INFORMATION TO USERS

This material was produced from a microfilm copy of the original document. While the most advanced technological means to photograph and reproduce this document have been used, the quality is heavily dependent upon the quality of the original submitted.

The following explanation of techniques is provided to help you understand markings or patterns which may appear on this reproduction.

1. The sign or “target” for pages apparently lacking from the document photographed is “Missing Page(s)”. If it was possible to obtain the missing page(s) or section, they are spliced into the film along with adjacent pages. This may have necessitated cutting thru an image and duplicating adjacent pages to insure you complete continuity.

2. When an image on the film is obliterated with a large round black mark, it is an indication that the photographer suspected that the copy may have moved during exposure and thus cause a blurred image. You will find a good image of the page in the adjacent frame.

3. When a map, drawing or chart, etc., was part of the material being photographed the photographer followed a definite method in “sectioning” the material. It is customary to begin photoing at the upper left hand corner of a large sheet and to continue photoing from left to right in equal sections with a small overlap. If necessary, sectioning is continued again — beginning below the first row and continuing on until complete.

4. The majority of users indicate that the textual content is of greatest value, however, a somewhat higher quality reproduction could be made from “photographs” if essential to the understanding of the dissertation. Silver prints of “photographs” may be ordered at additional charge by writing the Order Department, giving the catalog number, title, author and specific pages you wish reproduced.

5. PLEASE NOTE: Some pages may have indistinct print. Filmed as received.
AL-BAHRI, Muna Younis, 1938-
A DESCRIPTIVE AND COMPARATIVE
ANALYSIS OF VERBAL INTERACTION
PATTERNS IN THE CLASSROOMS OF
SELECTED IRAQI MIDDLE SCHOOLS.

The Ohio State University,
Ph.D., 1977
Education, curriculum and instruction

University Microfilms International, Ann Arbor, Michigan 48106
A DESCRIPTIVE AND COMPARATIVE ANALYSIS OF VERBAL
INTERACTION PATTERNS IN THE CLASSROOMS OF
SELECTED IRAQI MIDDLE SCHOOLS

DISSERTATION

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

By

Muna Younis Al-Bahri, B.A., M.A.

***

The Ohio State University
1977

Reading Committee:
Prof. Elsie Albery
Prof. Paul Klohr
Prof. Jeanne Orr

Approved By

[Signature]
Adviser
School of Education

[Signature]
Adviser
School of Education
ACKNOWLEDGMENT

The author is honored to have had the privilege of studying with Professor Charles M. Galloway, one of the American experts on that which is left unsaid—nonverbal communication, during her Ph.D. program. Not only has his patient and astute guidance been intellectually stimulating and growth conducive, but his sensitivity to the needs of his students (both scholastic and personal) has provided support and encouragement. The author is proud to have had such an exceptional model to emulate during her stay at The Ohio State University, and in her career as a university instructor.

The author also would like to thank an old friend, Professor Jeane Orr, for her understanding and unlimited willingness to help during her study in the United States.

Deep appreciation is presented to professor Elsie Alberty and Professor Paul Klohr; their meaningful suggestions were most helpful.

The author is profoundly grateful to her husband, Hassan, and to her daughter, Hania, for their support and for their unfailing faith and encouragement.
VITA

February 10, 1938 . . . . Born—Baghdad, Iraq

1958-1959 . . . . . . B.A., Social Work, Baghdad University, Baghdad, Iraq

1961-1962 . . . . . . M.A., Education (Elementary), The Ohio State University

1962-1976 . . . . . . Instructor, Baghdad University (College of Education)

PUBLICATIONS


"The Efficiency of the College of Education," Baghdad University, Educational Research Center, Baghdad University, Baghdad, Iraq, 1975.

"National Assessment of Science Sections of the Secondary Schools in Iraq," (Dr. Herman Fernandis) a translation from English to Arabic. Educational Research Center, Baghdad, Iraq, 1975.

FIELDS OF STUDY

Major Field: Education

Curriculum and Foundations. Professor Charles M. Galloway
TABLE OF CONTENTS

ACKNOWLEDGMENT ............................................ ii
VITA ....................................................... iii
LIST OF TABLES ............................................ vi
LIST OF FIGURES ............................................ viii

Chapter

I  INTRODUCTION ............................................. 1
   The Problem of the Study ............................... 7
   The Significance of the Study ......................... 7
   The Objectives of the Study ........................... 9
   Definition of Terms ...................................... 10
   The Plan of the Study .................................... 12

II  REVIEW OF RELATED LITERATURE ......................... 13
   Factors Related to Science Teacher Effectiveness . 16
   Systems of Classroom Behavioral Analysis ............ 28
   Studies Related to the Application of Interaction  
      Analysis System Abroad ............................... 39
   Teachers Training Programs in Iraq .................... 46

III  THE METHOD AND PROCEDURES OF THE STUDY ......... 53
   The Methods of Recording and Decoding Data .......... 54
   The Sample of the Study ................................ 58
   Limitations of the Study ................................ 58
   The Statistical Methods of Data Analysis and  
      Checking Observer's Reliability ...................... 59
   Summary ................................................ 63
# TABLE OF CONTENTS—Continued

<table>
<thead>
<tr>
<th>Chapter</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>IV</td>
<td>71</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>PRESENTATION AND ANALYSIS OF DATA</td>
<td>71</td>
</tr>
<tr>
<td>The Verbal Behavior Patterns of Chemistry</td>
<td>73</td>
</tr>
<tr>
<td>Female Teachers</td>
<td>73</td>
</tr>
<tr>
<td>The Verbal Behavior Patterns of Chemistry</td>
<td>94</td>
</tr>
<tr>
<td>Male Teachers</td>
<td>94</td>
</tr>
<tr>
<td>A Comparison Between the Verbal Behavior of Chemistry Female Teachers and Chemistry Male Teachers</td>
<td>109</td>
</tr>
<tr>
<td>The Verbal Behavior Patterns of Physics</td>
<td>114</td>
</tr>
<tr>
<td>Female Teachers</td>
<td>114</td>
</tr>
<tr>
<td>The Verbal Behavior Patterns of Physics Male Teachers</td>
<td>129</td>
</tr>
<tr>
<td>A Comparison Between the Verbal Behavior of Physics Female Teachers and Physics Male Teachers</td>
<td>147</td>
</tr>
<tr>
<td>A Comparison Between the Verbal Behavior Patterns of Science Teachers of the First Observations with the Second Observations</td>
<td>152</td>
</tr>
<tr>
<td>Determining the Verbal Behavior Patterns of Chemistry and Physics Teachers According to Sex</td>
<td>155</td>
</tr>
<tr>
<td>A Comparison Between the Patterns of Verbal Behavior in the Classes of Science According to Subject Matter</td>
<td>165</td>
</tr>
<tr>
<td>Discussion of the Comparisons Between Chemistry and Physics Teachers According to Sex and Subjects</td>
<td>170</td>
</tr>
<tr>
<td>Summary</td>
<td>177</td>
</tr>
<tr>
<td>V</td>
<td>178</td>
</tr>
<tr>
<td>SUMMARY, CONCLUSIONS AND RECOMMENDATIONS</td>
<td>178</td>
</tr>
<tr>
<td>APPENDICES</td>
<td>186</td>
</tr>
<tr>
<td>BIBLIOGRAPHY</td>
<td>200</td>
</tr>
</tbody>
</table>
# LIST OF TABLES

<table>
<thead>
<tr>
<th>Table</th>
<th>Description</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Flanders Category System for Interaction Analysis</td>
<td>11</td>
</tr>
<tr>
<td>2</td>
<td>Anderson Categories for Coding Domination and Integration</td>
<td>30</td>
</tr>
<tr>
<td>3</td>
<td>Verbal Behavior Patterns in Chemistry Classes (Female Teachers)</td>
<td>90</td>
</tr>
<tr>
<td>4</td>
<td>Teachers Indirectness/Directness in Chemistry Classes (Female Teachers)</td>
<td>91</td>
</tr>
<tr>
<td>5</td>
<td>Verbal Behavior Patterns in Chemistry Classes (Male Teachers)</td>
<td>108</td>
</tr>
<tr>
<td>6</td>
<td>Teachers Indirectness/Directness in Chemistry Classes (Male Teachers)</td>
<td>110</td>
</tr>
<tr>
<td>7</td>
<td>Verbal Behavior Patterns in Chemistry Classes (A Comparison Between Female and Male Teachers)</td>
<td>111</td>
</tr>
<tr>
<td>8</td>
<td>Teachers Indirectness/Directness in Chemistry Classes (A Comparison Between Female and Male Teachers)</td>
<td>113</td>
</tr>
<tr>
<td>9</td>
<td>Verbal Behavior Patterns in Physics Classes (Female Teachers)</td>
<td>128</td>
</tr>
<tr>
<td>10</td>
<td>Teachers Indirectness/Directness in Physics Classes (Female Teachers)</td>
<td>131</td>
</tr>
<tr>
<td>11</td>
<td>Verbal Behavior Patterns in Physics Classes (Male Teachers)</td>
<td>144</td>
</tr>
<tr>
<td>12</td>
<td>Teachers Indirectness/Directness in Physics Classes (Male Teachers)</td>
<td>147</td>
</tr>
<tr>
<td>13</td>
<td>Verbal Behavior Patterns in Physics Classes (A Comparison Between Female and Male Teachers)</td>
<td>148</td>
</tr>
<tr>
<td>Table</td>
<td>Description</td>
<td>Page</td>
</tr>
<tr>
<td>-------</td>
<td>-----------------------------------------------------------------------------------------------</td>
<td>------</td>
</tr>
<tr>
<td>14</td>
<td>Teachers Indirectness/Directness in Physics Classes (A Comparison Between Female and Male Teachers)</td>
<td>150</td>
</tr>
<tr>
<td>15</td>
<td>Verbal Behavior Patterns in Physics and Chemistry Classes (A Comparison Between the First and the Second Observations)</td>
<td>152</td>
</tr>
<tr>
<td>16</td>
<td>Teachers Indirectness/Directness for Chemistry and Physics Classes (A Comparison Between the First and the Second Observations)</td>
<td>153</td>
</tr>
<tr>
<td>17</td>
<td>Verbal Behavior Patterns in Science Classes (A Comparison Between Female and Male Teachers)</td>
<td>156</td>
</tr>
<tr>
<td>18</td>
<td>Teachers Indirectness/Directness in Science Classes (A Comparison Between Female and Male Teachers)</td>
<td>159</td>
</tr>
<tr>
<td>19</td>
<td>Verbal Behavior Patterns in Science Classes (A General Comparison Between Female and Male Teachers)</td>
<td>164</td>
</tr>
<tr>
<td>20</td>
<td>Teachers Indirectness/Directness in Science Classes (A General Comparison Between Chemistry and Physics Teachers)</td>
<td>165</td>
</tr>
<tr>
<td>21</td>
<td>Verbal Behavior Patterns in Science Classes (A General Comparison Between Chemistry and Physics Teachers)</td>
<td>169</td>
</tr>
<tr>
<td>22</td>
<td>Teachers Indirectness/Directness in Science Classes (A Comparison Between Chemistry and Physics Teachers)</td>
<td>170</td>
</tr>
<tr>
<td>Figure</td>
<td>Description</td>
<td>Page</td>
</tr>
<tr>
<td>--------</td>
<td>----------------------------------------------------------</td>
<td>------</td>
</tr>
<tr>
<td>1</td>
<td>Withall's Classroom Climate Categories</td>
<td>33</td>
</tr>
<tr>
<td>2</td>
<td>Sample Matrix of Flanders Interaction Analysis System</td>
<td>55</td>
</tr>
<tr>
<td>3</td>
<td>Sample Matrix Showing Indirectness/Directness</td>
<td>64</td>
</tr>
<tr>
<td>4</td>
<td>Sample Matrix Showing Revised Indirectness/Directness</td>
<td>65</td>
</tr>
<tr>
<td>5</td>
<td>Sample Matrix Showing Student Talk/Teacher Talk</td>
<td>66</td>
</tr>
<tr>
<td>6</td>
<td>Sample Matrix Showing Extended Indirect Talk/Extended Direct Talk</td>
<td>67</td>
</tr>
<tr>
<td>7</td>
<td>Sample Matrix Showing Content Cross Area</td>
<td>68</td>
</tr>
<tr>
<td>8</td>
<td>Sample Matrix Showing Teacher Talk/Student Talk</td>
<td>69</td>
</tr>
</tbody>
</table>
CHAPTER I

INTRODUCTION

In Iraq in the last decade there has been an increasing emphasis on the improvement of Iraqi science teachers education. This emphasis is apparent in the growing enrollments in the science departments of Baghdad University's College of Education compared with the humanities departments (3, p. 94), the special programs for inservice science teachers and the annual conferences arranged by responsible authorities for discussing scientific affairs (49, p. 5). Abdul Aziz Al-Bassam (p. 3) indicates that the shortage of technically and scientifically well trained manpower were the basic factors which motivated people of concern to emphasize the importance of science education at the middle school level. They seem to realize that the educational process has the responsibility of helping the students to achieve specific educational objectives, among which are the development of their personalities and the improvement of their verbal behavior in addition to meeting their urgent needs of having an educational experiences and skills which are based squarely upon a realistic interpretation of the problems which are created by the science and technology of the changing world. They hope that such an approach could help in preparing students either for the continuation of their academic work or for their professional life.
A series of studies examined the various subjects taught in the different levels of schooling in Iraq was conducted by Al-Umar, Al-Bahri, and Fernandis H., between 1973-1975. All agreed on similar findings which indicate that more than 70% of what the students learn in schools is theoretical and based on recitation or memorization from textbooks. Student progress is not cumulative in any intellectual or practical sense (4)(5)(30). High school graduates cannot be described as adequately qualified for either attending the universities or the job markets. The percentages of their failure in the first two years of college are very high (3, p. 9). Also their lack of vocational training prevents job opportunities for work (31, p. 97). These findings do not differ much from those findings of Al-Hashimy (6, p. 51) thirty five years ago, who mentioned that the Iraqi society had experienced a tremendous change, yet the traditional methods of instruction which were followed by teachers for many generations were still, at his time, the master pieces of their daily work.

If Iraqi educators believe in education as a means to improve the quality of life for all individuals in the country, then plans for educational development must be based on dependable research.

Studying actual classroom practices would be of great use in providing a picture of the tools that are needed to reach a desirable state of development; plus the patterns of verbal interaction between the teacher and the students. More specifically, studying the introductory courses of chemistry and physics in which students are exposed for the first time to such subjects would reflect patterns of teacher-student
behaviors. From the results of such studies educators could build up new instructional strategies that could meet the demands of the modern society in a most efficient manner that could increase the effectiveness of the educated manpower.

In the United States there is a great deal of application and experimentation in areas such as television, computer, teaching machines and recordings, as a means for instructional improvement that are designed to make learning more effective and to bring about better learner and staff utilization. Also there are many new educational approaches in teachers preparation programs: programmed instruction, micro-teaching, nonverbal interaction, and verbal interaction.

An analysis of verbal interaction in the classroom is the title of the present investigation. It can be assumed that most of the middle school Iraqi teachers are of the traditional type that do not help students to learn through their classroom verbal activities. Teachers fail to motivate students in a way that interests them or involves them in classroom discussion. They are not much concerned with the feelings of their students. They do not give them opportunities to participate in classroom discussion. Students do not receive the needed encouragement to lead some of the classroom verbal activities or to exchange ideas with each other. Teachers practice a wide range of disciplinary activities in the classroom without considering the possibility of having the student discipline himself. They do not give enough appraisals to the students to encourage their learning through evaluation.

Verbal interaction analysis is a technique that was mainly designed to help teachers to overcome their traditional shortcomings in
teaching. It is also helpful to supervisors, student teachers, college instructors, and other educators who are directly concerned with the teaching-learning process and who want to improve the role of the teacher in the classroom.

Many educators recognize the importance of talk in teaching, and many consider teaching to be an interactive process. According to Flanders,

The chances are better than 60 percent that you will hear some one talking if you are in an elementary or secondary classroom. (33, p. 1)

Meux and Smith write, "Teaching behavior is primarily verbal," (51, p. 1). A committee of the American Educational Research Association calls teaching a "form of interpersonal influence aimed at changing the verbal behavior potential of another person (43, p. 91).

Stolurow and Pahel state that;

Teaching is fundamentally a social process involving communication and interaction between at least two people, a teacher and a student. It is a kind of dialectic in which both serve as teacher and student at different times and at different levels. A teacher is not only instructing a student, but also is learning about that student, and using what he learns in making decisions about what to do next in the course of his teaching. Similarly, the student is not only learning but he is providing information to the teacher, which in turn, guides the teacher in the ongoing interaction. (65, p. 2).

This statement makes clear that through the process of interaction the teachers become capable of understanding the social, emotional, economical, academic backgrounds of students. In doing so they might become more helpful in serving as counselors for them.

Frymier believes that

All that affects human behavior should be of interest to teacher. The better we know man, the better our educational designs will serve him (41, p. 6).
When teachers practice a specific technique in their interaction with student they can play more effective roles in motivating them positively toward their studies. The responsibility of every teacher is to help the students to learn. But helping them learn means helping them learn;

to value learning, to want to learn, how to learn, to value knowledge, to acquire knowledge, to understand knowledge and to behave according to knowledge (41, p. 15).

The success of teachers in motivating their students is very important because motivation gives direction and intensity to student's behavior. It significantly affects their abilities and their achievement.

The instructional methods of teachers have positive effects as well as negative effects on students behavior. Positive effects provide students with a sense of worth, feeling of acceptance, positive concept of other persons, a variety of points of view. Negative effects create excessive anxiety or fear, jumping to conclusions, dislike of authority, and limited sources of information. Teachers patterns of classroom verbal interaction, when positive, are likely to create the following behaviors: attentive listening, question asking for information, arguing fine points in discussion, insisting that contrary views be presented.

But behavioral patterns when negative are likely to create the following results: being quiet but not hearing, inattentiveness, disruptive talk during discussion, telling teacher off (41, p. 27). The influences of those patterns of behavior might leave its negative marks on the students lives for a long time. They might be reflected in the
following examples; going to movies instead of doing homework, doing homework just to get teacher's approval, copying from seatmate during examinations, dropping out of school, daydreaming, giving up during a test, reluctance to ask questions when in doubt (41, p. 27).

Interaction analysis is a technique for capturing quantitative and qualitative dimensions of teacher behavior in the classroom, but as an observational system, it clearly does not measure all that occurs. It views the dynamics of the classroom through a particular lens. It captures the verbal behavior of teachers and students that are directly related to the social-emotional climate of the classroom. The Flanders System of Interaction Analysis which is being used in this study has ten categories which cover the verbal behaviors of teacher-students. A description of these categories and how it was applied in this study for observing and recording classroom verbal interaction, is presented in Chapter III.

This study is concerned with the chemistry and physics classes in the second year of the middle schools of boys and girls in Iraq, because of the great importance of these subjects at this level of schooling. Interaction analysis will reflect how introductory courses are being taught for students and what kinds of teaching behavioral patterns occur.

This study is the first of its kind for determining the actual verbal behaviors of both teachers and students in middle school science classes in Iraq.
The Problem of the Study

The problem of this study was the determination of the observable verbal teacher-students interaction in the classrooms of chemistry and physics in selected Iraqi Middle Schools. The Flanders System for Interaction Analysis was used to describe and to determine the actual state of interaction in those classes. The problem of the study was concerned with answering the following questions:

1. What percentages of classroom time was spent in teacher talk, student talk, and silence and confusion?

2. What were the ratios of teacher response, teacher instantaneous response, teacher questions, and teacher instantaneous questions?

