Behaviors from which other intentions for assignments are inferred (such as control) are categorized according to the primary intent.

Category 2: Control: Those behaviors that intend to make the classroom activities more orderly or formal. They tend to structure, regulate or otherwise keep student behavior and attention within limits, i.e., teacher behaviors that intend to have the students follow a recommended course of action.

Category 3: Release: Those teacher behaviors that intend to make student behavior less formal and orderly. They tend to allow greater student control of attention and discipline, i.e., those teacher behaviors that increase informality and permissiveness in the classroom.

Category 4: Goal Setting: Those behaviors which explicitly deal with the stating, explaining, implying, or clarifying of the purposes or goals for a given individual or classroom activity.

Category 5: Content Development: Those behaviors dealing primarily with subject matter in the science classroom. These behaviors are based upon
efforts to achieve objectives related to content whether they are cognitive, psychomotor or affective.

a. **Teacher Centered Vs. b. Student Centered:**

It is useful to consider the classroom as teacher centered when the attention of most students is on the teacher, or the teacher is attempting to obtain the attention of most students in the classroom. In addition, behaviors comprising teacher assertiveness in relation to individual students or groups of students are teacher centered even though the remainder of the students may be involved in student centered activities.

1) **Procedures:** Those behaviors of the teacher concerned with instruction in procedural aspects of the content. Illustrative are behaviors involved in instruction in laboratory procedures and procedures in problem solving.

2) **Knowledge:** Those behaviors of the teacher which pertain to giving and receiving information at low cognitive levels. The principal concern is that of knowledge of specific aspects of content
such as facts, definitions, and terminology as contrasted with interpretation, extrapolation, application, analysis, synthesis, observation, and evaluation.

3) **Scientific Process**: Those behaviors of the teacher which pertain to such cognitive processes as observation, interpretation, extrapolation, application, analysis, synthesis, and evaluation as contrasted with knowledge of relatively specific information such as facts, definitions, and terminology.

4) **Tentativeness of Knowledge**: Those behaviors in which the teacher states or distinctly implies a state of change regarding scientific knowledge.

5) **Generalizations**: Those behaviors which are of considerable scope or breadth as contrasted with specificity and depth of other content considerations being undertaken by the teacher. Operationally, these behaviors may be explicitly described by the teacher or may be identified by
the observer on the basis of his
acquaintance with teacher behavior
and the content under consideration.

6) **Articulation of Content:** Those
behaviors through which the teacher
tries to establish continuity
across topical areas or time.
Articulation and integration of
topical areas may be within biology
or between biology and other areas of
knowledge. When generalizations or
summarizations are used as means of
articulation and integration of
content, the behaviors are classified
on the basis of the latter intent.

7) **Facilitates Communication:** Those
behaviors in which the teacher attempts
to make clear and distinct the
nature of communication.
These can be distinguished from
explanations and illustrations of
content as such in that the latter
pertain to examples and elaborations,
given to aid understanding of the
nature of the content. Hand motions
and voice pitch intended to draw attention to content are seen as facilitating communication. However, when such non-verbal behaviors illustrate content, they must be categorized as such, not as facilitation of communication.

Category 6: **Affectivity:** Those behaviors that intend to elicit and reinforce, positively or negatively, contributions to the teaching-learning process by an individual or group of students.

a. **Positive Affectivity:** Those behaviors that elicit and reinforce, in a positive manner, contributions by an individual or group of students to the teaching-learning process. These behaviors take the form of teacher recognition, encouragement, and/or praise; they are based on the positive aspects of teacher motivation and evaluation.

b. **Negative Affectivity:** Those behaviors that elicit, correct and reinforce, in a negative manner, contributions by an individual or group of students to the teaching-learning process. These
behaviors take the form of corrective feedback, criticism, reprimands, accusations, admonition, and/or willful disregard; they are based on the negative aspects of teacher motivation and evaluation.

Category 7: **Undecided**: Those behaviors whose intent can not be inferred and categorized into the other categories in the system.
GLOSSARY OF TEACHER CLASSROOM BEHAVIORS

The following glossary is not exhaustive with respect to the definitions of behaviors in the categories and subcategories. It provides the descriptive definitions of the various categories and subcategories as seen by reviewing the pilot tapes. Duplications in the glossary are accounted for by the fact that the observer must categorize behaviors on the basis of context and inferred behavioral intent.

1. Management
   a. Routine Management
      1. Erases and/or washes chalk board
      2. Calls roll (verbal and non-verbal)
      3. Opens or closes windows and/or doors
      4. Passes out papers or gives papers to student to pass out
      5. Takes up papers or asks students to take up papers
      6. Adjusts lighting
      7. Looks for or readies materials or papers
      8. Pulls down movie screen
      9. Takes care of administrative details (signs notes, talks to visitors, prepares absence
slips, and admits tardy students)
10. Moves and/or reorganizes furniture
11. Shuffles paper during school announcement
12. Sends student on errand
13. Announces or explains school events
14. Gives several grades on request
15. Washes hands
16. Sharpens pencil
17. Mentions that exams or papers are available for those interested
18. Asks for lost articles
19. Waits for class to arrive or for bell to ring
20. Watches time

b. Laboratory Management

1. Looks for or readies supplies or equipment
2. Asks students to clean up or to turn off equipment
3. Tells students how to get information; gives sources of information
4. Shows, provides, or directs pupils to materials, supplies, and equipment
5. Reads instructions
6. Asks student needs of materials
7. Aids individual students with specific techniques
8. Shouts instructions to entire class while class works
9. Observes or supervises laboratory activities

c. Study Management

1. Asks student about make-up test or assignment
2. Gives make-up test to individual student
3. Gives, explains, repeats, implies or reminds students of assignments
4. Assigns reading (aloud or directed study)
5. Refers students to specific page in textbook
6. Gives assignment and time for directed study; also observes or directs study
7. Asks student to make a diagram on the chalk board
8. Tells students to make copies of the diagrams on the chalk board
9. Assigns or reminds students of quiz or examination
10. Calls attention to displays

2. Control

a. Looks up from work
b. Silence
c. Stops walking
d. Indicates inability to hear due to classroom noise
e. Postpones student question or statement
f. Shooes or places finger to lips
g. Points student to his seat
h. Holds out hands to request students to wait
i. Turns and stares
j. Taps pencil
k. Raises brow or uses eyes to gain attention
l. Stands with hands on hips and stares in silence
m. Holds up hand(s)
n. Rubs brow or grabs head
o. Walks to front of room or to door as the bell rings
p. Walks from seat to seat and inspects work
q. Records in grade book while student reports
r. Scans room to see who is not working
s. Uses sarcasm to control student(s)
t. Stares at individual student (eye contact)
u. Adjusts apparatus for student without being asked
v. Asks student to report after class
w. Comments on appropriateness of combing hair in public
x. Watches carefully the interchange between two students
y. Studies or stares at student giving a report
z. Maintains or returns to authoritarian position (behind desk or demonstration table, at door or in front of room)
aa. Walks back and forth behind students
bb. Waves hands to get attention
cc. Cautions student on his behavior
dd. Moves toward students who are noisy
ee. Refers to handout about term paper
ff. Tells students to draw
gg. Gives instruction for handout
hh. Gives instructions regarding written work
ii. Tells students when to turn work in
jj. Tells students to proceed with work
kk. States or asks:
   1) "Take your seats"
   2) "The bell has rung"
   3) "You are too noisy"
   4) "Time is running out"
   5) "Five more minutes"
   6) "Some people are still talking"
   7) "Get busy"
   8) "Give me your attention"
   9) "Let's keep it quiet"
  10) "Sit down"
  11) "Get rid of those things, will ya"
  12) "Too much competition"
  13) "Put away your books"
  14) "COME ON"
  15) "Shut up"
  16) "If you don't be quiet . . ."
  17) "I just want the answer"
  18) "Get into your groups"
19) "Start your homework"
20) "Get the microviewers"
21) "Work on this for ... minutes"
22) "Attention class"
23) "Pay attention"
24) "One at a time"
25) "I really didn't expect Bill to cooperate"
26) "Hurry up"
27) "Will YOU cooperate?"
28) "What's the trouble here?"
29) "You must participate"
30) "Taste this"
31) "Quit messing around"
32) "Some are not paying attention"
33) "Get back where you belong"
34) "You're going to ruin it"
35) "What are you doing now, David?"
36) "Quiet"
37) "Move back"
38) "What's your problem?"
39) "Finished?"
40) "Tom, where are you supposed to be?"
41) "Are you in this class? Well, take part"
42) "If everybody would accept his own responsibility"
43) "You should already know this"
3. Release