3. What ratio of classroom time was spent by students in initiative activities?

4. How quick was the teacher-student interchange of ideas as it is indicated by the steady state ratio and pupil steady state?

5. What was the ratio of indirect to direct teacher influence?

The Significance of the Study

The main responsibility of the classroom teacher is to guide the learning activities of students in order to help them change their behavior in a constructive manner. As he/she helps students to learn in the classroom situation, the teacher, as the leader, interacts with the students both as individuals and as a group. In the process of this interaction he influences the students, sometimes intentionally with planned behavior, sometimes consciously without planning, but often
without awareness of his behavior and the effect of this behavior on the learning process.

The teacher is continually influencing the students and the learning situation. But how much knowledge does he have about the methods of influence he is using? How much does he know about how students perceive his behavior? and how much control is he able to exert over his behavior in the classroom? By studying his own behavior in some systematic, objective manner, the teacher may gain further insight into his own pattern of influence. As he gains it, he may decide that he wants to change because he is not achieving what he thought he was achieving, or he is not achieving what he has now decided he wants to achieve on the basis of new insights about student learning. With accurate feedback data it becomes easier for the teacher to direct his instructional strategy that is based on a fuller understanding of a dependable interaction analysis system, thus helping students to achieve desirable educational objectives. Not only can classroom teachers benefit from a study like this, but student teachers, the "methods of instruction" teachers, supervisors, and other educators directly concerned with the teaching-learning process.

More specifically, this study is of great significance for the following reasons:

1. Describes some conditions and tools necessary for understanding and improving teacher behavior in the classroom. These descriptions can help the teacher to analyze and to modify his behavior in a positive direction.
2. Indicates to what extent the behavior of the students is influenced by the behavior of the teacher. Thus, it becomes possible to infer how student achievement, skills, and student behaviors are influenced by teacher behaviors in selected chemistry and physics classes.

3. Presents a new technique that is applied successfully in the programs of teacher preparation in the United States and in many other foreign countries. Since it was possible to apply this technique in analyzing the interaction of the sample under study, it will be possible to apply it to the state of instruction in many other Iraqi classes. Changes in the methods of teaching in Iraqi schools must always be considered, when necessary, in order to help students meet the demands of their changing society. It is through better human relationships in the classroom, and better methods of instruction, students can achieve to their fullest capabilities.

The Objectives of the Study

This study aims at investigating the following:

1. Analyzing the verbal interaction that occurred between the teacher and students in some selected middle schools in Baghdad. The sample covers some second year physics and chemistry classes of both boys and girls.

2. Determining the relationship that might exist between the interaction patterns of Iraqi classrooms and the interaction patterns in American classrooms as indicated by Flanders research.
3. Determining the relationships between the patterns of interaction in the chemistry classes with that of the physics classes in both the classes for boys and girls.

Definition of Terms

The social forces at work in the classroom are so complex that it looks on the surface as if any attempt to analyze them would be extremely difficult. The teacher's interaction with students which is a portion of the total social process, seems difficult to identify. Nevertheless, teacher-student contacts have been classified into specifically defined behavioral acts by researchers who have studied teacher behavior.

The Flanders system, which is the system of interaction analysis applied in this study, is concerned with verbal behavior only because it can be observed with higher reliability than can nonverbal behavior. The assumption is made in this study that the verbal behavior of an individual is an adequate sample of his total behavior (8, p. 6).

In the Flanders system of interaction analysis there are ten categories that cover three basic parts; teacher talk (1-7), student talk (8,9) silence or confusion (10). Table 1 introduces the definitions of these categories.
### TABLE 1

**FLANDERS CATEGORY SYSTEM FOR INTERACTION ANALYSIS (8, p. 14)**

<table>
<thead>
<tr>
<th>Teacher Talk</th>
<th>Indirect Influence</th>
<th>Direct Influence</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1. ACCEPTS FEELING: accepts and clarifies the feeling tone of the students in a nonthreatening manner. Feelings may be positive or negative. Predicting or recalling feelings are included.</td>
<td>2. PRAISES OR ENCOURAGES: praises or encourages student action or behavior. Jokes that release tension, not at the expense of another individual, nodding head.</td>
</tr>
<tr>
<td></td>
<td>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 play, shift to category five.</td>
<td>4. ASKS QUESTIONS: asking a question about content or procedure with the intent that a student answers.</td>
</tr>
<tr>
<td></td>
<td>5. LECTURING: giving facts or opinions about content or procedure expressing his own ideas, asking rhetorical questions.</td>
<td>6. GIVING DIRECTIONS: directions, commands, orders to which a student is expected to comply.</td>
</tr>
<tr>
<td></td>
<td>7. CRITICIZING OR JUSTIFYING AUTHORITY: statements intended to change student behavior from non acceptable to acceptable pattern, bawling some one out, stating why the teacher is doing what he is doing, extreme self reference.</td>
<td></td>
</tr>
<tr>
<td>Student Talk</td>
<td>8. STUDENT TALK-RESPONSE: talk by students in response to teacher. Teacher initiates the contact or solicits student statement.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>9. STUDENT TALK-INITIATION: talk by students which they initiate. If calling on student is only to indicate who may talk next, observer must decide whether student wanted to talk. If he did, use this category.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>10. SILENCE OR CONFUSION: pauses, short periods of silence and periods of confusion in which communication cannot be understood by the observer.</td>
<td></td>
</tr>
</tbody>
</table>
Middle Schools

It is meant by Middle Schools in this study, those Iraqi Schools that follow the elementary schools. The duration of study in these schools is three years. The ages of students in these schools are from 13-16 years old. This level of schooling ends with a final national examination that qualifies students to attend the preparatory schools. The second grades of the Iraqi Middle Schools equal the eighth grades of American Junior High Schools.

The Plan of the Study

The study included the following chapters:

I. Introduction

The Problem of the Study
The Significance of the Study
The Objectives of the Study
Definition of Terms
The Plan of the Study

II. Review of Literature

Factors related to science teacher effectiveness
Systems of Classroom behavioral analysis
Studies related to the application of interaction analysis systems abroad
Teachers training programs in Iraq

III. Method and Procedure

The method of coding and decoding data
The sample of the study
Limitations of the study
The Statistical Methods of data analysis and checking observer's reliability.

IV. Data Presentation and Discussion

V. Summary, Conclusions and Implications.
CHAPTER II

REVIEW OF LITERATURE

This present attempt to determine the verbal behavior interaction patterns between teacher and students and between students is in a direct sense an attempt to evaluate the effectiveness of the teacher. Thus, it is closely related to the large body of research on teacher competence.

In the United States, studies concerning the measurement and the prediction of teaching effectiveness are very popular. More than 10,000 published studies have researched this topic. In 1960, Gage noted that not only its literature is great in number, but even its bibliographies have become unmanageable (26, p. 12). In 1948, Barr introduced a good summary of 138 investigations. He found that the ways of reporting the effectiveness of teaching in the investigations reviewed were in terms of:

- the character and personality traits; qualities of the person
- the desired competencies, performances; ability to do
- the behavior controls; knowledge, generalized skills, attitudes, interests and ideas (15, p. 204).

In 1950, Domas and Tiedman in their annotated bibliography of books and articles judged to be pertinent to the subject of teacher competence, classified the literature of teacher competence in the
following categories:

1. Traits of teachers  
2. Students opinions and ratings of teachers  
3. Procedures and techniques used by teachers  
4. Pupil growth or student progress  
5. Personality type of teacher  
6. Combinations of two or more of the foregoing categories  

(25, pp. 8-9).

In 1954 Morsh and Wilder synthesized about 360 studies which attempted to identify the effective instructor (54, pp. 1-149). In 1960, Mitzel reviewed more than 1300 studies (52). In 1961 Ellena, Stevenson and Webb presented an extensive review concerning teaching effectiveness (27). But researchers were not quite satisfied with those summaries. They raised many questions in their search for a better orientation for the research of teaching effectiveness. In commenting on the devices used on data gathering in a large and representative sample of studies dealing with the measurement and prediction of the effectiveness of teaching, Barr makes the following statement:

The reliabilities of these various devices seem to be relatively high; their validities relatively unknown. The evidence is chiefly of a correlational character and must not be accepted at face value... the data are many times inconsistent. The inconsistencies are probably more appearant than real. With so many different samples, data gathering devices, criteria, and purposes, a large amount of consistency should not be expected (Barr, 1948, p. 216).

The criteria and the predictors to be used in the measurement of teacher competence present another crucial problem in research. Barr noted five major classifications of such variables:

1. Practice teaching marks or ratings  
2. In-service ratings  
3. College grades or scholarship
4. The consensus of persons competent to judge and in a position to observe
5. Measures of pupil growth and achievement (Barr 1948 p. 204).

Each of these variables may have its strengths and weaknesses, but the measures of pupil growth and achievement were most preferred by investigators interested in behavior. This is clear in the comment of Betts:

Perhaps the most direct method for evaluating the functional effectiveness of a teacher is to measure the changes wrought in pupils under her instruction (18, p. 87).

If the responsibility of the teacher is to change the behavior of the students, then the measurement of such change might provide a measurement of the teacher competence.

Unlike these criteria, the inservice ratings of the teacher and the opinions of experts as to teaching efficiency, both are measurements taken at a point that is many steps away from pupil behavior and pupil change is indications of learning. In addition, some extreme variations in the evaluations of experts might occur (22, p. 315). This point of view made the measurement of teachers competence more complicated. The review of the literature reveals many other agreements and disagreements concerning the measures of pupil growth and achievement. Cogan is like Betts in considering pupil change as the most suitable criterion of teacher competence (22, p. 316).

Domas (p. 4) notes that disagreements in research findings add difficulties for the use of this criterion.

In the reviews mentioned above, many investigators attempted to relate many other presage variables like teacher formative experiences, social class, sex, age, teacher training experiences, skills,
motivations in addition to intelligence and personality traits, as aspects of pupil growth (26, p. 38).

Obviously these early studies did not include direct observation and recording of teachers classroom behavior as a technique for indicating teaching effectiveness. Research of teacher competence needs objective measurements of the behavior of teacher in the classroom (26, p. 13). Since this need was felt by many investigators, Ackerman in 1954 (2, p. 286) indicated that observations in the classroom are very important tools for measuring teaching effectiveness because the way in which the traits of a teacher shows itself in the classroom is the first step in relating it to pupil change.

The rest of this chapter includes a section on the effectiveness of science teachers that relate in a direct way to this study; a section on the historical development of the technique of studying verbal behavior in the classroom; a section on the studies related to the application of interaction analysis systems in some countries of the world.

Factors Related to Science Teacher Effectiveness

In general, the review of literature on teaching effectiveness pointed out some causes that are responsible for creating difficulties in this area of study. One of them is the absence of consensus about learning situations that can help in producing the desired educational objectives and pupil change.

When investigating the area of science objectives in the middle schools, it is possible to find nearly full agreement on objectives.
And, although there are different subjects in science like physics, chemistry, biology and mathematics, their objectives are similar. The most concise statement of objectives for modern science teaching was that of Richardson, who hypothesized that the teacher of science should teach in a manner that his students will:

1. Develop the ability to think critically, to use the method of science effectively.
2. Acquire the principles, concepts, facts and appreciations through which they can better understand and appreciate the nature of earth, its inhabitants and the universe.
3. Use wisely and effectively the natural resources of our earth as well as the products of science and technology.
4. Understand the social functions of science and think and act in relation to the implications of science and technology for society.
5. Develop understandings that will contribute positively to their physical and mental health and their recreational interest.
6. Acquire information, understanding, and appreciations that will contribute to their educational and vocational guidance (59, p. 8-9).

Other lists of more specific objectives made by other authors agree with those of Richardson. Burnett (21) stated objectives and content which reflected a high degree of agreement with Richardson. Lists of competency areas based on such readings could become a basis for researching the competencies desired in the effective science teacher (28, p. 39). Areas such as skill in handling student questions, develop the ability of the student to think critically, to use the method of science effectively, have a bearing on the present investigation.

The review of the literature indicated also some agreement among educators on the factors that are related to effective situations of learning in science learning of middle schools.
Davis (24, p. 204) employed a list of seventeen factors that are related to the effectiveness of science teachers. He constructed the list from a study of the literature. He identified and judged the effectiveness of a population of forty teachers of science who work in Ohio against the list. The only facet of his study which was appropriate to this study was list of factors of the effectiveness of science teachers:

1. Effective learning is more likely to occur when the teacher has a functional knowledge of how children develop and how learning takes place.

2. Effective learning is more likely to occur if the teacher knows about, understands, and uses a variety of methods of instruction as opposed to the exclusive use of one or two methods.

3. Learning will proceed more effectively when the teacher has established rapport with the learners belief that the teacher is well informed.

4. Learning will be likely to be more effective when considerable attention is given to problem solving, development of social thinking and scientific attitudes.

For the purpose of determining in a more specific way the factors which relate the effectiveness of learning situations, he introduced his list to the Members of the National Association of Research in Science Teaching, Members of the National Science Teacher Association, The National Association of Secondary School Administrators. He found they all have a general agreement of these items:

1. Effective learning is more likely to occur if the teacher knows about, understands, and uses a variety of methods of instruction as opposed to the exclusive use of one or two methods.

2. Learning will proceed more effectively when the teacher has established with learners and when learners believe that the teacher is well informed and effective.
3. Learning will likely to be more effective when considerable attention is given to problem solving, development of critical thinking and scientific attitudes.

Then he made contacts with school officials to obtain information about the effectiveness of teachers, he concluded:

for item 1 - when the teacher marked excellent in the rest of the seventeen items he also was ranked excellent in this item.

for item 2 - the same was true.

for item 3 - five of the excellent teachers were rated excellent, and ten of the eleven poor teachers were rated poor.

In 1962 Spore (63, pp. 319-334) investigated the competencies of science teachers in secondary schools. He studied the literature and developed sixty competencies to fit six roles; the director of learning, the counselor and guidance worker, the mediator of the culture, link with the community, member of the staff of the school and member of the profession. Four groups of judges used a five point scale to rate the competence as to the emphasis each should receive in preservice and in service programs of teachers education. The judges in the four groups were; foundation educators, science educators, science teachers and school administrators. The general findings indicated that the judges in the four groups perceived the role of the science teachers almost in the same way, with few differences in particular items. He reported there was perfect agreement among the judges concerning the role, member of the school staff. By rank order there was good agreement in the roles of a member of the profession, mediator of the culture, director of learning, and counselor and guidance worker. The greatest difference in rank orders appeared in the role link with the community.
Farmer (28) also investigated the image of the competent secondary school teacher as seen by selected groups which exert influence on the secondary school science education: a group of 324 science teachers, a group of 46 school administrators, a group of 25 science educators, a group of 32 secondary school science supervisors, a group of 50 college science teachers, a group of 24 industrial research scientists, a group of 42 members of the new curricula committees. He sent to each group a questionnaire of 16 areas of competency of the science teacher to rate each item in accordance to importance—major, moderate, none (28, pp. 43-46). When concluding his findings, it should be noted that even the lowest rated area was found to be above the level of importance designed as moderate. The conclusions regarding each competency area came in the following order according to its importance:

1. Effective use of laboratory work. It should be used to teach the methods by which scientists have solved problems and to help students learn to identify problems and solve them empirically.

2. Skillful handling of students questions. The teacher needs the ability to help students learn to analyze their own questions into components which can be answered by laboratory work whenever this is appropriate but he can not neglect developing his skill in accurately answering questions on a level understandable to the student.

3. Skill in conducting classroom discussions to stimulate students to evaluate critically and understand material more fully.

4. The use of content in planning lessons.

5. The control of the needed amount and kind of depth of knowledge in one science field that will enable him to challenge students to think in terms of the frontier problems and to teach in such a way that students acquire depth of knowledge in that field.
6. Breadth of knowledge of content within one science are to challenge students to study and appreciate some of the frontiers of that area and teach for breadth of students knowledge within that area of science.

7. Effective use of demonstrations to create problematic situations for student study and experimentation, and to illustrate how scientists have attacked and solved problems.

8. The ability to sense problems which merit investigation, to raise questions in the minds of students which will lead them to make sound judgments on their own to help them exploring it profitable.

9. Breadth of content knowledge over several fields of science to help students understand inter relationships of the science fields, and to select content most appropriate for teaching situation.

10. Skill in test construction, choice of standardized test and interpretation to test results in order to measure growth in attitudes formation and skill in problem solving as well as ability to use information, and to measure students understanding of major generalizations and concepts.

11. The use of resources that provide maximum experience with the experimental nature of science for each student and to help students learn to locate and use many kinds of resources to solve problems.

12. To understand testing and evaluation procedures in order to plan and carry out a testing program utilizing any devices he deems appropriate including the construction, administration and interpretation of his own tests.

13. To be able to select reading materials for student use primarily so that they can use this ability to provide a wide variety of reading materials as reference sources for use on an equal basis with the textbooks.

14. To make effective use of audio visual aids in order to provide second hand experiences where first hand experiences are not possible in the classroom.

15. To organize groups of students within classes for instructional purposes so that each student may progress at his own rate with permitting high ability students to progress more rapidly than the rest of the class.

16. Breadth of knowledge over several fields of learning so he can promote students understanding of the social implications of science and clarify student understanding of the inter relationship of science, mathematics and engineering.
For the purpose of examining critically the differences and similarities between Spore's study and Farmer's study, the list of the highest ranked competences of Spore are stated below.

The competent science teacher should have the ability to:

- Appreciate the social implications of the teaching profession and adhere to a code of ethics.
- Take professional growth as a personal responsibility
- Guide students in effective discussion, securing participation and critical thinking.
- Apply the psychological principles of learning to the teaching of science.
- Speaks logically and clearly.
- Be alert to the latest scientific developments, continuously revising lesson plans and materials to keep classroom experiences up to date.
- Guide students to sources of data and experimentation useful in the solution of their problems.
- Make the teaching of science consistent with a well thought out and stated philosophy of education.
- Bring students to see that natural laws, principles, and scientific theories have high worth, while superstitions, hunches and guesses are inferior ideas.
- Help the student think through his achievements so that he may come to realize his abilities as well as to be aware of his limitations.
- Recognize those community resources which are available for information.
- Develop an adequate science curriculum that will meet the needs of the local community.
- See the necessity for recognizing and providing for differences in native endowment, interest and need.
- Develop in students the ability to recognize the basis of authoritative information.
- Guide students to discover and structure problems so that they may be analyzed and attacked by logical means.

- Develop in students a critical understanding of differences in conceptions of truth and methods of formal inquiry.

- Work cooperatively in planning general education and administrative objectives to improve the overall school program.

- Make use of current materials as sources of information in the classroom.

- Lead students to recognize the universality of the cause and effect relationships

- Recognize and encourage promising students to enter a career of science.

- Lead students to recognize and use good conservation practices by developing proper attitudes.

- Work effectively as a member of science teacher organization.

- Select course content that will help in developing an understanding of the broad significance of specific field of subject matter.

- Define classroom objectives and use the cooperative help of students in their formulation.

- See the task of teaching science as one of method rather than one of indoctrination.

- Guide students who plan to become research or applied scientists to gain through a liberal education the techniques needed to be effective citizens.

- Establish techniques of correlating science with other areas of learning.

- Use the broad implication of subject matter in its application to community problems.

- Teach appreciation for scientific research and its role in the past development and present improvement of society.

- Construct measuring instruments and tests that will effectively indicate group as well as individual progress.
Speaking specifically, there are some competency areas which relate more closely to this study.

The competent science teacher in the secondary school must:

a. Be skillful in handling the questions of the students. He needs the ability to help students learn to analyze their own questions into components which can be answered by laboratory work whenever this is appropriate but he cannot neglect developing his skill in accurately answering questions on a level understandable to the students.

b. Be skillful in conducting class discussion to stimulate students to evaluate critically and understand material more fully, and to emphasize the need for further study of a topic and to uncover profitable ways to pursue such study.

These areas were ranked as 2 and 3 in importance, thus the verbal skills of the science teacher were almost the most important skills needed to judge the teacher as competent. In spite of the differences between the areas of competencies developed by Farmer and Spore, they are alike in emphasizing the importance of the verbal skills which a competent science teacher needs. These skills were ranked very highly in the areas of teacher competencies. Schlessinger (61) emphasized such skills in his statements regarding teacher competence.

Investigators attempted to determine in what traits the effective and the ineffective secondary school teachers are different. They used different measurements for determining different traits.

Barr, one of the most active investigators of teaching effectiveness conducted a pioneer study in 1929. His subjects were the social sciences teachers. Among the minimum essentials of teaching success that are applicable to science teaching are the teacher's classroom behavior; ability to use effective methods of appraising the
work of the pupils, ability not to create disciplinary difficulties, ability to use appreciative attitude, evidenced by the teacher comments, skill in asking questions, have a wealth of commentarial statements, have definite directions for study, ability to stimulate interest (14).

Ryans (60) one of the investigators who attempted to make use of systematic observations of the classroom performance of effective and ineffective teachers in order to generalize their acts into categories of a broad nature, in his extensive study he concluded that the classroom behaviors observed fell into three patterns:

1. understanding, friendly teacher behavior vs. aloof egocentric behavior.

2. systematic, responsible, businesslike behavior vs. evading, unplanned, slipshod behavior

3. stimulating, imaginative behavior vs. routine, dull behavior.

Obviously these patterns can be applied for determining the observable behaviors of science teachers in the secondary schools.

In 1964, Tubbs (67) made a comparison between the traits of 53 most effective teachers of science with 43 least effective teachers of science from a sample of 404 science teachers from secondary schools of many states in America. Teachers were rated on an effective scale by their principals, colleagues and their classes. The effective teachers differed from the ineffective teachers in the following traits:

- They were judged by their principals and colleagues to be more extroverted and more persistent and to exercise more leadership.
- They made higher grades in student teaching, and in their undergraduate science courses.
- They had more years of experience
More came from urban or rural backgrounds than from a suburban background.

They held more positions of leadership in churches and synagogues (67, p. 60).

Howe (45) investigated selected factors of 55 biology teachers as they related to 5 learning outcomes in this area of education. The factors were:

- Gain in knowledge and understanding of biological facts, concepts and principles.
- Gain in skill in applying the methods of science.
- Improvement in critical thinking skills.
- Development of an understanding of the nature of science, and
- Development of more favorable attitudes toward science and scientific careers.

Among the findings that have bearing to this study are:

1. High rating of teacher-pupil relationship was related to positive gains in students understanding of the nature of science.

2. High ratings of teachers personal adjustment was related to positive gains in students understanding of the nature of science.

3. Composite success was positively related to favorable teacher attitudes toward science and to high rating of the relationships between the teacher and the pupil, and high rating of teacher personal adjustment (45, 153-168).

In his paper Cogan (22) sets forth the general background and the theoretical framework of an exploratory study in teaching learning processes. The relationship between specific classroom behaviors of teachers and the productive behaviors of their pupils were investigated. He collected the data from administrators, teachers and 987 pupils in the eighth grade in 5 junior high schools in 2 New England communities.
All the schools offer departmentalized instruction. The sample included 18 teachers of English, 11 teachers of Arithmetic and 4 of science. The data secured from the pupil survey were analyzed from two different points of view. Perception Analysis is the first one. It examined the relationships between the pupil perception of the behavior of his teacher and the load of work which the pupil reported. The general findings of this first analysis were:

1. The instrument provided items by which the pupil could make consistent differentiations between the behavior of different teachers.

2. There is strong evidence to show that in the pupils perceptions the teachers conductive and inclusive behaviors are each positively related to the pupils scores in required work and in self initiated work.

3. There is only inconclusive evidence that within the framework of the pupils perceptions of the teacher preclusive behaviors are negatively related to the pupils scores on required and self initiated work.

The second analysis, "trait analysis," attempted to determine the differences in traits among teachers on the scales of the survey; and to find whether these traits can be characterized in terms of the observations of the pupil and if it relates to the average scores of the productivity of the pupil. Among the findings of this second analysis:

1. The analysis furnished reliable measurements of the traits of teachers and of the productivity of the pupil.

2. The pupils reported different levels of the three kinds of teacher behavior and different amounts of required and self initiated work for different teachers.

3. The trait of inclusiveness, for all teachers and for the teachers in each community, is positively related to average required work scores and to average self initiated work scores. The trait of avoidance teacher behaviors had no significant relationship with self initiated or required work. This was particularly true for the teachers of science.
Dunkin and Biddle (26) trace the historical development of interaction analysis (IA) and its underlying theory through the work of Anderson, Lewin, Lippitt and White, Withall, Cogan, Bales, Strodtbeck, Haugh, and Flanders.

H. H. Anderson from 1939 through 1946 conducted and discussed a series of systematic studies concerning the effects of teacher behavior upon pupil behavior. His pioneer work originated the notion of social emotional climate. His studies were influenced by the psychological principle that the child's learning is influenced by the decisions of the teacher concerning when and how to handle classroom activities (26, p. 97).

He transformed this principle into concrete terms by making an identification and quantification for behavioral phenomena, upon which Flanders depended in clarifying how the indirect behavior of the teacher correlates positively with the achievement of the child.

His work can be divided into three stages;

1. The stage in which he observed the contacts between preschool children. He showed that it was possible to measure children's behavior by a reliable instrument. He recorded the behavior as "contacts" that are of two categories; "domination" in which the child uses commands, force, ignoring others rights, rigidity in adapting to others, resisting differences in action or opinion; and "integration" in which the child increases the interplay of differences, permits others to choose and express themselves (13, p. 12).

2. The stage in which he observed the contacts of teachers with children. He studied dominative and integrative teachers and students behaviors. He considered a dominative person as the one who is rigid, deterministic, who neglects the desires and the judgment of others. The dominative behaviors usually contains the application of force, threats, blame, shame.

They are techniques of autocracy or dictatorship. They do not permit the growth process in the individual. They are against the
scientific attitude and the open mind. In contrast, the integrative behaviors usually contain the use of energy in common purposes, reducing conflict, agreement and giving permissions, they are the behaviors of a flexible growing individual, who is willing to learn new meanings. This individual has a healthy social contact with others, that are built on his interest in them, on his attempts to understand them (10, p. 73). These behaviors are consistent with the scientific attitude and the open mind. They encourage growth of self and others since they make the most of differences.

3. The stage in which he developed a method of observing the teachers and the pupils behavior. The method was based on recording the behavior of the pupil in a simultaneous manner, one pupil at a time over a five minute period to record the dominative and the integrative contacts of the teacher with the observed child (12, pp. 34-36).

The two basic dimensions of domination and integration were expanded into a series of categories which showed the degree of conflict or harmony in each contact (11, table 2).

It is possible to summarize Anderson’s work in the following points;

1. Patterns of dominative and integrative behaviors of teachers were noticed to be spread in classrooms, and the pupils behavior is consistent with the kind of behavior that the teachers show in the classroom.

2. When a teacher practices a certain style of behavior, the influence of his behavior will continue even when he is out of the room.

3. Students of the dominative teachers were more easily turned away from school duties and showed rejection of their teacher's behavior. But student of the integrative teachers were more initiative in their work; and more willing for voluntary social contributions and more interested in solving problems (11)(12)(13).

4. An objective index by which teachers could be compared, can define operationally in more moderate terms the domination and the integration, (Table 2).
### TABLE 2

**ANDERSON CATEGORIES FOR CODING DOMINATION AND INTEGRATION**
*(ADAPTED FROM ANDERSON AND BREWER, 1945) (11)*

<table>
<thead>
<tr>
<th><strong>A. Domination</strong></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Determined a detail of acts for the child in carrying out a detail.</td>
<td></td>
</tr>
<tr>
<td>2. Direct refusal.</td>
<td></td>
</tr>
<tr>
<td>3. Relocating, repeating, or placing children in different relations to each other or to property.</td>
<td></td>
</tr>
<tr>
<td>4. Postponing, slowing up the child.</td>
<td></td>
</tr>
<tr>
<td>5. Disapproval, blame or obstruction.</td>
<td></td>
</tr>
<tr>
<td>6. Warning, threats, or conditional promises.</td>
<td></td>
</tr>
<tr>
<td>7. Calls to attention or group activity.</td>
<td></td>
</tr>
<tr>
<td>8. Rations material.</td>
<td></td>
</tr>
<tr>
<td>9. Lecture method (defining a problem or anticipating a question).</td>
<td></td>
</tr>
<tr>
<td>10. Questions; lecture method (one-answer questions) recitation.</td>
<td></td>
</tr>
<tr>
<td>11. Perfunctory questions as statements (indifference).</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>B. Integration</strong></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Approval.</td>
<td></td>
</tr>
<tr>
<td>2. Accepts differences.</td>
<td></td>
</tr>
<tr>
<td>3. Extends invitations to activity.</td>
<td></td>
</tr>
<tr>
<td>4. Questions or statement regarding child's expressed interest or activity.</td>
<td></td>
</tr>
<tr>
<td>5. Builds up (helps child to better definition or solution without giving final answer).</td>
<td></td>
</tr>
</tbody>
</table>
Lewin, Lippitt and White in their famous autocracy-democracy study at the University of Iowa in 1939, researched the influences of autocratic (authoritarian), democratic, and laissez-faire (permissive) styles of leadership behavior on groups of boys engaging in club activities. The three styles of leadership were put under experimentation. (20 p. 131).

Their findings reveal that submission or rebellion was the result of autocracy. In the presence of autocratic leader the productivity of boys was high, but in his absence the aggression and destructiveness of boys were high. A general interpretation of their data on aggression can be made in terms of the following factors: tension, restricted space of free movement, rigidity of group structure and style of living (6, p. 98).

Also, they found that task orientation, cooperation, friendship, independence, initiation and ability to effectively overcome frustration were the results of democratic leadership.

Laissez-faire style of leadership was least conducive to productivity, which was higher in the leader's absence, in addition to the intergroup hostility. The democratic style of leadership was preferred by boys nearly in all cases.

In sum, they indicated that students may be happier and feel more positive toward teachers and other group members in a setting in which the adult behaves essentially as one of the group and in which decisions are made by group discussion, but they may produce more when asked and directed by their leader. Also, specific learning tasks may
be handled effectively by introducing little direction to the students and by obliging them to take the responsibility of organizing the situation (20, p. 132).

Recent research testing the Lewin thesis in the situations of the classroom indicated that the productivity of the students is not always greater, or as great in democratic or "student centered" classes, and many students feel dissatisfied or anxious in such settings.

In general, the findings of Lewin, Lippitt and White supported those of Anderson. They confirmed the findings that autocratic leadership tends to elicit aggressive rebellion against the leader or apathetic submission toward him.

Building on these previous studies, Whihall (68, p. 47), developed seven categories of teacher verbal behaviors as indicators of the climate in the classroom (Figure 1). The categories ranged from "learner-supportive" statements through "neutral" statements to "teacher self supporting" statements. He also put a "climate index" which represented the ratio of "learner-centered" to "teacher-centered" statements.

Withall concluded that (68) it is possible to describe and to evaluate the climate of the classroom in a relatively reliable way. Through a categorization of teacher statements, it is possible to have a valid measure of social-emotional climate of groups. He indicated that the learner-centered verbal behaviors tend to be reacted to with positive feelings and teacher centered verbal behaviors tend to be reacted to with negative feelings.
1. Learner-supportive statements that have the intent of reassuring or commending the pupil.

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

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

6. Reproving or depreacting 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 of course of action.

Figure 1: Withall's classroom climate categories. (From Sithall, 1949, p. 349) in (26, p. 99).
In spite of the fact that different terms were used by the mentioned above researchers, the underlying principle involved in classifying teacher behaviors as either autocratic or democratic (Lewin-Lippitt-White), dominative or integrative (Anderson), teacher-centered or learner-centered (Withall), appears to be the same. Also it is possible to make the following conclusions concerning their research;

a. The social-emotional climate of a classroom is determined by the teacher who is the most influential factor.

b. The verbal behaviors of teachers are highly significant in setting this climate.

c. A trained observer can categorize the verbal behaviors of teachers in a relatively valid and reliable way.

d. It is probable that the attitudes and achievement of pupils are influenced by the social-emotional climate of a classroom as determined by categorizing the verbal behaviors of teachers.

Setting forth the general background and the theoretical framework of an exploratory research in teaching-learning process, Cogan examined the relationship between the teacher's control and organization of the subject matter and their degree of warmth and encouragement. The two kinds of variables were found to be significantly related to performance of required work and frequency of self-initiated (non-assigned) projects (22, p. 317).

In 1949 Flanders conducted an experiment applying Withall's observational system. His purpose was to further relate Withall's learner-centered and teacher-centered description to the response of the pupil. He indicated that the pupils responded in a positive manner during the times of learner-centered style of activities. But they
responded in a negative manner during times of teacher-centered styles of behavior. The pupils in the second situation showed physical unrest, low ability to recall, anxiety and involuntary responses.

This experiment was followed by a series of studies which improved Withall's system into an instrument which records the interaction between the teacher and the pupil (Table 1).

Flanders used the terms "direct" (categories 5-6-7) and "indirect" (categories 1-2-3-4) as a vocabulary that defined the teacher and the pupil talk. These categories, when compared with those of Withall, they appear nearly identical, but Flanders added two categories for judging the verbal behavior of the pupil, "response" and "initiation", and another for "silence" and "confusion". So, he provided a mean for identifying, quantifying and relating the talk of the pupil for possible cause and effect relationships, with the talk of the teacher.

Flanders observational system is different from Withall's system. The system of Withall depended upon transcripts of the statements of teacher for the purpose of making a classification of their behavior, but the system of Flanders can be used to record the order of verbal events in the classroom. These events can be displayed in a matrix form which the frequencies and relationships of the different patterns of the teacher-pupil verbal behavior in the classroom can be seen.

Interaction analysis system was established by Flanders as a result of the research he conducted in schools of the United States and New Zealand between 1955-1957. In the two countries, pupil attitudes were found to be related to the patterns of behavior of their
teachers, and favorable attitudes relate positively to more use of indirect influences and negatively to more use of direct influences (33, p. 113).

The research of New Zealand introduced a matrix tabulation, so, Flanders was able to develop a system of recording the sequences of behaviors instead of only tallying them (33, p. 58). Also that research helped him to create a reliable research instrument that was of great use in studying the relationships between teachers' verbal behavior and pupil attitudes and achievement.

When Flanders returned to the United States, he established his famous system depending on his study (33, p. 109), which was financed by the United States Office of Education between 1958-1960. Its purpose was to find the relation between pupil achievement and its relation to teacher patterns. He used for his study the same seventh grade social studies teachers and classes and eighth grade mathematics teachers and classes, that were used for the New Zealand study. His findings were:

1. Students achievement was high in a classroom with a flexible pattern of teaching, and it was less in a classroom with restricted pattern of teaching.

2. The most purposeful and independent attitudes were noticed to be associated with the most indirect patterns of teacher behavior.

3. Students learning was retarded when the teaching pattern was direct, except when the objectives were clarified by the use of indirect methods.

4. The most indirect teachers received superior achievement scores in both social studies and mathematics classes.

In general it is founded that the indirect verbal behaviors increase the learning of the students more than the direct verbal behaviors.
Dunkin and Biddle (26, p. 32) in their review of literature on classroom climate concluded that;

Teachers in standard classrooms are reported to evidence considerable "directness" and to exhibit praise, acceptance, and criticism for small percentages of the time. Teachers who are "indirect" are associated with and probably induce pupils who initiate more. Indirectness; praise, acceptance, and criticism are all associated with teacher-personality instruments of one kind or another.

Amidon and Giammetteo (9, p. 164) studied the verbal behavior of superior teachers and found that superior teachers tend to use more indirect behavior (categories 1-3) and less direct behavior (categories 6 and 7) than average teachers. Also superior teachers use extended clarification and acceptance more than average teachers (cell 3-3). Silence and confusion periods are less in the classes of superior teachers when compared with average teachers (category 10). The classes of the superior teachers are alive; the students ask many questions and receive many answers when they ask questions, but the case is different in the average teachers classes who receive and answer less pupils questions (9-5). Flexibility is a character of a superior teacher (most of the cells are used).

These findings confirm the finding of Flanders in showing that teaching behaviors promote educational outcomes.

From the studies conducted by Flanders has evolved endless interest by many teacher educators all over the United States, in the possible positive influences of indirect teaching on student attitudes or social emotional climate.

Flanders in his book "Analyzing Teaching Behavior," summarized his research on social emotional climate together with sixteen other
studies that have applied his observation system in investigating the climate of the classroom (39, pp. 370-410). He found a consistent significant relation between the behavior of the teacher as computed by his system, and the social emotional climate of the classroom as measured by the scales of attitudes. Also, he found a significant relation between the behavior of the teacher, the attitudes of the pupils, and their achievement (39, p. 424).

Flanders observational system represents a most preferred instrument. This instrument has been modified by many researchers for their own purposes. Dunkin and Biddle mentioned that:

- Amidon and Hunter, in 1967, developed the Verbal Interaction Category System (VICS) by subscripting the original categories of Flanders in order to distinguish between narrow and broad teacher questions. Separations were also made within accepting and criticizing categories to allow for information about whether the behavior was accepted or denied.
- Hough in 1967 attempted to modify Flanders system by distinguishing between lecturing and answering pupils questions, between criticism and corrective feedback, and between pupil initiations.
- Simon and Boyer, in 1970 also attempted to make some modification in Flanders system (26, p. 103).

Many studies on teacher effectiveness were conducted before 1950, yet research on teaching has undergone considerable change in the last two decades. The present research focuses mostly on the process of teaching. Many researchers tend to observe the actual instances of instruction in the classroom instead of studying teachers qualities or training. Teachers and pupils are now being studied in interaction. Hundreds of studies have been published on investigations of systematic observation of classroom behavior. Many reviews of the literature on this subject have become almost annual events like Withall, 1960; Medley and Mitzes, 1963; Meux, 1967; Biddle, 1967; Nuthall, 1968, 1970;
Flanders and Simon, 1970; and Rosenshine, 1971. A recent publication for Simon and Boyer, 1970 reported 79 different systems for observing the classroom, nearly all of them developed in the last two decades (36, p. 17).

Recent research tends to reflect theory and to consider contextual effects. In spite of an increase in research, most efforts focused on activities rather than on effects of teaching because of the difficulties involved in providing valid information concerning the teacher effectiveness problem. Another reason for slowing down teacher effectiveness research is the development of a conceptual nature involving relationships between teaching and learning. Some current research is also handicapped by the desire to prove that one method of teaching is better than others. Other studies have made use of weak or confused observational tools, and most have collected data from only small samples of classrooms and teachers. But above all, contemporary research in the United States is underfinanced as Rosenshine and Frust in 1971 had commented (26, p. 16).

Current classroom research has already provided substantial knowledge concerning the process of teaching; concepts that apply to instruction and information concerning instructional processes.

Studies Related to the Application of Interaction Analysis Systems Abroad

One of the difficulties involved in the improvement of the programs of teachers education in Iraq is the belief that the educational techniques which are workable in a certain environment are not necessarily workable in another. The review of some literature on the
application of interaction analysis systems in some countries of the world, provide a strong evidence of its positive effects on teachers educational training and programs.