a. Laughs, smiles, jokes, or teases

b. Removes formal barriers and shortens formal distance (moving from behind desk when talking informally, etc.)

c. Chats informally with students

d. Ignores or tolerates student noise

e. Gives students a choice of things to do

f. Encourages student talk and participation

g. Allows and encourages discussion among students

h. Ignores control

i. Uses humor

j. Accepts student joke

k. Offers own materials for student use

l. Draws cartoon or joke on board or overhead

m. Encourages students to select their own committee and committee officials

n. Stops talking to receive student statement

o. Moves around room talking informally and giving aid when students ask for it

p. Asks for student help

q. Accepts student's correction or criticism

r. Asks for volunteers

s. Corrects own mistake or apologizes for error made earlier
t. Admits lack of knowledge or understanding in certain area
u. Lays hands on student
v. Approaches student who is talking
w. Sits on desk
x. Uses sarcasm concerning self
y. Leans toward class as he talks
z. Raises hand during student discussion
aa. Uses sarcasm as joke, laughs
bb. Uses a sweeping motion with hands to elicit response
cc. Asks one student to give another assistance
dd. States or asks:
   1) "Any questions?"
   2) "Are you sure?"
   3) "Everyone understand?"
   4) "Are you with us?"
   5) "Other questions?"
   6) "Do you see that?"
   7) "How many think . . . ?"
   8) "Want the same kind of problem or a harder one?"
   9) "How many understand?"
  10) "How many are lost?"

4. Goal Setting
   a. States the purpose of a particular class activity
   b. Reviews the major objectives of a given exercise
c. Re-phrases the objectives of an exercise

d. Justifies an area of study

e. Points out the results of studying certain areas of information

f. Refers to a concept as the most important in the whole world

g. Asks about the significance of a certain fact

h. Emphasizes the importance of a topic

i. Places emphasis on certain topics of a student's report, statement or question

j. Marvels at man's accomplishments

k. Notes that photosynthesis is not an accomplishment of man

l. Refers to man's starvation

m. Asks question about the effect of human actions, decisions

n. Asks question about man in general

o. Refers to human life as a natural resource

p. Relates content to local community situation

q. Relates content to current events

r. Relates content to government

s. Relates content to lives of students in class, home
5. Content Development
   a. Teacher Centered (see subdivisions below)
   b. Student Centered

1) Procedures
   a) Tells students how to proceed with work
   b) Shows examples of assignment done and explains it
   c) Nods, answers, or gives assent to student procedures
   d) Refers to materials and the instructions on the use thereof
   e) Gives or shows instructions to individuals, groups, or class
   f) Stops the class work and calls attention to specific procedure
   g) Gives or shows instructions for individual laboratory work
   h) Asks group about their procedures
   i) Tells students how to do work and how not to do it
   j) Gives or shows students the procedures for solving a problem