Withall (69, p. 5) reported some facets of Nigeria's education system, when he was associated for 18 months with the Comparative Education Study and Adaptation Center of the University of Lagos, which aimed at improving secondary schools curriculum and the inservice education for inspectors, principals and teachers to enable them to appreciate and use with success the new curricula practices that have been and are being developed by Nigerians. He had the opportunity to observe several secondary school teachers of science in Aitetoro. He trained one of the teachers to use the categories of his Climate Index, and on the basis of a 35 minute categorization of the teacher's verbalizations distributed themselves thus:

learner-oriented verbalizations;

<table>
<thead>
<tr>
<th>Category</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>category 1</td>
<td>21 verbalizations</td>
</tr>
<tr>
<td>category 2</td>
<td>nil</td>
</tr>
<tr>
<td>category 3</td>
<td>59</td>
</tr>
</tbody>
</table>

Total 80

teacher-oriented verbalizations;

<table>
<thead>
<tr>
<th>Category</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>category 5</td>
<td>28 verbalizations</td>
</tr>
<tr>
<td>category 6</td>
<td>nil</td>
</tr>
<tr>
<td>category 7</td>
<td>nil</td>
</tr>
</tbody>
</table>

Total 28

neutral statements--category 4 18 (not included in computing index)

\[
\frac{\text{total of learner-oriented verbalizations}}{\text{total of teacher-oriented verbalizations}} = 2.8
\]

An index greater than 1 indicates a climate in which effective learning problem-solving inquiry are measurably enhanced.
Among what Withall recommended for improving the Nigerian teachers education programs were the mounting of intensive in-service education programs in the areas of instructional methods for both secondary teachers and their principals and instructors and the offering of help to the faculty of the university to enable them to further improve their skills in instruction.

Janigara in 1971 (46, p. 68) reviewed research in classroom interaction analysis in India. He classified it into three categories;

1. Studies linking presage variables and teacher influence in the classrooms; Pareek and Rao found that "The main teacher talk category is that of lecturing and the main student talk category is that of responding to the teacher. This seems to be the general pattern in the influence behavior of the fifth grade teachers of Delhi schools. The high ratio of direct influence behavior to indirect behavior can be attributed to lecturing as the main activity by the teacher."

Buch and Santhanam, Taneja and Shah found similar results. Buch and Quraishi in their study of social sciences teachers found that teachers who had masters' degrees talked more than those with bachelor's degrees. Also they found that teachers who took social studies methods courses in their professional training talk as much as teachers who had no methods courses. Quraishi and Lulla found significant difference in the behavioral patterns of male and female teachers. Roy found the same result and added subjects as a source of variation.

The studies mentioned above are mostly replications of the studies conducted in other places. The coverage is still sketchy and the treatment of the data needs more improvement.
2. Studies linking teacher influence in the classroom and product variables:

The Flanders Interaction Analysis System was first used by Mehta in 1968, for helping teachers to create a climate of warmth and support in their classrooms as a part of his achievement motivation training project. His experiment resulted in positive effects. With Kanada in a follow up study he confirmed the findings of his first study. But the unavailability of standard tools for measuring achievement of the pupils and the dependence of the investigators on the grades of final examinations were an important limitations of the study. Desai, in a before-and-after experiment found 15% gain in pupils achievement after classroom behavior training of the teachers. But the study was inadequate in its methodology. Lulla conducted a well designed study to find out the relationship between the teacher influence and the achievement of the pupil she processed the data and computed the results.

3. Studies attempting modification of classroom behavior of teachers. Roy used a) feedback from the discrepancy data between desired behaviors and teachers self ratings; b) feedback from the discrepancy data between teachers self ratings and the opinions of pupils about the behavior of the teacher; c) feedback from the discrepancy data between teachers self rating and peers ratings and d) feedback from the discrepancy data between teachers self ratings and outside observer's ratings for changing the behavior of teachers. The Flanders system was used as an observation tool by the outside observer. It was found that feedback from discrepancy data between teachers self ratings
and the opinions of the pupils about the behavior of the teacher was more effective in changing the classroom behaviors of teachers than other treatments. It was also found that teachers self rating was more effective in changing classroom behavior of teachers than the teachers peer ratings. Also the study revealed that outside observer ratings were more effective than teachers peer rating but not as effective as teachers self rating and pupils opinion as a means of changing classroom behavior of teachers.

Wragg in 1971 (70, p. 17) mentioned that before 1966 there was almost no study of interaction in Britian. In 1969/70 he conducted an inquiry, sponsored by the Social Science Research Council into the teaching behavior of 102 graduate student teachers at Exeter University College of Education. A group of observers collected Flanders data from 600 lessons given by the 102 student teachers in 41 schools in the Southwest of England.

In comparing this data with that produced by Flanders in his book "Analyzing Classroom Behavior" it is possible to conclude the following:

The British student teachers have lower teacher question ratio (the British 21 but the Americans 26) than the figure presented by Flanders.

The British pupil initiation ratio (British 43 but the American 34) is higher.

The British immediate teacher response (British 50 but the American 60) is higher, but their content cross ratio is lower (the British 50 but the Americans 55).

The students in the sample also completed the Cattell 16 PF test, the Allport-vernon-Lindzey study of values (Richardson's British
form), the Torrance Tests of creative thinking (verbal test B) and the Alice Heim AH5 test of high grade intelligence. These scores, along with ratings of teaching effectiveness by supervising Tutor and teaching practice school were then analysed along with the classroom data. Among correlations between presage and process variables found to be significant at 1 per cent level were the following:

Cattell Factor A (warmth) and Flanders category 3 (r; .25) and teacher question ratio (r; .31)

Cattell Factor 1 (sensitive) and category 8 (r; .27) and % teacher talk (r; .37) and pupil steady state ratio (r; .32)

Cattell Factor 0 (insecure) and category 6 (r; .27)

Allport-Vernon-Lindzey Aesthetic value and category 1 (r; .25) and category 8 (r; .30) and category 9 (r; .25) and % teacher talk (r; .42)

Torrance Fluency score and category 3 (r; .27)

Alice Heim AH5 Intelligence Test and category 6 (r; = .26)

The comparison of the ratings of effectiveness and classroom data showed a negative correlation (r; = .27) between use of criticism and tutors rating, and a correlation of r; .25 between occurrence of category 8 and ratings by the teaching practice school.

A factor analysis of selection of the presage, process and product variable showed no very strong factors. Two of the mark factors produced were; I. An academic factor which loaded on use of lecture, use of praise, political values and class of degree (Bachelor degree), and II. A warm accepting factor which loaded on Cattell Factor A., acceptance of feelings and ideas, pupil talk and flexibility.
Analysis by type of school, age group, stage of teaching practice, sex of teacher, sex of class and subject being taught, showed interesting differences,

Wragg also used a twenty category extension of the Flanders system for use in foreign language lessons and showed that teachers tended to use largely a drilling technique with very little spontaneous talk by children (p. 20)

He also investigated the effect of feedback on reteach lessons in the micro-teaching situation. A 2×2 design was used to control feedback about the first lesson given by a group of student teachers. Analysis of both interaction analysis data and children's ratings showed that the group which received both video tape and Flanders data feedback showed the greatest changes in the re-teach lesson. They lectured less, elicited more spontaneous talk from the children and were rated significantly higher by them.

Activity is very noticeable in the areas of teacher education, primary school observation and science teaching. In spite of that, gaps in-service teacher training and certain secondary school curriculum areas, do exist in Britain (70, p. 19).

In Latin America, Searles (62, p. 9) described the characteristics of the verbal style of 42 teachers in Puerto Rico and Coasta Rica schools. He found that the teachers all predominantly use an expository mode of expression rather than examinatory; they present information instead of eliciting it from the students. The ratio of teacher talk to learners talk is high. The style is characterized by a high degree of substantive content in the verbal activity of the
teacher, since there is a small amount of students directive statements.
(The 12% in comparison with 20-25% in North American schools).

Searles ( p. 11) generalized that the flow of information in
the classes he observed was at a rate of one instructional unit about
every 30 seconds. That flow was even faster in the elementary grades.
Thus the student was asked to handle much information in a short time.
He stated that, "the reaction to this overload is generally apathetic
rather than rebellious and the learner drops out, either by sitting
patiently or by dropping out of school entirely into a culture that is
more amenable."

The review of the literature mentioned above indicates the state
interaction analysis research in some countries of the world. It makes
it clear that in spite of the deficiencies, the techniques of such
analysis has a noticeable effect in the improvement of teachers educa-
tion programs. Thus, the introduction of such techniques in the Iraqi
programs of teachers education would have a constructive effect on its
structure.

Teachers Training Programs in Iraq

In Iraq the programs of teachers training and preparation date
back to sixty years ago (3, p. 1), (7, p. 111). These programs are of
two kinds. The first, includes hte preparatory Institutes which are
from 1 to 2 years duration; that prepares the high school graduates
for teaching the different subject matters in the elementary schools.
The second, includes the colleges of education, which are of 4 years
duration; that prepare high school graduates for teaching the different subject matters in the middle and secondary schools.

The population explosion and the desire of more and more youths to attend those institutes and colleges, partially as a result of their pure theoretical preparation in the high schools (30, p. 97), and the demand of the society for teachers to teach in the increasing numbers of schools at the different levels of schooling, has brought about a real crisis in higher education. This crisis has not yet been adequately met by expanding present facilities, and as a result, and in spite of the high rate of failures, the output of those institutions and colleges is quantitative rather than qualitative. The programs of teachers are theoretical and traditional to an extent that cannot be expected to successfully meet the problems and demands of the changing occupation of teaching. Student teachers complain that the subjects which they study have little relation to what they might experience in their future profession. Their instructors believe that the standards of current students are far below the standards of student teachers ten or twenty years ago. The principals of elementary and secondary schools state that a large part of the difficulty is due to the fact that teachers are employed who do not know the nature of the teaching process; what to teach and how to teach in a way that facilitates desired pupil's behavioral changes. One look at the curriculum proves that it is, for the most part, subject centered, and is largely determined by adopted textbooks and fixed courses of study. Six weeks of the four year program for the training of high school teachers is devoted to student teaching and the rest is devoted to professional
courses. This seems to be a very small amount of time to which to acquire the attitudes, understanding and skills of teaching. Teachers are labeled educators if they have academic degrees. It does not seem necessary to have a professional degree from the colleges of education to be a teacher. The colleges of science and letters graduates also can become teachers, though they have not received a professional preparation.

There are scattered efforts for introducing technology into the curriculum. Television, teaching machines, and recordings are designed to make learning more effective. Modern courses like those in educational communication have not yet been introduced into those programs. The theoretical foundations of the process of learning and teaching which are related to the analysis of teaching behavior is nearly neglected. If one asks what is to be done to join those programs with both the reality of teaching and the reality of socioeconomic developments in the society? An answer might be found in the educational experiences of other countries.

In the United States the responsibility of meeting such a task is assigned to educators who prepare teachers. Those teachers are to understand the method of introducing knowledge to the learner in addition to their specialty in the content that they teach. Professional or instructors are not only accountable for the achievements of their students but also for their own development and professional growth.

In Iraq, much of what is learned in education courses is neither conceptualized, quantified, nor taught in a manner that joins theory and practice. Student teachers mostly know the teaching process as it
is introduced to them by their instructors. How is it possible to create, in the courses of education, an active, problem solving process, a true sense of inquiry, and a constant search for principles through experimentation? At least one factor favors change and that is the lack of solid evidence that anything that is being taught is clearly associated with any index of effective teaching, with the possible exception of practice teaching.

There are many factors that resist curriculum change in teacher education. Flanders states:

Perhaps the most important is that genuine curriculum innovation, to be distinguished from tinkering with content and sequence, would require that existing faculty members, old and new alike, think differently about their subject matter, act differently while teaching, and relate differently to their students (35, p. 283).

For many people this is not easy, yet changes take place when the teacher really desires to change. The area of human communication needs to be considered in the programs of teacher education, if the country expects to have graduates who can depend on themselves in thought and action. The programs need to emphasize, among its purposes, the importance of human relations in teaching. At this point it might be useful to introduce an idea about how the purposes of teachers training education are looked upon in another country.

In the United States, Flanders clarifies that the purposes of such education:

is to start with an average college student and produce a beginning teacher who can, at some minimal level:

a) Accept the need to control his own behavior for professional purposes,

b) Identify the range of teaching behaviors that requires in teaching,
c) Perform these behaviors at appropriate moments in spontaneous situations,

d) Predict the consequences of providing various teaching behaviors under specified conditions,

e) Plan a strategy of teaching behaviors for specified purposes and situations,

f) Collect information about his own behavior and the consequences of his behavior in classroom settings,

g) Achieve those resources necessary to continue his professional growth on the job,

h) Identify his own preferred outcomes of classroom instruction as functions of his own behavior (34, p. 160).

He emphasizes the importance of overt behavior. Thus, what is being taught in teacher education may be understood by incorporating it into the personal overt behavior of the teacher candidate. Also, the methods of teaching of the instructor of education and his teaching principles may result in a conflict between the goals and means for the student so that the student will see a need to transform cognitive understanding into personal behavior (37, p. 361).

Flanders indicates that there are specific critical teaching behaviors that should be taught in teacher education. If student teachers learn to classify overt behavior by a method like interaction analysis, they will be able to improve their own teaching behaviors. He defines the critical teaching behaviors as a pattern of acts that are logically related to certain educational outcomes, follow a certain sequence with measurable probability, and seem crucial in terms of a theory of teacher influence verified by past research (37, p. 361).

In a typical pattern of teaching, the teacher communicates contents that are accompanied with questions and the students answer briefly. In a basic drill pattern of teaching, the teacher asks short questions and the students give short answers, in a direct manner of
communication. Both of those two patterns are controlled by the teacher because the students speak to the teacher and talk little to each other. Their questions are referred to the teacher to judge.

These two patterns of teaching are very common in Iraqi schools. In a third pattern of teaching which is a direction-giving pattern, most often the students seek clarification and resist the direction of the teacher. In another pattern there is more student initiation. The questions asked by the teacher are longer and more general and students have a chance to express ideas. This communication pattern allows for more sustained student participation. The teacher utilizes the ideas of the student though sometimes he may shift to his own ideas in lecturing or questioning.

In a fourth, very rare pattern of teaching, the teacher responds to the effective aspects of students verbalization in a constructive manner. He reacts to the feelings and ideas of the students by giving praise and encouragement. The teacher also might make an inference about the effective aspects of interaction and make an interpretation during silence. Critical decisions are required when the teacher transfers from the cognitive aspects of students to the effective aspects. He praises the students and attempts to reinforce positive effective reactions to motivate them. A reverse set of critical transition behaviors occurs when the teacher moves from the effective aspects to the intellectual aspects of the communication in the classroom (37, p. 368).
This chapter indicated that a great deal has been written about teacher effectiveness and about the relationships of teacher training to effectiveness in teaching. But in Iraq, the implications of research findings in these areas have not been taken into careful consideration. The next chapter will present the research findings of Flanders, upon which this study is based, and will outline the method and procedures of the study.
The Flanders System of Interaction Analysis was used as a research tool in this study. The observations were made by the investigator who was trained in the procedure of collecting and recording data according to the ten categories of the system. The following procedures for collecting, recording, and decoding the data were undertaken by the investigator:

1. Official permission for the investigator was obtained from the Ministry of Education in Baghdad (Appendices A and B) which enabled visitations to the schools in the area of Rasafa. The first visit to each school was for the purpose of meeting with science teachers in order to become acquainted and to know their weekly schedules of chemistry and physics lessons. In those visits the teachers were informed about the purpose of the study and its limitations.

2. The investigator succeeded in making two separate observations for each teacher included in the sample. The investigator made every effort to assure teachers that the observations were not evaluations of their teaching. When a teacher was unwilling to cooperate another teacher was chosen. This difficulty occurred three times, when two teachers insisted on testing their students at the time of the observation, and the third one excused herself because of a painful accident.
which happened to a student in her class.

3. Value judgments about good and bad teaching behavior were avoided.

4. The first ten minutes of each lesson were not recorded since that time was used to prepare students for the lesson. Also, the last ten minutes were excluded because the teacher usually gave assignments for the next lesson during that time. The investigator recorded approximately 20 minutes for each lesson.

5. Two tape recorders were used for the observations; one to record classroom activities with the microphone directed to the teacher and students, and the second one to recode observer codings of teacher-student verbal communication. After the lesson, each tape was given a number. Then the investigator recorded the symbols on a special recording form (tally sheet). These entries were transferred to a matrix for each observation.

Tape recordings enabled a measure of control for coding precise time intervals of five seconds and for coding changes in teacher-student behavior. The tape recordings also provided a measure for increasing the reliability of the observations, since it was possible to listen to the tape as long as needed to determine to which category a specific behavior belonged.

The Method of Recording and Encoding the Data

Each recorded lesson on tape was decoded on a tally sheet (Appendix C). Then the sequence of numbers was entered into a ten-row by ten-column table, which is called a matrix (see Figure 2). This
Figure 2. Raw interaction data plotted on a 10×10 matrix. The sequence of verbal responses are plotted in the matrix by pairs; e.g., 10-4-8 becomes two pairs, 10-4 and 4-8. The first tally appears in the 10th row, 4th column, and the second tally in the 4th row, 8th column.
matrix contains ten rows and ten columns, so the total number of cells becomes 100, which represents the types of interaction that might occur in a classroom. The generalized sequence of the teacher-pupil interaction can be examined readily in this matrix. The following example shows how the investigator classified the events and how the observations were recorded in the matrix. The example is a second-grade chemistry teacher who was beginning a discussion on the glass industry. The investigator held the microphone close to her mouth then she was ready to record.

The teacher said to the class, "Girls, hide all your text books quickly." (observer classified this as a 6, followed by 10 because of the period of silence and confusion as the girls tried to hide the books). The teacher said, "Suad, we are all waiting for you. Will you hide your bag in the desk?" (observer recorded a 7 and 6) "I know now," continued the teacher, "that some of you had a little difficulty with, and were somehow disturbed by the study of this subject yesterday; I think that today we are going to find it more interesting." (observer recorded two 1's reacting to feeling.) "Now, has anyone had a chance to think about what was discussed yesterday?" (observer recorded a 4 for a question). A girl answered, "I thought about it, and I believe that glass in the old times was not so pure, because the factories were unable to have very high temperatures. Also, knowledge exchange between countries was very slow." (observer records four 9's). The teacher responded by saying, "Well, I am pleased to hear you personal idea, Alia. Now let me see if I understood your idea thoroughly. You have thought that if people knew how to control the needed temperatures they
would be able to have pure glass." (This was classified as a 2, followed by two 3's).

Thus the observer was able to record on a tally sheet the following sequence of numbers:

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>10</td>
<td>6</td>
</tr>
<tr>
<td>6</td>
<td></td>
</tr>
</tbody>
</table>

1st pair

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>2nd pair (10</td>
<td>10</td>
</tr>
<tr>
<td>10</td>
<td></td>
</tr>
</tbody>
</table>

3rd pair

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>4th pair (7</td>
<td>6</td>
</tr>
<tr>
<td>6</td>
<td></td>
</tr>
</tbody>
</table>

(The use of a 10 at the beginning and end of the sequence is because it is assumed that each record began and ended with silence).

Tabulations were then made in the matrix to represent pairs of numbers. In the listing, the numbers were marked off in pairs. The first pair is 6-10, etc. The particular cell in which tabulation of the pair of numbers is made is determined by using the first number in the pair to indicate the row and the second number in the pair for the column. Thus, 10-6 would be shown by a tally in the cell formed by Row 10 and Column 6. The second pair, 6-10, would be shown in the cell formed by Row 6 and Column 10. The third pair, 10-7, is entered into the cell, Row 10 and Column 7. Each pair of numbers overlaps with the previous pair, and each number, except the first and the last, is used twice. It is for this reason that a 10 is entered as the first number and the last number in the record. This number is chosen since it is convenient to assume that each record began and ended with silence.
This procedure also permits the total of each column to equal the total of the corresponding row.

The Sample of the Study

Twenty four classroom visitations for twelve teachers; six male teachers and six female teachers, were conducted from April 11 to April 29, 1977. The number of the schools covered by the study was six; three schools of boys and three schools of girls. In each school two teachers were observed: a teacher who taught chemistry and a teacher who taught physics. The sample covered the teachers of these subjects in the second grades of the Middle Schools only. These middle schools were chosen randomly from the schools of boys and the schools of girls in the Rasafa area, Baghdad.

Limitations of the Study

Sample size. The sample size in terms of subjects is minimal in terms of applying the results of the study to teaching programs. However, any study is limited in its interpretation to the specific context in which it took place. The primary purpose was to test an observational procedure which might be retested in other contexts.

Obtaining a cross section of verbal behavior. Each teacher in the sample was visited only two class periods because the time available for observations was limited. A cross section of the verbal classroom behaviors identified by Flanders may not have been observed during this limited number of visits. In spite of the fact that observations were made at random, these verbal classroom behaviors may not have been representative of all classroom verbal behaviors.
The Hawthorne Effect. Chemistry and physics teachers and students might have been aware that they were involved in a study, especially during the time the classroom was being observed. This may have affected the data of the study, giving rise to the Hawthorne effect.

Method of Estimating Reliability

The reliability of the investigator's data recordings onto tally sheets form the tape recordings were computed by means of Scotts's formula for estimating reliability (Appendix D). Two recorded lessons of the sample were selected randomly: a chemistry lesson from a school of boys and a physics lesson from a school of girls.

Two well trained observers in the Flanders observational System, who understood the native Iraqi language also tallied from tapes. The reliability of the first lesson between the investigator and one of the observers' tallying was 87.1% and the second lesson was 87.7%. The observers' reliability in the first lesson was 86.5% with the other observer and 89.4% in the second lesson with the same observer. Apparently the agreements of reliability between observers was satisfactory.

Methods of Obtaining the Percentages and Ratios of the Patterns of Verbal Behaviors

The frequencies displayed in the cells of the matrix indicate the patterns of verbal interactions that took place in the classrooms between the teacher and the students and between the students. The mathematical treatment of these frequencies made it possible to obtain the percentages and ratios of patterns which include teacher talk, pupil talk, silence and confusion, teacher response, instantaneous teacher
response, teacher questions, instantaneous teacher question, pupil initiation, content cross, and steady ratio.

The methods of obtaining the percentages and ratios of the above mentioned patterns are as follows: (39, pp. 100-107).

**The percentage of Teacher Talk (TT).** This percentage can be found by adding category frequencies of $1 + 2 + 3 + 4 + 5 + 6 + 7$, multiplying by 100, and dividing by the sum of the 10 categories. This percentage is an index which represents the total amount of teacher talk.

**The Percentage of Student Talk (PT).** This percentage can be found by adding category frequencies of $8 + 9$, multiplying by 100, and dividing by the sum of the 10 categories. This percentage is an index which represents the total amount of pupil talk.

**The Percentage of Silence and Confusion (PC).** This percentage can be found by finding the total frequencies in category 10, multiplying by 100, and dividing by the sum of the categories. This percentage is an index of the total amount of classroom silence and confusion periods.

**The Teacher Response Ratio (TRR).** This ratio can be found by adding category frequencies $1 + 2 + 3$, multiplying by 100, and dividing by the sum of $1 + 2 + 3 + 6 + 7$. This ratio is an index which corresponds to the teacher's tendency to react to the ideas and feelings of the pupils.

**The Teacher Question Ratio (TQR).** This ratio is calculated by multiplying the category 4 frequency by 100 and dividing by the sum of categories 4 and 5. This ratio is an index representing the tendency
of a teacher to use questions when guiding the more content oriented part of the class discussion.

The Pupil Initiation Ratio (PIR). This ratio is calculated by multiplying the frequency in category 9 by 100 and dividing by the sum of all pupil talk (categories 8 and 9). This ratio indicates what proportion of pupil talk was fudged by the observer to be an act of initiation.

The Instantaneous Teacher Response Ratio (TRR). This ratio can be calculated by adding the cell frequencies in rows 8 and 9, columns 1, 2, and 3, multiplying this sum by 100, and dividing the product by the total tallies in the cells of rows 8 and 9, columns 1, 2, 3, 6, and 7. This ratio represents the tendency for the teacher to praise or integrate pupil ideas and feelings into the class discussion, at the moment the pupils stop talking.

The Instantaneous Teacher Question Ratio (TQR 89). This ratio is calculated by adding the frequencies in cells (8-4) + (9-4), multiplying by 100, and dividing by the total tallies in the four cells (8-4) + (8-5) + (9-4) + (9-5). This ratio represents the tendency of the teacher to respond to pupil talk with questions based on his own ideas, compared to a tendency to lecture.

The Content Cross Ratio (CRR). This ratio can be found by the following calculation: \[ \frac{2(\text{total frequencies in column 4 + 5}) - (\text{total frequencies in perpendicular cells which are formulated between rows 4 + 5})}{\text{total frequencies of the matrix}} \times 100 \]. This ratio indicates to what extent the class discussion is focusing on subject matter, and to what extent the teacher
is active in this discussion. When it is high it can be considered that the teacher's attention to motivation and discipline problems are at a minimum.

The Steady State Ratio (SSR). This ratio is calculated by adding the frequencies in the \((8-8) + (9-9)\) cells, multiplying by 100, and dividing by all pupil talk tallies. This ratio reflects the tendency of the teacher and pupil talk to remain in the same category for periods longer than 5 seconds. The higher this ratio, the less rapid is the interchange between the teacher and the pupils.

Flanders Percentages and Ratios
(Normative Expectations for Matrix)

The percentages and ratios of the patterns of verbal interaction between the teacher and the students and between the students in the Iraqi middle schools chemistry and physics classes, were compared with the standard percentages and ratios that Flanders obtained from his research, in order to make judgments concerning the present state of verbal interaction in the Iraqi schools for this study.

Flanders Percentages and Ratios are:

Percent teacher talk 68%
Percent pupil talk 20%
Percent silence and confusion 11-12%
Teacher response ratio .42
Instantaneous teacher response ratio .60
Teacher question ratio .26
Instantaneous teacher question ratio .44
Pupil initiation ratio .34
Content cross ratio .55
Steady state ratio .50
Pupil steady ratio .35
Different analysis are available for making interpretations of the kinds of verbal interaction that can occur in a classroom:

a. Categories 1 through 4 are compared to categories 5 through 7 to obtain the ratio of indirect teacher talk to direct talk (I/D ratio) (figure 3).

b. Categories 1 through 3 are compared to 6 and 7 to obtain a revised I/D ratio that indicates the social emotional climate of the classroom (figure 4).

c. Percentages within categories 8 and 9 (student talk) are compared to 1 through 7 to obtain a ratio of student talk to teacher talk (S/T ratio) (figure 5).

d. Identifications of certain areas and cells in the matrix in which a relatively small number of tallies appear provides an indication of the typical patterns of interaction and the typical responses to specific kinds of verbal behaviors (figures 6, 7, 8).

Since sample analysis were available to treat the various categories of behavior, only the methods stated in figures 3 and 4 were used for the purpose of this study.

Summary

The Flanders System of Interaction Analysis was used as a research tool in this study. The investigator operated under certain ground rules in order to collect reliable classroom recorded data. Instead of recording the codes of interaction directly on a tally sheet during the time of the observations, the investigator recorded the codes on a tape. Another tape recorder was used at the same time to record classroom verbal activities. This method enabled the investigator to control the five second intervals and changes in behavior for coding tallies. Later the codes were recorded on a tally sheet. Then they were displayed on a matrix which contained ten rows and ten columns with a total number of 100 cells. Patterns of interaction were then
Figure 3. I/D ratio—categories 1-4 divided by categories 5-7, a measure of indirectness versus directness.

<table>
<thead>
<tr>
<th></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>9</th>
<th>10</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></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>
<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>
<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>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Indirect</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Direct</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>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Figure 4. Revised I/D ratio—categories 1-3 divided by categories 6-7, a measure of affective indirectness versus affective directness, an indication of social-emotional climate.
Figure 5. S/T ratio categories 8-9 divided by categories 1-7, student talk versus teacher talk, a measure of time consumed by the students versus the teacher.
Figure 6. Extended indirect talk divided by extended direct talk, a measure of extended use of positive versus negative affective responses.
Figure 7. Column 4 and 5, rows 4 and 5 are called the content cross. The number of tallies in this area of the matrix indicates the degree to which session was cognitively oriented.
Figure 8. Area X indicates patterns of student talk following teacher talk. Area Y indicates patterns of teacher talk following student talk.
analyzed from these matrices. These analyses indicated the patterns of verbal interaction that took place in the classes of chemistry and physics, male and female teachers. A mathematical treatment of these frequencies made it possible to obtain the percentages of various teacher-student behavioral patterns. Specific percentages and ratios were derived from Flanders research as standards for making comparisons with the observational data obtained from randomly selected Middle Schools of Baghdad, Iraq.
CHAPTER IV

PRESENTATION AND ANALYSIS OF THE DATA

The first chapter dealt with the various aspects of the problem: the need for the study, the objectives, the terms used in the study.

The second chapter introduced a background concerning each of the following: the measurement and the prediction of teaching effectiveness, factors related to science teacher effectiveness, systems of classroom behavioral analysis, and the application of interaction analysis systems in other countries. The second chapter introduced a brief statement concerning teachers training programs in Iraq, with a technique for determining the patterns of verbal interaction between the teacher and the students, and between students.

The third chapter presented the method and the procedures that were followed in this study, the sample of the study, the limitations, the statistical means that were used for obtaining reliable results and for determining the patterns of verbal behaviors of the teachers and students that were included in the sample.

In this chapter the investigator will focus on following the process of interaction in every class that was covered by the sample. Every pattern of interaction is illustrated by category numbers and percentages, that serves to describe teacher and student interaction. What are the actual types of interaction in the lessons of chemistry and
physics? What areas of class interaction are most emphasized by teachers in the schools of boys and in the schools of girls? How does each type of classroom verbal interaction meet the educational objectives of those Iraqi physics and chemistry classes?

The frequencies of the interaction between the teacher and the students, for the twenty four classroom observations were displayed on twenty four matrices. For the purpose of analyzing the verbal interaction, the observations were classified into four groups:

Group 1: Represents three chemistry female teachers in three Middle Schools of Girls. Two observations for every teacher in this group were displayed on two matrices. The total number of observations is six (Matrices 1, 2, 3, 4, 5, 6).

Group 2: Represents three chemistry male teachers in three Middle Schools of Boys. Two observations for every teacher were displayed on two matrices. The total number of observations is six (Matrices 7, 8, 9, 10, 11, 12).

Group 3: Represents three physics female teachers in three Middle Schools of Girls. Two observations for every teacher were displayed on two matrices. The total number of observations is six (Matrices 13, 14, 15, 16, 17, 18).

Group 4: Represents three physics male teachers in three Middle Schools of Boys. Two observations for every teacher were displayed on two matrices. The total number of observations is six (Matrices 19, 20, 21, 22, 23, 24).

Analysis of verbal interaction was made for every recorded lesson. Comparisons between the patterns of behavior, were made for
the same teacher, for the same group of teachers, for each two groups of teachers, and for the four groups of teachers, in order to indicate the actual behavioral patterns and the differences between those patterns, if any, according to subject matter and sex.

**Group 1: The Verbal Behavior Patterns of Chemistry Female Teachers**

Matrix 1 represents the first chemistry classroom verbal interaction that was observed in a second year Middle School for Girls. From the total number of frequencies of the matrix cells, it was possible to obtain the different percentages and ratios concerning teacher-student interaction; the percentage of teacher talk, student talk, and silence and confusion; the ratios of teacher response, instantaneous teacher response, teacher questions, instantaneous teacher question, student initiation, content cross, steady state, and students steady state.

Apparently the percent of teacher talk, had taken 60.7% of the time of the recorded lesson. The percent of teacher talk is found to be higher than the percent of student talk (19.0%), and higher than the percent of silence and confusion (20.3%).

In comparing the above mentioned percentages with the standard percentages which Flanders had concluded from his research, (39, pp. 100-108) it can be concluded that the percent of teacher talk is lower than the standard percent by 7.3%; the percent of student talk was lower than the standard percent by 1%; but the percent of silence and confusion was higher than that of the standard percent by 9.3-8.3%.
<table>
<thead>
<tr>
<th>Category #*</th>
<th>Teacher</th>
<th>Student</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2</td>
<td></td>
<td>2</td>
</tr>
<tr>
<td>2</td>
<td>2</td>
<td>1</td>
<td>17</td>
</tr>
<tr>
<td>3</td>
<td></td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>4</td>
<td></td>
<td>4</td>
<td>2</td>
</tr>
<tr>
<td>5</td>
<td></td>
<td>8</td>
<td>72</td>
</tr>
<tr>
<td>6</td>
<td></td>
<td>1</td>
<td>6</td>
</tr>
<tr>
<td>7</td>
<td></td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>8</td>
<td>11</td>
<td>1</td>
<td>9</td>
</tr>
<tr>
<td>9</td>
<td></td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>10</td>
<td>2</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>8</td>
<td>4</td>
<td>16</td>
</tr>
<tr>
<td></td>
<td>6</td>
<td>1</td>
<td>25</td>
</tr>
<tr>
<td>Total</td>
<td>2</td>
<td>17</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>20</td>
<td>90</td>
<td>16</td>
</tr>
<tr>
<td></td>
<td>1</td>
<td>46</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>50</td>
<td>247</td>
<td></td>
</tr>
</tbody>
</table>

| Percentage  | .81     | 6.88    | 1.61  | 8.09  | 36.43 | 6.47  | .41   | 18.63 | .41   | 20.24 | 20.50 |

*Teacher = Categories 1-7; Student = Categories 8 and 9.

Percent Teacher Talk = 60.7  I/D = 0.40
Percent Pupil Talk = 19.0  RI/D = 1.35
Percent Silence and Confusion = 20.3
Teacher Response Ratio = 57.5
Instantaneous Teacher Response Ratio = 100
Teacher Questions Ratio = 18.8
Instantaneous Teacher Question Ratio = 69.2
Pupil Initiation Ratio = 2.1  Steady State Ratio = 45.3
Content Cross Ratio = 45.3  Pupil Steady State Ratio = 27.6

Matrix 1. The Categories, Cells and Frequencies in a Second Grade Middle School Chemistry Lesson
By checking the matrix, it can be pointed out that the teacher had started the cycle of interaction by lecturing (5-5), asking questions (5-4), receiving answers from the students (8-8), then giving them a feedback (8-2), commenting on their answers (8-5), and asking them more questions again (8-4).

The matrix indicates that the teacher was responsive. This can be noted in the teacher's tendency to react to the ideas and feelings of the students, as it is evident in the Teacher's Response Ratio (TRR), which was higher than the standard ratio by 15.5%. The tendency of the teacher to praise or integrate students' ideas and feelings into the class discussion, at the moment the students stopped talking, is evident in the Instantaneous Teacher Response Ratio (TRR89) which was 100%. This ratio is higher than the standard ratio by 40%.

The teacher tended to use questions when guiding the more content-oriented part of the class discussion, as is evident in Teacher Question Ratio (TQR) which was 18.8%, this ratio is lower than the standard ratio by 7.2%. Although the Teacher's Question Ratio was relatively low, the tendency of the teacher to respond to student talk with questions based on her own ideas, compared to her tendency to lecture, was high as is evident in the Instantaneous Teacher Question Ratio, which was higher than the standard ratio by 25.2%.

The content cross ratio indicates that the teacher did focus on discussing subject matter. The content cross ratio is 55.3% which is almost identical to the standard ratio (55%). The rapidity of teacher-student interchange (45.3%), approximates the standard ratio, since it
is only 4.7% lower. The Steady State Ratio provides evidence for the adequacy of the rapidity of teacher and student talk. The tendency of teacher and student talk to remain in the same category for periods longer than 5 seconds was not very high, since it was lower than the standard ratio by 6.4%.

The matrix indicates that the teacher took an active role in classroom discussion. Student activity was lower than the average, as it is indicated by the Pupil Initiation Ratio, there initiation was only 2.1%, while the standard ratio is 34%. Such imbalanced classroom interaction, though it cannot be judged as good or bad might not have led to the fulfillment of chemistry educational objectives. The desired students behavioral changes might not be achieved through a pattern of interaction that does not encourage self inquiry, problem solving and critical thinking.

Regardless of the poor ratio of students initiation, other aspects of classroom verbal interaction can be considered close to the average although the periods of silence and confusion were relatively high.

The matrix indicates some additional ratios concerning verbal interaction. The Indirectness of the teacher versus her Directness (I/D) was 0.40%, while the Revised Indirectness/Directness Ratio (RI/D) was 1.35% to motivation and control, when eliminating the effects of lecturing and asking questions.

In order to get additional information about teacher-student interaction and to find out if it was influenced by the presence of the
observer in the classroom, a second observation for the same teacher and students was made.

Matrix 2 presents the second recorded lesson. The matrix indicates that the percentages of teacher talk, student talk, and silence and confusion, were respectively: 58.5%, 23.4% and 18%. Although the percentage of teacher talk had remained lower than the standard ratio, it was even lower than that of the first observation. It seems that the teacher had given the students more chances to participate in class discussion as is evident in the percentage of pupil talk which was higher than the standard ratio by 3.4%, but nearly the same time of silence and confusion was spent from the recorded lesson.

No significant differences was found concerning the flow of verbal interaction in the second observation. The matrix shows that the teacher was focusing on subject matter discussion which ratio was almost identical to the standard ratio (54.9%). The teacher was busy lecturing, asking questions, receiving answers and responding to the students with praise or encouragement.

The ratio responses of the teacher was 46.1% (TRR) and was 91.6% (ITRR). Though they were high when compared with the standard ratios, they were less than those ratios of the first observation.

The teacher's question ratio and the Teacher's Instantaneous Question Ratio were respectively 29.6% and 70%, which were higher than the ratios of the first observation.

The rapidity of the teacher-pupil interchange when pupils talked was close to the average. The tendency of teacher and students to remain in the same category for periods longer than 5 seconds was about
<table>
<thead>
<tr>
<th>Category #*</th>
<th>Teacher</th>
<th>Student</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1</td>
<td>8</td>
<td>9</td>
</tr>
<tr>
<td>2</td>
<td>1</td>
<td>9</td>
<td>11</td>
</tr>
<tr>
<td>3</td>
<td>1</td>
<td>1</td>
<td>4</td>
</tr>
<tr>
<td>4</td>
<td>2</td>
<td>15</td>
<td>17</td>
</tr>
<tr>
<td>5</td>
<td>7</td>
<td>51</td>
<td>58</td>
</tr>
<tr>
<td>6</td>
<td>4</td>
<td>1</td>
<td>5</td>
</tr>
<tr>
<td>7</td>
<td>1</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>8</td>
<td>6</td>
<td>14</td>
<td>20</td>
</tr>
<tr>
<td>9</td>
<td>2</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>10</td>
<td>4</td>
<td>1</td>
<td>5</td>
</tr>
<tr>
<td>Total</td>
<td>1</td>
<td>11</td>
<td>18.50</td>
</tr>
</tbody>
</table>

| Percentage | .45     | 4.96    | 2.73  |
|           | 10.84   | 30.19   | 6.33  |
|           | 2.72    | 22.59   | .94   |
|           | 18.02   |         |       |

*Teacher = Categories 1-7; Student = Categories 8 and 9.