2) Knowledge
   a) Presents or asks content in chronological order
   b) States facts, gives factual answer or reply or asks factual question
c) Gives explanation of phenomenon, process, or detail

d) Introduces subject

e) Presents problem and gives results as facts

f) Gives answer to question student missed

g) Gives detailed information

h) Gives exceptions to a law and examples thereof

i) Gives vocabulary list

j) Gives symbols and explains meaning thereof or asks meaning of symbols

k) States equality of given terms

l) Refers to text presentation of terms

m) Explains illustration

n) Asks for a term

o) Asks for name of process, structure, etc.

p) Asks for identification of object

q) Asks content question and gives answer

r) Extends factual knowledge from given information

s) Writes, draws, diagrams content on chalkboard

t) Listens while student reads

3) Scientific Process

a) Asks for prediction of results from a given procedure or situation
b) Asks how certain information could be obtained experimentally
c) Asks for an interpretation or explanation of data
d) Reminds students to keep eyes open
e) Asks student what usually happens under given conditions
f) Asks question about possible ways of getting information in biology
g) Distinguishes hypotheses from facts observed
h) Asks a question a second time but gives different variables
i) Asks: "Can you think of a simpler way?"
j) Asks critical question on scientific method
k) Presents hypothetical situation
l) Reads a question pertaining to the explanation of a result of experimentation
m) Discusses the traits of a scientist
n) Asks how problem was solved
o) Asks: "What about that? Could that happen?"
p) Asks sequence of specific questions that forces correct conclusion
q) Asks for the possible results of a problem
r) Asks for elaboration or extension of content from the known
s) Asks: "How do you know?"
t) Asks students what they think about given content, data, statements; asks question requiring judgment, evaluation
u) Asks students to think of exceptions
v) Makes a statement for student evaluation
w) Asks students why they took a particular position
x) Asks a question requiring inference(s) from present or previous information
y) Asks deductive thought question
z) Asks inductive thought question
aa) Extends student question and relates it to lab to follow but does not answer question
bb) Presents problems or problem situations for students to think through
cc) Reads problem statements
dd) Participates in or involves students in gathering, processing, and analyzing
e) Aids students in making scientifically useful and accurate observations
ff) Aids students in working out problem-solving and experimentation skills
gg) Asks and discusses basis of meaning of terminology
hh) Asks questions requiring value judgments by students
4) Tentativeness of Knowledge
   a) Makes statement emphasizing incompleteness of knowledge in given area of content
   b) Makes statement regarding tentativeness of knowledge or notes tentativeness of scientific knowledge
   c) Makes explanation with phraseology which implies tentativeness of information

5) Generalizations
   a) Reviews content in general terms or asks review questions
   b) Uses generalizations to summarize
   c) Reviews sequence of previous study, classwork, content
   d) Refers to organization of the chapter under consideration
   e) Explains an entire process as the reverse of another in summary
   f) Poses a review problem requiring inferences
   g) Summarizes by asking a broad question
   h) Asks a mathematical summary question

6) Articulation of Content
   a) Cites economic example in illustrating a principle
   b) Asks economic question
c) Introduces new topic as pertaining to the use of previous information
d) Relates content of lab work to paperwork already done
e) Relates one area of content in biology to another area of content in biology
f) Calls attention to a previous discussion, previous work, or previous information
g) Asks a background information question
h) Poses problem requiring use of previous information
i) Refers to previous experiences and knowledge of students
j) Relates content to earlier questions or considerations
k) States plans for tomorrow

7) Facilitates Communication
   a) Motions to student with hand(s) after asking question
   b) Motions to chalkboard, overhead projector screen, models, specimens, charts, or other aids
c) Asks student(s) to speak loudly
d) Recognizes student intent to make contribution or ask question (points to student, nods, says "yes", calls student by name, etc.)
e) Writes or records student answer on chalkboard or overhead projector
f) Repeats or confirms student statement
g) Asks: "Does that answer your question?"
h) Points out differences in questions asked
i) Repeats, rereads, restates teacher or student question, answer, problem or statement
j) Makes hand motions for emphasis
k) Makes statement emphatically (raises voice, motions with hands)
l) Gives pronunciations of terms
m) Asks for answers to questions
n) Clarifies the framework of a question
o) Articulates sources of communication