Percent Teacher Talk = 58.5
Percent Pupil Talk = 23.4
Percent Silence and Confusion = 18
Teacher Response Ratio = 46.1
Instantaneous Teacher Response Ratio = 91.6
Teacher Questions Ratio = 29.6
Instantaneous Teacher Question Ratio = 70
Pupil Initiation Ratio = 3.8
Content Cross Ratio = 54.9

Matrix 2. The Categories, Cells and Frequencies in a Second Grade Middle School Chemistry Lesson
average. These results are similar to the first observation.

Although the pupil Initiation Ratio in the second observation was higher than that of the first observation, it remained much lower than the standard ratio. Again this reflects a very imbalanced state of classroom interaction, which might not fulfill the desired student's behavioral changes.

The Indirectness of the teacher versus the Directness was .47% which exceeded that of the first observation, while the Revised Indirectness/Directness was .85% which indicates that the teacher was more direct in her approach to motivation and control.

Minor changes were exhibited in the verbal interaction of the teacher and the students on the matrix of the second observation.

Matrix 3 exhibits the classroom verbal interaction of a second chemistry female teacher.

The total tallies which were recorded in this lesson were 265. The percentage of teacher talk indicates that the teacher had the most active role in the classroom interaction. The percentage of the teacher talk was 72.8%, which is higher than the standard percentage by 4.8%. The percentage of student talk was 17.7%, which is lower than the standard ratio by 2.3%. The percentage of confusion and silence was 9.5% which is lower than the standard ratio by 1.5-2.5%.

On checking the matrix, it can be noticed that most of the load was put on cell 5-5. The flow of interaction which started in cell 5-5, can be stated in the following sequence: 5-5, 5-4, 4-10, 10-8, 8-8, 8-3, 3-5.
### Matrix 3. The Categories, Cells and Frequencies in a Second Grade Middle School Chemistry Lesson

<table>
<thead>
<tr>
<th>Category #**</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>9</th>
<th>10</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></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>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td></td>
<td></td>
<td>7</td>
<td>11</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>18</td>
</tr>
<tr>
<td>4</td>
<td></td>
<td></td>
<td>7</td>
<td>2</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>35</td>
</tr>
<tr>
<td>5</td>
<td></td>
<td>1</td>
<td>16</td>
<td>98</td>
<td>1</td>
<td>3</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>131</td>
</tr>
<tr>
<td>6</td>
<td></td>
<td></td>
<td>2</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>4</td>
</tr>
<tr>
<td>7</td>
<td></td>
<td>2</td>
<td>2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>4</td>
</tr>
<tr>
<td>8</td>
<td></td>
<td>16</td>
<td>2</td>
<td>14</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>41</td>
</tr>
<tr>
<td>9</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>6</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>6</td>
</tr>
<tr>
<td>10</td>
<td></td>
<td>2</td>
<td></td>
<td>4</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>18</td>
<td>25</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>1</td>
<td>18</td>
<td>35</td>
<td>131</td>
<td>4</td>
<td>4</td>
<td>41</td>
<td>6</td>
<td>25</td>
<td></td>
<td>265</td>
</tr>
<tr>
<td><strong>Percentage</strong></td>
<td>.38</td>
<td>6.79</td>
<td>13.2</td>
<td>49.43</td>
<td>1.51</td>
<td>1.51</td>
<td>15.47</td>
<td>2.26</td>
<td>9.43</td>
<td>22 min.</td>
<td></td>
</tr>
</tbody>
</table>
Like the chemistry teacher in the first two observations, this teacher was responsive. She reflected a great tendency to react to the ideas and feelings of the students. The TRR was 70.3% which is higher than the standard ratio by 27.7%. Those reactions occurred at the moment the students stopped talking, as is clear in the TRR (89%) which equalled 100% and which exceeded the standard ratio by 40%.

As it is indicated by the (TQR), the teacher did ask what might be considered a satisfactory number of questions. But in spite of this positive ratio, the tendency of the teacher to respond to student talk with questions based on her own ideas compared to her tendency to lecture was low, is evident in the (TQR 89) which equalled 12.5%, this ratio is below the standard ratio by 28.7%.

Unlike the first teacher, the rapidity of teacher-student interchange was 19.1%, and that is lower than the standard ratio by 14.9%. The Steady State Ratio which was 41.8% provides evidence for the limited number of the rapid interchanges between the teacher and the students.

More student initiation appeared in Matrix 3, and this is different from the first two matrices. But the (PIR) which was 12.7% was still much lower than the standard ratio. Again this reflects an imbalanced classroom interaction, which might not have led to the expected students' behavioral changes.

Out of the 11 standard percentages and ratios, only 3 can be judged to be close to the average. Thus, the verbal interaction of the first observation of the second teacher cannot be judged positively.
The teacher was direct in her behavior as is indicated by the I/D ratio which equalled 0.38%. This directness resulted from his emphasis on lecturing, because when this emphasis was eliminated the directness became low. The revised indirect/direct ratio (RI/D) which equalled 2.30% reflects that the teacher was indirect in his approach to motivation and control (2.30%).

In sum, the interaction in this lesson cannot be considered a balanced one, that might have helped in the fulfillment of the chemistry educational objectives.

Matrix 4 presents the second observation that was made for the same teacher and students.

The percentages of teacher talk, student talk, silence and confusion, were respectively: 71.3%, 20.3%, 8.4%. Apparently they all seem to be close to the standard percentages, as they were in the first observation.

No difference has been found in the flow of interaction between the two observations.

Again the teacher seemed to be very concerned about the ideas and feelings of her students. The (TRR) was 81.2% and the (TRR 89) was 100%.

A significant difference was found in the (PIR) between the two observations. The pupil initiation in the second observation was doubled, though it remained below the standard ratio by 9.4%.

An increase in the teacher question ratio of 4% has been found in the second observation. Another increase in the (TQR 89) of 42.5% has been found also.
<table>
<thead>
<tr>
<th>Category #*</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>Total</th>
<th>8</th>
<th>9</th>
<th>10</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>3</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>4</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td></td>
<td>4</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>5</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td></td>
<td></td>
<td>7</td>
<td>7</td>
<td>3</td>
<td></td>
<td></td>
<td>17</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td></td>
<td></td>
<td>3</td>
<td>7</td>
<td></td>
<td>11</td>
<td>14</td>
<td>42</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td></td>
<td></td>
<td></td>
<td>4</td>
<td>11</td>
<td>105</td>
<td>4</td>
<td>140</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>4</td>
<td>1</td>
<td></td>
<td>5</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>1</td>
<td>16</td>
<td>11</td>
<td>9</td>
<td>8</td>
<td>1</td>
<td></td>
<td>46</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9</td>
<td></td>
<td></td>
<td>14</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td>15</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>1</td>
<td>1</td>
<td>6</td>
<td>7</td>
<td>7</td>
<td>3</td>
<td></td>
<td>25</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>4</td>
<td>5</td>
<td>17</td>
<td>42</td>
<td>140</td>
<td>5</td>
<td>1</td>
<td>250</td>
<td>46</td>
<td>15</td>
<td>25</td>
<td>300</td>
</tr>
<tr>
<td>Percentage</td>
<td>1.33</td>
<td>1.66</td>
<td>5.66</td>
<td>14.0</td>
<td>46.66</td>
<td>1.66</td>
<td>0.33</td>
<td>15.33</td>
<td>5.0</td>
<td>2.5</td>
<td></td>
<td>25 min.</td>
</tr>
</tbody>
</table>

*Teacher = Categories 1-7; Student = Categories 8 and 9.

Percent Teacher Talk = 71.3
Percent Pupil Talk = 20.3
Percent Silence and Confusion = 8.4
Teacher Response Ratio = 81.2
Instantaneous Teacher Response Ratio = 100
Teacher Questions Ratio = 28.9
Instantaneous Teacher Question Ratio = 55
Pupil Initiation Ratio = 24.6
Content Cross Ratio = 80.3

Matrix 4. The Categories, Cells and Frequencies in a Second Grade Middle School Chemistry Lesson
No significant difference has been found in the (SSR) and in the (PSSR) between the two observations.

Although the content cross ratio was higher than the average ratio by 25.3%, the teacher was not the only one who took an active role in the discussion. The students did take an active role also, though they did not tend to remain very long in the same categories of interaction. The rapidity of the teacher-student interchange when students talked was below the standard ratio by 14.9%.

More indirectness appeared in the matrix of the second observation. The Rl/D doubled, which indicates a very desirable social emotional climate in the classroom. The I/D was 0.46% as a result of loading in category 5.

It seemed that both teacher and students were more active in the second observation.

In comparison with the previous three observations, it is appropriate to point out that this lesson reflected more average patterns of verbal interaction. Thus the interaction can be judged positively from an instructional point of view.

The fifth recorded observation is presented in Matrix 5. It exhibits the verbal interaction that occurred in the classroom of the third chemistry female teacher.

The percentage of teacher talk (68.8%) was similar to the standard ratio (68%). The teacher did give the students an average number of chances to talk, as was apparent in the student's talk percentage (24.3%), which exceeded the standard ratio by 4.3%. The periods of silence and confusion (6.8%) were half of the average.
<table>
<thead>
<tr>
<th>Category #**</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>9</th>
<th>10</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>4</td>
<td>3</td>
<td>2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>3</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td></td>
<td></td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>34</td>
<td>5</td>
<td>42</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>4</td>
<td>18</td>
<td>77</td>
<td></td>
<td>5</td>
<td>3</td>
<td>2</td>
<td>109</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>1</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td>2</td>
<td>4</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>5</td>
<td>2</td>
<td>14</td>
<td>22</td>
<td>11</td>
<td>2</td>
<td>56</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9</td>
<td></td>
<td>2</td>
<td>2</td>
<td></td>
<td></td>
<td>2</td>
<td>4</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>2</td>
<td>3</td>
<td>2</td>
<td>2</td>
<td>3</td>
<td>1</td>
<td>6</td>
<td>17</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>9</td>
<td>6</td>
<td>42</td>
<td>109</td>
<td>4</td>
<td>56</td>
<td>4</td>
<td>17</td>
<td>247</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Percentage</td>
<td>3.69</td>
<td>2.42</td>
<td>17.00</td>
<td>44.13</td>
<td>1.62</td>
<td>22.67</td>
<td>1.61</td>
<td>6.88</td>
<td>20.50</td>
<td>min.</td>
<td></td>
</tr>
</tbody>
</table>

*Teacher = Categories 1-7; Student = Categories 8 and 9.*

Percent Teacher Talk = 68.8
Percent Pupil Talk = 24.3
Percent Silence and Confusion = 6.8
Teacher Response Ratio = 78.9
Instantaneous Teacher Response Ratio = 100
Teacher Questions Ratio = 37.1
Instantaneous Teacher Question Ratio = 36.8
Pupil Initiation Ratio = 6.6
Steady State Ratio = 40.0
Content Cross Ratio = 87.4
Pupil Steady State Ratio = 18.3

Matrix 5. The Categories, Cells and Frequencies in a Second Grade Middle School Chemistry Lesson
The flow of verbal interaction, started as in the previous matrices, from cell 5-5 then it moved to cell 5-4, which shows that the teacher was asking questions while lecturing. The students answered the questions, as is clear in cell 4-8. They participated in the discussion, as it is evident in cell 8-5 and 8-4. The teacher praised the students as it is shown in cell 8-2. Then the cycle started again with the teacher asking questions, as is seen in cell 2-4, and the students answered.

Like teachers 1 and 2, the third observed teacher was of a very responsive type. The (TRR) and the (TRR 89) were respectively 78.9% and 100%. They were much higher than the standard ratios.

The teacher's question ratio was 37.1% which is higher than the standard ratio by 10.9%, and higher than the ratios of the previous two observed teachers. The tendency of the teacher to respond to pupil talk with questions based on her own ideas, compared to her tendency to lecture was 36.8%, and that is 7.2% below the standard ratio.

The emphasis of the teacher on subject matter was higher than the previous two teachers. The (CCR) equalled 87.4%.

The interchange between the teacher and the students was below the average as is indicated by (SSR) which equalled 40%. The interchange was very quick as is indicated by (PSSR) which equalled 18.3%.

Other ratios concerning the directness and indirectness of interaction (the I/D ratio of 0.50%, the RI/D ratio of 0.37) indicate that the teacher's direct interaction was more than her indirect behavior.
The teacher took the most active role in class. The standard ratio of pupil initiation is 34%, but the students initiation ratio in the class was only 6.6%.

From an instructional point of view, the lesson cannot be judged to be more than a traditional lesson, which might not have resulted in desired students' behavioral changes.

In order to find out what other types of interaction might take place in another classroom visitation, a second observation was made for the same teacher and students.

Matrix 6 exhibits the different behaviors of the teacher and the students. The total frequencies of behaviors was 247. A change in the activities of the teacher is evident in the matrix in comparison with that of the previous lesson. The percentage of teacher talk dropped 2.5% below the standard percentage. But the percentage of student talk (21.9%) was equal to the standard percentage. The same is true concerning the periods of silence and confusion which equalled 12.6%.

Although the (TRR) was less than the previous lesson, it remained higher than the standard ratio. The teacher reacted to the ideas and feelings of the students. The (TRR 89) which was 100% shows that the teacher tended to integrate students ideas and feelings in the discussion, at the moment they stopped talking.

The teacher question ratio was lower than the standard ratio by 6.9%. Although the teacher did show a tendency to respond to student talk with questions based on her own ideas, compared to her tendency to lecture, in the first observation, she did not show the same tendency
<table>
<thead>
<tr>
<th>Category #*</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>9</th>
<th>10</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td></td>
<td>2</td>
<td></td>
<td>4</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>2</td>
<td>8</td>
</tr>
<tr>
<td>3</td>
<td></td>
<td></td>
<td></td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>4</td>
<td></td>
<td>2</td>
<td>5</td>
<td>9</td>
<td>7</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>4</td>
<td>27</td>
</tr>
<tr>
<td>5</td>
<td></td>
<td>11</td>
<td>98</td>
<td>3</td>
<td>13</td>
<td>2</td>
<td></td>
<td></td>
<td></td>
<td>9</td>
<td>136</td>
</tr>
<tr>
<td>6</td>
<td></td>
<td>3</td>
<td>1</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>5</td>
</tr>
<tr>
<td>7</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8</td>
<td></td>
<td>2</td>
<td>2</td>
<td>19</td>
<td>24</td>
<td>1</td>
<td>4</td>
<td></td>
<td></td>
<td></td>
<td>52</td>
</tr>
<tr>
<td>9</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>6</td>
<td>1</td>
<td>1</td>
<td></td>
<td></td>
<td>1</td>
<td>8</td>
</tr>
<tr>
<td>10</td>
<td></td>
<td>4</td>
<td>1</td>
<td>8</td>
<td>2</td>
<td></td>
<td>2</td>
<td>4</td>
<td>13</td>
<td>34</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>8</td>
<td>2</td>
<td>27</td>
<td>136</td>
<td>5</td>
<td>1</td>
<td>52</td>
<td>8</td>
<td>34</td>
<td>273</td>
<td></td>
</tr>
<tr>
<td>Percentage</td>
<td>2.93</td>
<td>.73</td>
<td>9.89</td>
<td>49.82</td>
<td>1.83</td>
<td>.36</td>
<td>19.04</td>
<td>2.93</td>
<td>12.45</td>
<td>22.75</td>
<td></td>
</tr>
</tbody>
</table>

*Teacher = Categories 1-7; Student = Categories 8 and 9.

Percent Teacher Talk = 65.5
Percent Pupil Talk = 21.9
Percent Silence and Confusion = 12.6
Teacher Response Ratio = 62.5
Instantaneous Teacher Response Ratio = 100
Teacher Questions Ratio = 19.0
Instantaneous Teacher Question Ratio = 9.5
Pupil Initiation Ratio = 19.0
Steady State Ratio = 50.5
Content Cross Ratio = 76.2
Pupil Steady State Ratio = 41.6

Matrix 6. The Categories, Cells and Frequencies in a Second Grade Middle School Chemistry Lesson
in the second observation. The (TRR 89) became only 9.5% and that was below the standard ratio by 33.5%.

The emphasis of the teacher on the subject matter was very high in comparison with the standard ratio, it was lower than that of the previous lesson.

The students reflected more involvement in the discussion by initiating more ideas of their own. The ratio of their initiation was 19.0%. This ratio is lower than the standard ratio by 14%.

The flow of interaction remained the same. The tendency of the teacher and student talk to remain in the same category for periods more than five seconds was close to the standard. The teacher-student interchange when students talked was close to the standard.

More indirectness than directness was reflected by the teacher in the second observation. The RI/D was 1.6%, while it was 0.37% in the previous matrix.

Again the lesson cannot be judged to be more than a traditional lesson which may not have resulted in the achievement of all the expected educational objectives of chemistry teaching-learning processes. A similar judgment can be stated concerning the interaction in all the classes of female chemistry teachers who were observed.

Table 3 presents the total means that were obtained from the percentages and ratios of the behavioral patterns in the six chemistry classes that were taught by female teachers: means of the first observations and means of the second observations.

In both the first and the second observations, the main focus of the teachers was on subject matter, though more emphasis was put on
TABLE 3
VERBAL BEHAVIOR PATTERNS IN CHEMISTRY
CLASSES: FEMALE TEACHERS

<table>
<thead>
<tr>
<th>Pattern of Behavior</th>
<th>First Observations</th>
<th>Second Observations</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>T #1</td>
<td>T #2</td>
</tr>
<tr>
<td>TT</td>
<td>60.7</td>
<td>72.8</td>
</tr>
<tr>
<td>PT</td>
<td>19.0</td>
<td>17.7</td>
</tr>
<tr>
<td>SC</td>
<td>20.3</td>
<td>9.5</td>
</tr>
<tr>
<td>TRR</td>
<td>57.5</td>
<td>70.3</td>
</tr>
<tr>
<td>TRR 89</td>
<td>100</td>
<td>100</td>
</tr>
<tr>
<td>TQR</td>
<td>18.8</td>
<td>25.9</td>
</tr>
<tr>
<td>TQR 89</td>
<td>69.2</td>
<td>12.5</td>
</tr>
<tr>
<td>PIR</td>
<td>2.1</td>
<td>12.7</td>
</tr>
<tr>
<td>CCR</td>
<td>55.0</td>
<td>83.7</td>
</tr>
<tr>
<td>SSR</td>
<td>45.3</td>
<td>41.8</td>
</tr>
<tr>
<td>PSSR</td>
<td>27.6</td>
<td>19.1</td>
</tr>
</tbody>
</table>

It in the first observations (75.3%), which was higher than the standard average by 25.3%.

The rapidity of the teacher-pupil interchange when pupils talked was far beyond the standard average in the first observation though it tended to be closer in the second observations (31.2%).

The tendency of teacher and pupil talk to remain in the same category for periods longer than 5 seconds, on average was close to the standards in both the first and the second observations.

Table 4 indicates that the indirectness versus directness on average was more in the first observations than the second, while the revised indirectness versus directness increased in the second
observations, which reflected an improvement in the social-emotional climate of the classroom.

### TABLE 4

TEACHERS INDIRECTNESS/DIRECTNESS IN CHEMISTRY CLASSES: FEMALE TEACHERS

<table>
<thead>
<tr>
<th>Teacher #</th>
<th>First Observations</th>
<th>Second Observations</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>I/D</td>
<td>RI/D</td>
</tr>
<tr>
<td>1</td>
<td>0.40</td>
<td>1.35</td>
</tr>
<tr>
<td>2</td>
<td>0.38</td>
<td>2.30</td>
</tr>
<tr>
<td>3</td>
<td>0.50</td>
<td>0.37</td>
</tr>
<tr>
<td>Total Average</td>
<td>0.42</td>
<td>1.34</td>
</tr>
</tbody>
</table>

The averages of the percentages of teacher talk, pupil talk, and silence and confusion in the first observations were respectively; 67.4%, 20.3%, 12.2%.

The average percentage of teacher talk decreased to 65.1% in the second observations, while the average percentages of pupil talk and silence and confusion increased to 21.8% for the first and to 13.0% for the second.

In spite of the slight changes in the above mentioned three averages, they all were close to the standard averages.

The average of teacher response in the first observations (68.9%) was higher than that in the second observations (63.2%). In both the first and the second observations, the teacher response average was higher than the standard average.
A very slight difference was found in the average of instantaneous teacher response between the first observations and the second observations. Although the average was higher in the first observations, all the observations remained much higher than the standard average.

On average, the questions of the teachers showed an increase of 4.6% in the second observations. In both the first and the second observations the average of teachers' questions remained slightly higher than the standards.

In the second observations the teachers tended to ask more questions based on their own ideas, compared to their tendency to lecture. The average of the (TQR 89) showed an increase of 6.3%.

Although the average of pupil initiation in the second observations did increase (15.8%), it remained less than half of the standard average.

The total mean of each behavioral pattern that was analyzed appears below:

1. For teacher talk it was 66.2%, and that is very close to the standard ratio (68%).

2. For student talk it was 21.1% and that is very close to the standard ratio (20%).

3. For silence and confusion it was 12.6%, and that is almost the same as the standard ratio (11-12).

4. For teacher response it was 66%, and that is above the average (44%).
5. For teacher instantaneous response it was 98.6%, and that is much higher than the average ratio of Flanders (44%).

6. For teacher questions it was 26.5%, and that is almost the same as the standard ratio (26%).

7. For instantaneous teacher questions it was 42.1%, and that is almost the same as the average ratio of Flanders (44%).

8. For student initiation it was 11.4%, and that equals 1/3 of the standard ratio (34%).

9. For content it was 72.9%, and that is above the average ratio by 17.9%.

10. For steady state it was 43.6% and that is close to the standard ratio (50%).

11. For students steady state it was 26.4% and that is below the average ratio by 8.6%.

In sum the verbal interaction analysis between the teacher and the students in the Middle Schools for Girls, chemistry classes indicates average teacher talk, pupil talk, silence and confusion periods, teacher questions, instantaneous teacher questions, and steady state. The emphasis on subject matter was much higher than the average. The tendency of female teachers to praise or integrate students ideas and feelings into class discussion was much higher than the average. The pupil's initiation was found to be much lower than the average. The pupil steady state was slightly below the average. The teachers seemed to be direct in their interaction with their students, but when eliminating their tendency to lecture, they tended to reflect more indirectness in their approach to motivation and control.
Group 2: The Verbal Behavior
Patterns of Chemistry
Male Teachers

Matrix 7 represents the first chemistry classroom verbal interaction that was recorded in a second year Middle School for Boys.

The percentage of teacher talk (59%) dropped 9% lower than the average, while the students did talk enough, as was indicated by the percentage 21.9% which was slightly higher than the standard percentage, the periods of silence and confusion (19.1%) were greater than the standard percentage (11-12%).

The cycle of interaction started with the teacher lecturing, cell 5-5; some periods of silence and confusion, cell 10-10; the teacher continued lecturing, cell 5-10; then the teacher gave directions, cell 5-6; the students responded to the teacher, cell 6-8, for relatively long periods of time, cell 8-8; then the student continued discussing, cell 8-5, and the flow continued with the teacher asking questions, cell 5-4.

The reactions of the teacher to the ideas and feelings of the students were above the standard ratio by 8%. He did praise the students and integrated their ideas in class discussion. The (TRR 89) equalled 100%, and that was 40% above the average.

The questions of the teacher were few (17.7%) when compared with the standard ratio (26%), and his instantaneous questions were 4.9% lower than the standard ratio.

The pupil initiation ratio was 6.4%, and that was much below the standard ratio.
<table>
<thead>
<tr>
<th>Category #*</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>9</th>
<th>10</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>1</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></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>5</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td></td>
<td></td>
<td></td>
<td>4</td>
<td></td>
<td>4</td>
<td></td>
<td>6</td>
<td>24</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td></td>
<td>11</td>
<td>87</td>
<td>4</td>
<td>6</td>
<td></td>
<td></td>
<td>25</td>
<td>127</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td></td>
<td></td>
<td>1</td>
<td>1</td>
<td></td>
<td>4</td>
<td></td>
<td>2</td>
<td>8</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8</td>
<td></td>
<td>2</td>
<td>5</td>
<td>5</td>
<td>14</td>
<td></td>
<td></td>
<td>32</td>
<td>58</td>
<td></td>
<td></td>
</tr>
<tr>
<td>9</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>4</td>
<td></td>
<td></td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td></td>
<td>4</td>
<td>15</td>
<td>3</td>
<td></td>
<td>12</td>
<td></td>
<td>20</td>
<td>54</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>3</td>
<td>5</td>
<td>24</td>
<td>127</td>
<td>8</td>
<td></td>
<td>58</td>
<td>4</td>
<td>54</td>
<td>283</td>
<td></td>
</tr>
</tbody>
</table>

| Percentage  | 1.06 | 1.76 | 8.48 | 9.54 | 2.82 |   | 20.49 | 1.41 | 19.08 | 23.5 |

*Teacher = Categories 1-7; Student = Categories 8 and 9.

Percent Teacher Talk = 59.0
Percent Pupil Talk = 21.9
Percent Silence and Confusion = 19.1
Teacher Response Ratio = 50
Instantaneous Teacher Response Ratio = 100
Teacher Questions Ratio = 17.7
Instantaneous Teacher Question Ratio = 39.1
Pupil Initiation Ratio = 6.4
Content Cross Ratio = 70

Matrix 7. The Categories, Cells and Frequencies in a Second Grade Middle School Chemistry Lesson
Much emphasis was put by the teacher on subject matter discussion, as was evident in the (CCR) which was 15.6% higher than the average.

The teacher-student interchange was close to the standard ratio (51.6%).

The I/D was 0.23, the RI/D was 1.00. In general, the matrix does not reflect well balanced patterns of verbal behavior between the teacher and the students.

Matrix 8 presents the second observation for the same teacher and class.

The percentage of teacher talk was 57.1%, which is lower than the standard percentage of the first observation. The percentage of student talk increased to 25.3%, and that was higher both than the standard percentage and the average of the first observation. Though the periods of silence and confusion had decreased, it remained higher than that of the first observation and the standard percentage.

The cycle of interaction did not change much. More load was put on cells 5-6 and 6-8, and more initiation was exhibited by the students on cells 5-9, 9-9, 9-8.

Although the students initiation did increase (16.1%), it remained below the standard ratio by 17.9%.

The teacher response ratio decreased clearly in the second observation to 32.1% which was much below the standard ratio. The instantaneous teacher response ratio decreased to 75% in the second observation, though it remained higher than the average.
<table>
<thead>
<tr>
<th>Category #*</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>9</th>
<th>10</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>2</td>
<td>1</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>2</td>
<td>6</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td></td>
<td></td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>2</td>
<td>3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td></td>
<td>1</td>
<td>2</td>
<td>1</td>
<td>11</td>
<td>1</td>
<td>16</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td></td>
<td>7</td>
<td>63</td>
<td>8</td>
<td>3</td>
<td>1</td>
<td>96</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td></td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>10</td>
<td>2</td>
<td>18</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>4</td>
<td>2</td>
<td>4</td>
<td>4</td>
<td>21</td>
<td>1</td>
<td>5</td>
<td>52</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9</td>
<td></td>
<td>4</td>
<td></td>
<td>3</td>
<td>2</td>
<td>1</td>
<td>10</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10</td>
<td></td>
<td>2</td>
<td>12</td>
<td>4</td>
<td>4</td>
<td>6</td>
<td>15</td>
<td>43</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>6</td>
<td>3</td>
<td>16</td>
<td>18</td>
<td>1</td>
<td>52</td>
<td>43</td>
<td>245</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Percentage</td>
<td>2.44</td>
<td>1.22</td>
<td>6.53</td>
<td>18.93</td>
<td>.41</td>
<td>21.22</td>
<td>4.08</td>
<td>17.55</td>
<td></td>
<td></td>
<td>20.41 min.</td>
</tr>
</tbody>
</table>

*Teacher = Categories 1-7; Student = Categories 8 and 9.*

Percent Teacher Talk = 57.1
Percent Pupil Talk = 25.3
Percent Silence and Confusion = 17.5
Teacher Response Ratio = 32.1
Instantaneous Teacher Response Ratio = 75
Teacher Questions Ratio = 15.7
Instantaneous Teacher Question Ratio = 19
Pupil Initiation Ratio = 16.1
Steady State Ratio = 42.8
Content Cross Ratio = 62
Pupil Steady State Ratio = 37

Matrix 8. The Categories, Cells and Frequencies in a Second Grade Middle School Chemistry Lesson
Both (TQR) and (TQR 89) decreased clearly in the second observation and were much below the average ratios.

The teacher put less emphasis on the discussion of the subject matter in the second observation. When compared to the standard ratio, however, subject matter was still the main focus of the class discussion (62%).

The (SSR) was 42.8% and the (PSSR) was 37%. Both ratios were close to the average, as in the first observation.

The matrix reflects more directness than indirectness in the classroom behavioral patterns, than in the first observation.

The state of interaction did not improve in the second observation. More imbalanced patterns of behavior can be noticed in the second recorded lesson.

Matrix 9 represents the verbal interaction that occurred in the chemistry class of a second male teacher.

Unlike the teacher in the first two observations, this teacher seemed to be more active. He talked for 75.8% of the recorded lesson, and that was 7.8% higher than the average. The students talked for 21% of the total recorded lesson, and that was 1% higher than the standard ratio. The class was very quiet, as is evident in the low percentage of silence and confusion, which was only 3%, while the standard percentage is 11-12%. Although the averages of student talk were alike in the classes of the two teachers, the averages of silence and confusion were much different. The students were more controlled by the second teacher. The teacher was responsive as is clear in the (TRR) and in
<table>
<thead>
<tr>
<th>Category #*</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>9</th>
<th>10</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>2</td>
</tr>
<tr>
<td>2</td>
<td>1</td>
<td>5</td>
<td>4</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>11</td>
</tr>
<tr>
<td>3</td>
<td></td>
<td>2</td>
<td>3</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>5</td>
</tr>
<tr>
<td>4</td>
<td></td>
<td>1</td>
<td>1</td>
<td></td>
<td>35</td>
<td>1</td>
<td>2</td>
<td></td>
<td></td>
<td></td>
<td>40</td>
</tr>
<tr>
<td>5</td>
<td>1</td>
<td>4</td>
<td>15</td>
<td>84</td>
<td></td>
<td></td>
<td></td>
<td>2</td>
<td></td>
<td></td>
<td>111</td>
</tr>
<tr>
<td>6</td>
<td></td>
<td>2</td>
<td>2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>4</td>
</tr>
<tr>
<td>7</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>6</td>
<td>5</td>
<td>14</td>
<td>14</td>
<td></td>
<td></td>
<td></td>
<td>8</td>
<td></td>
<td></td>
<td>47</td>
</tr>
<tr>
<td>9</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>2</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td>4</td>
<td>7</td>
</tr>
<tr>
<td>Total</td>
<td>2</td>
<td>11</td>
<td>5</td>
<td>40</td>
<td>111</td>
<td>4</td>
<td>47</td>
<td>1</td>
<td>7</td>
<td></td>
<td>228</td>
</tr>
<tr>
<td>Percentage</td>
<td>.87</td>
<td>4.82</td>
<td>2.19</td>
<td>17.54</td>
<td>48.68</td>
<td>1.75</td>
<td>20.61</td>
<td>.4</td>
<td>3.07</td>
<td>19</td>
<td>min.</td>
</tr>
</tbody>
</table>

*Teacher = Categories 1-7; Student = Categories 8 and 9.

Percent Teacher Talk = 75  
Percent Pupil Talk = 21  
Percent Silence and Confusion = 0.3  
Teacher Response Ratio = 64.2  
Instantaneous Teacher Response Ratio = 73.3  
Teacher Questions Ratio = 34.7  
Instantaneous Teacher Question Ratio = 50  
Pupil Initiation Ratio = 2  
Content Cross Ratio = 52.6  

Matrix 9. The Categories, Cells and Frequencies in a Second Grade Middle School Chemistry Lesson
the (TRR 89) which were respectively; 64.2% and 73.3%. Both percentages are higher than the standard ratios.

The teacher did ask many questions even more than the standards. This is evident in ratios (TQR) and (TQR 89) which were respectively 34.7% and 50%.

The tendency of the teacher and student talk to remain in the same category for periods longer than 5 seconds was close to the average (45.6%). But the teacher-student interchange was very quick as was indicated by the (PSSR) which equalled 16.6%.

The students were not initiative in the class of the second teacher. The ratio of their initiation was (2%), and that is 32% below the standard ratio.

The I/D ratio was .50%, the RI/D was 4.5%. Apparently more indirectness than directness occurred in the verbal interaction of the recorded lesson.

In comparison with the standard percentages and ratios, the verbal interaction of the classroom cannot be judged as well balanced.

Matrix 10 represents the second observation for the same teacher and students. The percentage of teacher talk was higher than the standard ratio, though it was less than the percentage of the first observation by 1.6%. The percentage of student talk remained almost the same and very close to the standard percentage (20.6%). The periods of silence and confusion, though less than the average, were above the percentage of the previous lesson.

The cycle of interaction followed the same pattern of the first observation. The teacher directed the subject matter discussion. Most
### Matrix 10. The Categories, Cells and Frequencies in a
Second Grade Middle School Chemistry Lesson

<table>
<thead>
<tr>
<th>Category #*</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>9</th>
<th>10</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>2</td>
<td>5</td>
<td>3</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1</td>
<td></td>
<td></td>
<td>11</td>
</tr>
<tr>
<td>3</td>
<td></td>
<td>4</td>
<td>6</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>10</td>
</tr>
<tr>
<td>4</td>
<td></td>
<td>7</td>
<td></td>
<td>31</td>
<td>3</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>41</td>
</tr>
<tr>
<td>5</td>
<td></td>
<td>18</td>
<td>97</td>
<td></td>
<td>10</td>
<td></td>
<td></td>
<td>8</td>
<td></td>
<td></td>
<td>135</td>
</tr>
<tr>
<td>6</td>
<td></td>
<td></td>
<td>2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>2</td>
</tr>
<tr>
<td>7</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8</td>
<td></td>
<td>9</td>
<td>10</td>
<td>11</td>
<td>16</td>
<td></td>
<td></td>
<td>10</td>
<td></td>
<td></td>
<td>56</td>
</tr>
<tr>
<td>9</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10</td>
<td></td>
<td></td>
<td>3</td>
<td>4</td>
<td></td>
<td>4</td>
<td></td>
<td>5</td>
<td></td>
<td></td>
<td>16</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>11</td>
<td>10</td>
<td>41</td>
<td>135</td>
<td>2</td>
<td></td>
<td></td>
<td>56</td>
<td>16</td>
<td></td>
<td>271</td>
</tr>
<tr>
<td><strong>Percentage</strong></td>
<td>4.05</td>
<td>3.70</td>
<td>15.12</td>
<td>49.81</td>
<td>.74</td>
<td>20.66</td>
<td>5.90</td>
<td>22.58 min.</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Teacher = Categories 1-7; Student = Categories 8 and 9.*

Percent Teacher Talk = 73.4
Percent Pupil Talk = 20.6
Percent Silence and Confusion = 6
Teacher Response Ratio = 91.3
Instantaneous Teacher Response Ratio = 100
Teacher Questions Ratio = 29.9
Instantaneous Teacher Question Ratio = 40.7
Pupil Initiation Ratio = 0
Steady State Ratio = 42.8
Content Cross Ratio = 89.6
Pupil Steady State Ratio = 17.8
of the load was put on cells 5, 4, and 8. The teacher lectured, asked questions, and praised the students after receiving the answers.

The ratios of teacher responses indicate that the teacher was much more responsive to the feelings and ideas of his students than the first observation. The (TRR) was 91.3% and the (TRR 89) was 100%.

The teacher did ask many questions. The (TQR) was 29.9% which was 4.9% above the average. The (TQR 89) was 40.7%, and that was close to the average.

The (SST) was close to the average (42.8). But the teacher-student interchange was very quick as was indicated by the (PSSR) which equalled 17.8%.

The teacher put much more emphasis on the discussion of the subject matter, which was different from the previous lesson. The (CCR) was 89.6% which is 37% higher than the previous observation, and 34.6% above the standard ratio.

A zero ratio for the initiation of students in this classroom was indicated by the matrix.

The I/D was 0.45, the RI/D was 10.5. The indirectness was more than directness in the interaction of the classroom.

Like the first observation, and according to the standard percentages and ratios, the verbal interaction in the classes of the second teacher cannot be judged as well balanced in a manner that might have helped students to achieve the desired educational objectives of chemistry.

The verbal interaction that occurred in the classes of the third male chemistry teacher are presented in matrices 11 and 12.
Matrix 11 presents the first recorded observation. The percentages of teacher talk and students talk were very close to the standards. They were respectively 69.4% and 22%. The class was rather quiet, as can be indicated from the low percentage of silence and confusion 8.6%.

The cycle of interaction was like the following; 5, 8, 8, 4, 9, 3, 5. The ratios of teacher response and instantaneous teacher response, which were respectively 86.3% and 100%, were much more above the average in reactions to pupil ideas and feelings.

The teacher did ask many questions. The (TQR) is 5.5% above the standard ratio. But the teacher tended to lecture more than respond to student talk with questions based on his own ideas, as was indicated by the (TQR 89) which was below the standard ratio by 12%.

The teacher reflected great concern with the discussion of subject matter, as can be concluded from the (CCR) which was above the average by 24.1%. This result is not very different from the results of teachers 1 and 2, who both showed much emphasis on subject matter as a main focus for classroom interaction.

Like the other male teachers, this teacher had very low student initiation in the classroom. The (PIR) was 8.4.

Both the steady state ratio (44.4%) and the students steady state ratio (25.4%) were not very much below the standard ratios.

The I/D was 0.46, the RI/D was 6.34, the S/T was 0.34 and the EI/ED was 0.00.

Although the main two patterns of verbal behavior; teacher talk, student talk were close to the standard percentages, the rest of
<table>
<thead>
<tr>
<th>Category #*</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>9</th>
<th>10</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>2</td>
<td></td>
<td>1</td>
<td>2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>4</td>
</tr>
<tr>
<td>3</td>
<td></td>
<td>3</td>
<td>2</td>
<td>5</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>14</td>
</tr>
<tr>
<td>4</td>
<td></td>
<td></td>
<td>1</td>
<td>5</td>
<td>2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>40</td>
</tr>
<tr>
<td>5</td>
<td></td>
<td></td>
<td></td>
<td>1</td>
<td>22</td>
<td>92</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>124</td>
</tr>
<tr>
<td>6</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>2</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>3</td>
</tr>
<tr>
<td>7</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>3</td>
<td>8</td>
<td>6</td>
<td>17</td>
<td></td>
<td></td>
<td></td>
<td>15</td>
<td>5</td>
<td></td>
<td>54</td>
</tr>
<tr>
<td>9</td>
<td></td>
<td>2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>5</td>
</tr>
<tr>
<td>10</td>
<td></td>
<td>2</td>
<td>2</td>
<td>5</td>
<td>2</td>
<td></td>
<td></td>
<td>11</td>
<td>1</td>
<td></td>
<td>23</td>
</tr>
<tr>
<td>Total</td>
<td>1</td>
<td>4</td>
<td>14</td>
<td>40</td>
<td>124</td>
<td>3</td>
<td></td>
<td>54</td>
<td>5</td>
<td>23</td>
<td>268</td>
</tr>
<tr>
<td>Percentage</td>
<td>.37</td>
<td>1.49</td>
<td>5.22</td>
<td>14.92</td>
<td>46.27</td>
<td>1.11</td>
<td>20.14</td>
<td>1.86</td>
<td>6.58</td>
<td>22.33</td>
<td></td>
</tr>
</tbody>
</table>

*Teacher = Categories 1-7; Student = Categories 8 and 9.