6. Affectivity

a. Positive Affectivity

1) Smiles at correct answer
2) Smiles while listening to student contribution
3) Smiles approval at student action
4) Writes honor roll students on board and calls attention to them
5) Nods head in the affirmative
6) Uses hands to draw out responses
7) Pats student
8) Reassures student(s)
9) Thanks student for correction or correct answer
10) Makes obvious use of a kind voice
11) Speaks as if he were very interested in the topic
12) Thanks student for his contribution
13) Points out the value of a student's contribution
14) Gives credit to student concerning his actions
15) Responds in a kind tone of voice to incorrect answer and gives a second chance
16) Recognizes skill of a student in certain areas
17) States or asks (associated non-verbal behaviors are extremely important here):
   a) "That's a boy"
   b) "That's better"
   c) "Go ahead and out the fish" (encouragement)
   d) "This is pretty easy, isn't it?"
   e) "Nice to work with symbols, isn't it?"
   f) "Fine"
   g) "Good"
   h) "Keep it up...good"
   i) "Very good"

b. Negative Affectivity
   1) Admonishes student for not picking up a fish
   2) Uses sarcasm to motivate student action
   3) Makes a face at an incorrect answer
4) Jokes at the expense of the student(s)
5) Moves hands in a pushing-away-motion when incorrect response is given
6) Identifies student with poor technique
7) Uses a harsh tone of voice when correcting a student's response
8) Raises eyes and shakes head no
9) Ignores student comments and questions
10) Does not recognize student with his hands raised
11) Points out two students who disagree
12) Hits table with hand at incorrect student procedure
13) Gives a sarcastic answer to irrelevant question
14) Reveals skepticism about student(s) knowledge in general
15) Makes a sarcastic statement concerning student's ability, perfection and coordination
16) Frowns at student who has an accident
17) Remains expressionless at student reply
18) Shakes head in the negative and clicks tongue
19) Glares at student who answers incorrectly
20) Avoids eye contact while talking to or with students
21) Shakes head in disgust
22) States or asks (associated non-verbal behaviors are extremely important here):

a) "That's wrong"

b) "If you don't know this, you will be in trouble"

c) "You're doing the wrong assignment"

d) "That is a poor technique"

e) "You are just guessing, work on the problem"

f) "You don't need a slide"

g) "This will probably bore you but . . . ."

h) "First graders can figure this out"

i) "I don't believe you"

j) "NO"

k) "Either do this or not"

l) "Whew . . . finally got that one out" (wiped brow)

m) "Start over"

n) "You people aren't labeling properly"

o) "Who took the equipment?" (accuses students)

p) "Did you see? . . . NO, you couldn't"

q) "Forget it"

r) "Not yet"

s) "Y.O.U need a piece of paper"

t) "I give up"
APPENDIX B

DATA RECORD
<table>
<thead>
<tr>
<th>Verbal</th>
<th>Congruent</th>
<th>Non-verbal</th>
<th>Contradictory</th>
<th>Predominate</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
APPENDIX C

MASTER DATA RECORD
<table>
<thead>
<tr>
<th>Category</th>
<th>Verbal</th>
<th>Congruent</th>
<th>Non-verbal</th>
<th>Contradictory</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>1a</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1b</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1c</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5a1) a)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5a1) b)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5a1) c)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5a1) d)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5a1) e)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5a2) a)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5a2) b)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5a2) c)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5a2) d)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5a3) a)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5a3) b)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5a3) c)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5a3) d)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5a3) e)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5a4) a)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5a4) b)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5a4) c)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5a4) d)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5a4) e)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5a5) a)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5a5) b)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5a5) c)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5a5) d)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5a5) e)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5a6) a)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>---------</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td></td>
</tr>
<tr>
<td>5a6) b)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5a6) c)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5a6) d)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5a6) e)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5a7) a)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5a7) b)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5a7) c)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5a7) d)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5a7) e)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5b1) a)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5b1) b)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5b1) c)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5b1) d)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5b1) e)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5b2) a)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5b2) b)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5b2) c)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5b2) d)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5b2) e)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5b3) a)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5b3) b)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5b3) c)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5b3) d)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5b3) e)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5b4) a)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5b4) b)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5b4) c)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5b4) d)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5b4) e)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5b5) a)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5b5) b)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5b5) c)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5b5) d)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5b5) e)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5b6)a)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>--------</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5b6)b)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5b6)c)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5b6)d)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5b6)e)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5b7)a)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5b7)b)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5b7)c)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5b7)d)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5b7)e)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6a</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6b</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>TOTAL</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
APPENDIX D

A GENERAL DESCRIPTION OF REQUESTED RESEARCH

RESOURCES AND OPPORTUNITIES
A General Description of Requested Research Resources and Opportunities
addressed to
The Cincinnati, Ohio, Public Schools
by John S. Richardson

The need for improved teacher performance is perhaps more evident today than ever before. With the continuing emphasis on the role of science in our society and the reflected emphasis in the school classroom, we are facing continuing calls for more effective science teachers and for the evidence that teachers are actually more effective in their teaching activities than ever before.

Currently, there is evidence that the behaviors of science teachers can be related to their competence in its more specific aspects and to the overall quality of their teaching; furthermore, it can be related to the achievement of the pupils for whom they have responsibility. In fact, the behaviors of the teachers can be and have been directly related to the behaviors of the pupils as they study and learn.

However, such studies of interaction analysis are only in their beginning. While some few have been completed in the field of science education, many more will be needed before generalizations can become as trustworthy as our profession will require. One complexity
enters the teaching of science in a way that some fields do not face so directly, if at all. The dependence of science teaching upon the use of the laboratory and other experience approaches involves a dimension of teaching that will eventually require fairly complex research procedures. For example, the earlier studies in interaction analysis attempted to base the analysis on verbal behavior only. Currently the research efforts at The Ohio State University are attempting to include in part an analysis of non-verbal behavior as well as verbal behavior in the teaching of science.

At this point in our research, we are particularly concerned with studies, details of which will be presented by the investigators as their research designs are extended and realized in the general fields of biological science and physics in the secondary schools. At this point we have need of sequential recordings on video tape and a certain number of audio tapes, also, to the extent of a number in the range of five to ten separate recordings over a period of time for each of six or eight teachers in the above fields that would be developed in relation to the availability of the personnel and upon the class schedule. We do not anticipate at this time that any separate testing of the pupils would be involved, thus making no request for use of instructional time as part of the program.
APPENDIX E

OBSERVER AGREEMENT DATA RECORD
## OBSERVER AGREEMENT DATA RECORD

**Tape #:** ___________________  **Teacher:** ___________________

**Segment #:** ___________________  **Form of Expression:** ___________________

<table>
<thead>
<tr>
<th>I</th>
<th>II</th>
<th>III</th>
<th>IV</th>
<th>V</th>
<th>VI</th>
<th>VII</th>
</tr>
</thead>
<tbody>
<tr>
<td>Category</td>
<td>Obs. A</td>
<td>%</td>
<td>Obs. B</td>
<td>%</td>
<td>% Diff.</td>
<td>I*II</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

---

*Note: The table is empty and needs to be filled in with the observed data.*
BIBLIOGRAPHY


17. Bruce, M.H., and McLeod, R.J. "A Study to Identify Relationships Between Behavior Patterns and Personal Traits in Science Student Teachers." A Paper submitted to NARST, 1966. (Mimeographed)