Percent Teacher Talk = 69.4
Percent Pupil Talk = 22
Percent Silence and Confusion = 8.6
Teacher Response Ratio = 86.3
Instantaneous Teacher Response Ratio = 100
Teacher Questions Ratio = 31.5
Instantaneous Teacher Question Ratio = 32.0
Pupil Initiation Ratio = 8.4
Content Cross Ratio = 79.1

Matrix 11. The Categories, Cells and Frequencies in a Second Grade Middle School Chemistry Lesson
the patterns of behavior were not well balanced, and like the classes of the other male teacher, the interaction might not be considered to be helpful in creating the desired students behavioral changes.

Similar behavioral patterns of teacher-students interaction were reflected in the second observation of the class of the third teacher.

Matrix 12 shows the percentage of teacher talk was higher than the percentage of the first observation and above the standard percentage. The percentage of student talk was 19.8%, which was close to the average, though it was less than the percentage of the first observation. The percentage of silence and confusion was 6%, and that was half of the standard percentage.

The cycle of verbal interaction followed the same path of the interaction of the first observation, though there was more load on cells 4-9, and 9-9.

The teacher responded to the feelings and ideas of the students as is indicated by the (TRR) which equalled 86.3%. That ratio is above the standard ratio by 25.7%. The (TRR 89) was 68.4%. This ratio is above the standard ratio and the ratio of the first observation.

The teacher did ask many questions, even more than the average and more than the ratio of the first observation, as is indicated by the (TQR) which equalled 41.8%. But the questions that were asked by him instantaneously were few (15.7%).

The main focus of classroom discussion was put on subject matter. The (CCR) was 77.7% and that was less than the ratio of the first observation, and above the standard ratio by 22.7%.
### Matrix 12. The Categories, Cells and Frequencies in a Second Grade Middle School Chemistry Lesson

<table>
<thead>
<tr>
<th>Category #**</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>9</th>
<th>10</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>2</td>
</tr>
<tr>
<td>2</td>
<td></td>
<td>2</td>
<td>5</td>
<td>4</td>
<td></td>
<td></td>
<td></td>
<td>4</td>
<td>1</td>
<td></td>
<td>16</td>
</tr>
<tr>
<td>3</td>
<td></td>
<td>2</td>
<td>4</td>
<td>4</td>
<td></td>
<td></td>
<td></td>
<td>3</td>
<td>4</td>
<td></td>
<td>18</td>
</tr>
<tr>
<td>4</td>
<td></td>
<td>1</td>
<td>1</td>
<td>5</td>
<td>15</td>
<td></td>
<td></td>
<td>25</td>
<td>3</td>
<td></td>
<td>51</td>
</tr>
<tr>
<td>5</td>
<td></td>
<td>2</td>
<td></td>
<td>29</td>
<td>75</td>
<td></td>
<td></td>
<td>5</td>
<td>9</td>
<td></td>
<td>120</td>
</tr>
<tr>
<td>6</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1</td>
<td></td>
<td></td>
<td>1</td>
<td></td>
<td>2</td>
</tr>
<tr>
<td>7</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1</td>
<td>1</td>
<td>2</td>
<td></td>
<td>4</td>
</tr>
<tr>
<td>8</td>
<td>5</td>
<td>17</td>
<td>3</td>
<td>14</td>
<td></td>
<td></td>
<td>5</td>
<td>1</td>
<td></td>
<td></td>
<td>45</td>
</tr>
<tr>
<td>9</td>
<td>4</td>
<td></td>
<td>2</td>
<td></td>
<td>2</td>
<td>4</td>
<td></td>
<td>4</td>
<td>12</td>
<td></td>
<td>12</td>
</tr>
<tr>
<td>10</td>
<td></td>
<td></td>
<td>5</td>
<td>3</td>
<td>2</td>
<td>1</td>
<td>3</td>
<td>1</td>
<td>2</td>
<td></td>
<td>17</td>
</tr>
<tr>
<td>Total</td>
<td>2</td>
<td>16</td>
<td>18</td>
<td>51</td>
<td>120</td>
<td>2</td>
<td>4</td>
<td>45</td>
<td>12</td>
<td>17</td>
<td>287</td>
</tr>
<tr>
<td>Percentage</td>
<td>.69</td>
<td>5.57</td>
<td>6.27</td>
<td>17.77</td>
<td>41.81</td>
<td>.69</td>
<td>1.38</td>
<td>15.68</td>
<td>4.18</td>
<td>5.92</td>
<td>23.91</td>
</tr>
</tbody>
</table>

*Teacher = Categories 1-7; Student = Categories 8 and 9.*

- Percent Teacher Talk = 74.2
- Percent Pupil Talk = 19.8
- Percent Silence and Confusion = 6
- Teacher Response Ratio = 85.7
- Instantaneous Teacher Response Ratio = 68.4
- Teacher Questions Ratio = 41.8
- Instantaneous Teacher Question Ratio = 15.7
- Pupil Initiation Ratio = 21.0
- Steady State Ratio = 33.1
- Content Cross Ratio = 77.7
- Pupil Steady State Ratio = 15.7
The interchange between the teacher and the pupils was very quick, as it is indicated by the (SSR) which equalled 33.1%, which is 16.9% below the standard ratio.

The pupil initiation ratio was 21%, and that was higher than the ratio of the first observation, and higher than the pupil initiation ratios of the first and second chemistry classes.

The I/D was 0.69%, the RI/D was 6.00%. The indirectness was more than the directness in the second recorded observation.

Although the teacher was very active and the students talked for a satisfactory time and took more initiative than the students in some other classrooms, the matrix indicates a lack of more balance according to the standard ratios and percentages. Instructionally the interaction cannot be considered average.

Table 5 presents the total means that were obtained from the percentages and ratios of the behavioral patterns in the six chemistry classes that were taught by male teachers. Both total means of the first and second observations are presented in this table.

The averages of the percentages of teacher talk, pupil talk, and silence and confusion in the first observations were respectively: 67.8%, 21.6% and 10.2%.

No significant differences appeared in the three mentioned above percentages in the second observations. According to the standard percentages the main three patterns of behavior were adequate, both in the first and second observations.

The average of teacher response was higher than the standard ratio by 24.8%, and it tended to be higher in the second observations.
<table>
<thead>
<tr>
<th>Pattern of Behavior</th>
<th>First Observations</th>
<th>Second Observations</th>
<th>Average</th>
<th>Average</th>
<th>Mean</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>T # 1  T # 2  T # 3</td>
<td>T # 1  T # 2  T # 3</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>TT</td>
<td>59.0  75.0  69.4</td>
<td>67.8</td>
<td>57.1</td>
<td>73.4</td>
<td>74.2</td>
</tr>
<tr>
<td>PT</td>
<td>21.9  21.0  22.0</td>
<td>21.6</td>
<td>25.3</td>
<td>20.6</td>
<td>19.8</td>
</tr>
<tr>
<td>SC</td>
<td>19.1  3.0   8.6</td>
<td>10.2</td>
<td>17.5</td>
<td>6.0</td>
<td>6.0</td>
</tr>
<tr>
<td>TRR</td>
<td>50.0  64.2  86.3</td>
<td>66.8</td>
<td>52.1</td>
<td>91.3</td>
<td>85.7</td>
</tr>
<tr>
<td>TRR 89</td>
<td>100   73.3  100</td>
<td>91.1</td>
<td>75.0</td>
<td>100</td>
<td>68.4</td>
</tr>
<tr>
<td>TQR</td>
<td>17.7  34.7  31.5</td>
<td>27.9</td>
<td>15.7</td>
<td>29.9</td>
<td>41.8</td>
</tr>
<tr>
<td>TQR 89</td>
<td>39.1  50.0  32.0</td>
<td>40.3</td>
<td>19.0</td>
<td>40.7</td>
<td>15.7</td>
</tr>
<tr>
<td>PIR</td>
<td>6.4   2.0   8.4</td>
<td>5.6</td>
<td>16.1</td>
<td>0.0</td>
<td>21.0</td>
</tr>
<tr>
<td>CCR</td>
<td>70.6  52.6  79.1</td>
<td>67.4</td>
<td>62.0</td>
<td>89.6</td>
<td>77.7</td>
</tr>
<tr>
<td>SSR</td>
<td>49.9  45.6  44.4</td>
<td>46.6</td>
<td>42.8</td>
<td>42.8</td>
<td>33.1</td>
</tr>
<tr>
<td>PSSR</td>
<td>51.6  16.6  25.4</td>
<td>31.2</td>
<td>37.0</td>
<td>17.8</td>
<td>15.7</td>
</tr>
</tbody>
</table>

The average of the instantaneous teacher response was higher than the standards by 31.1%, though it tended to show a slight decrease in the second observations (86.1%).

The questions of the teachers showed an increase of 1.6% in the second observations. In both the first and second observations the averages of teachers questions were very adequate.

In the first observations the teachers tended to ask more questions based on their ideas, compared to their tendency to lecture. The average of the (TQR 89) was very close to the standards in the first observations, but it showed a decrease of 12.7% in the second observations.
Although the average of pupil initiation in the second observations was higher than the first, in all observations it remained much below the standards (8.9%).

In all observations the emphasis of teachers on the discussion of subject matter was much higher than the standard emphasis (71.9%), though in the second observations it tended to be higher than it was in the first.

The steady state ratio, on average, was close to the standards in the first observations (46.6%), but it dropped to (39.5%) in the second observations.

The pupil steady state ratios, on average, were higher in the first observations (31.2%) than they were in the second observations (23.5%). The total mean of all observations is below the standards by 9.8%.

Table 6 indicates that the indirectness versus directness on average was more in the second observations than the first, while the revised indirectness versus directness increased by 2.38%, which reflected an improvement in the social-emotional climate of the classroom.

Table 7 presents a comparison between the total means of the verbal behavioral patterns of both female and male chemistry teachers. The following results were obtained for each behavioral pattern:

1. For teacher talk, the male teachers tended to talk somewhat more than the female teachers. The total means for male teacher talk was 68% while it was 66.2% for female teachers. The total means of both sexes were nearly the same, like the standards.
TABLE 6

TEACHERS INDIRECTNESS/DIRECTNESS IN CHEMISTRY
CLASSES: MALE TEACHERS

<table>
<thead>
<tr>
<th>Teacher #</th>
<th>First Observations</th>
<th>Second Observations</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>I/D</td>
<td>RI/D</td>
</tr>
<tr>
<td>1</td>
<td>0.23</td>
<td>1.00</td>
</tr>
<tr>
<td>2</td>
<td>0.50</td>
<td>4.50</td>
</tr>
<tr>
<td>3</td>
<td>0.46</td>
<td>6.30</td>
</tr>
<tr>
<td>Average</td>
<td>0.39</td>
<td>3.93</td>
</tr>
</tbody>
</table>

Total Mean I/D = 0.42
Total Mean RI/D = 4.79

2. For pupil talk, in the classes of male teachers the students tended to talk little more than the students in the classes of female teachers. The total mean of boys talk was 21.7% while the total mean of girls talk was 21.1%. Both total means of boys and girls talk were almost the same, like the standards.

3. For silence and confusion, the classes of female teachers had more periods of silence and confusion (12.6%) than the classes of male teachers (10.0%). The classes of teachers of both sexes had a general total mean that equalled the standard mean.

4. For teacher response, the male teachers were more responsive to their students than female teachers. The (TRR) of male teachers had a mean of 68.2%, while the female teachers had a mean of 66%. The general total mean of teacher responses of both sexes is higher than the average by 25.1%.
TABLE 7
VERBAL BEHAVIOR PATTERNS IN CHEMISTRY CLASSES:
A COMPARISON BETWEEN FEMALE AND MALE
CHEMISTRY CLASSROOMS

<table>
<thead>
<tr>
<th>Pattern of Behavior</th>
<th>First Observations</th>
<th>Second Observations</th>
<th>Average</th>
<th>Mean</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>T # 1</td>
<td>T # 2</td>
<td>T # 3</td>
<td>T # 1</td>
</tr>
<tr>
<td>Female Teachers</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>TT</td>
<td>60.7</td>
<td>72.8</td>
<td>68.8</td>
<td>67.4</td>
</tr>
<tr>
<td>PT</td>
<td>19.0</td>
<td>17.7</td>
<td>24.3</td>
<td>20.3</td>
</tr>
<tr>
<td>SC</td>
<td>20.3</td>
<td>9.5</td>
<td>6.8</td>
<td>12.2</td>
</tr>
<tr>
<td>TRR</td>
<td>57.5</td>
<td>70.3</td>
<td>78.9</td>
<td>68.9</td>
</tr>
<tr>
<td>TRR 89</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
</tr>
<tr>
<td>TQR</td>
<td>18.8</td>
<td>25.9</td>
<td>37.1</td>
<td>21.2</td>
</tr>
<tr>
<td>TQR 89</td>
<td>69.2</td>
<td>12.5</td>
<td>36.8</td>
<td>29.5</td>
</tr>
<tr>
<td>PIR</td>
<td>2.1</td>
<td>12.7</td>
<td>6.6</td>
<td>7.1</td>
</tr>
<tr>
<td>CCR</td>
<td>55.0</td>
<td>86.7</td>
<td>87.4</td>
<td>75.3</td>
</tr>
<tr>
<td>SSR</td>
<td>45.3</td>
<td>41.8</td>
<td>40.0</td>
<td>42.3</td>
</tr>
<tr>
<td>PSSR</td>
<td>27.6</td>
<td>19.1</td>
<td>18.3</td>
<td>21.6</td>
</tr>
<tr>
<td>Male Teachers</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>TT</td>
<td>59.0</td>
<td>75.0</td>
<td>69.4</td>
<td>67.8</td>
</tr>
<tr>
<td>PT</td>
<td>21.9</td>
<td>21.0</td>
<td>22.0</td>
<td>21.6</td>
</tr>
<tr>
<td>SC</td>
<td>19.1</td>
<td>3.0</td>
<td>8.6</td>
<td>10.2</td>
</tr>
<tr>
<td>TRR</td>
<td>50.0</td>
<td>64.2</td>
<td>86.3</td>
<td>66.8</td>
</tr>
<tr>
<td>TRR 89</td>
<td>100</td>
<td>73.3</td>
<td>100</td>
<td>91.1</td>
</tr>
<tr>
<td>TQR</td>
<td>17.7</td>
<td>34.7</td>
<td>31.5</td>
<td>27.9</td>
</tr>
<tr>
<td>TQR 89</td>
<td>39.1</td>
<td>50.0</td>
<td>32.0</td>
<td>40.3</td>
</tr>
<tr>
<td>PIR</td>
<td>6.4</td>
<td>2.0</td>
<td>8.4</td>
<td>5.6</td>
</tr>
<tr>
<td>CCR</td>
<td>70.6</td>
<td>52.6</td>
<td>79.1</td>
<td>67.4</td>
</tr>
<tr>
<td>SSR</td>
<td>49.9</td>
<td>45.6</td>
<td>44.4</td>
<td>46.6</td>
</tr>
<tr>
<td>PSSR</td>
<td>51.6</td>
<td>16.6</td>
<td>25.4</td>
<td>31.2</td>
</tr>
</tbody>
</table>

General total percentage of female and male chemistry teachers:
TT = 67.1; PT = 21.4; SC = 11.3; TRR = 67.1; TRR 89 = 92.3; TQR = 27.5;
TQR 89 = 37.4; PIR = 10.1; CCR = 72.4; SSR = 43.3; PSSR = 26.8.
5. For instantaneous teacher response, the total mean of female teachers was 98.6%, and that was higher than the total mean of male teachers by 12.5%. The general total mean is above the average by 32.3%.

6. For teachers questions, the male teachers tended to ask more questions than female teachers. The male teachers total mean was 28.5%, while it was 26.5% for female teachers. The general total mean is very close to the standards mean.

7. For instantaneous teacher questions, the female teachers had a total mean of 42.1% while the male teachers had a total mean of 32.7%. The general total mean of both sexes is 37.4% and that was below the average by 7.4%.

8. For pupil initiation, the students in the female teachers classes had a total mean of 11.4%, while the students in the male teachers classes had a total mean of 8.9%. The general total mean of pupil initiation was 10.1% which is much lower than the standards mean that equals 34%. The students in the classes of both female and male chemistry teachers cannot be described as being initiative.

9. For subject matter emphasis (CCR), although the female teachers had a total mean that was higher by 1.9% than the total mean of male teachers, both teachers reflected a great emphasis on subject matter discussion. The general total mean of the (CCR) was 72.4% which is higher than the standards by 17.4%.

10. For steady state ratios, on average, the total mean of the female teachers was higher than the total mean of male teachers. The
general total mean for both teachers was 43.3% which is below the average by 6.7%.

11. For the pupil steady ratios, on average, the total mean of the male teachers was higher than the total mean of female teachers. The general total mean of both teachers was 26.8% which is below the average by 9.2%.

The total mean of I/D in the classes of male teachers is found to be higher than the same kind of interaction in the classes of female teachers. The RI/D in the classes of male teachers had a total mean that was higher than that of the female teachers. The patterns of interaction in the classes of male teachers is more varied and balanced than the classes of female teachers (Table 8).

| TABLE 8 |
|---|---|---|
| TEACHERS INDIRECTNESS/DIRECTNESS IN CHEMISTRY CLASSES: A COMPARISON BETWEEN FEMALE AND MALE TEACHERS |
| Teachers | I/D  | RI/D |
| Female   | 0.41 | 1.80 |
| Male     | 0.42 | 4.79 |
| Average  | 0.41 | 3.29 |

In sum, the general total means of behavioral patterns of chemistry teachers in the second year of the middle schools, according to the standard percentages and ratios, tended to be average for teachers talk, student talk and periods of silence and confusion. The
teachers were very responsive. They asked questions. The interchange
between them and the pupils tended to be very rapid. They put great
emphasis on subject matter discussion as a main classroom activity.
The teacher was the real master of the classroom. The students were
very poor in their initiation. The teachers were direct in their
interaction. But when eliminating their tendency to lecture they
seemed indirect in their approach to control and motivation.

Group 3: The Verbal Behavior
Patterns of Physics
Female Teachers

Matrix 13 presents the first physics classroom verbal inter­
action that occurred in a second year Middle School for Girls.

The percentage of teacher talk was 66.7% and that was 1.3%
below the average. The percentage of pupil talk was 17.4% and that was
2.6% below the average. The periods of silence and confusion were 4.9%
above the average.

The teacher response ratio was nearly the same, like the
standard ratio (45.7). But the instantaneous teacher response ratio
was much higher than the standard ratio. It was 81.8%.

The (TQR) indicates that the teacher did ask many questions.
This ratio was 32.3%. The (TQR 89) was above the average by 1.8%.

The content cross ratio of 77.3% reflects the great emphasis of
the teacher on the discussion of subject matter, which was higher than
the average by 22.3%.

The steady state ratio was 35.8% and that is below the average
by 14.2%. The pupil steady state ratio was 24.5% and that was below
the average by 11.5%.
<table>
<thead>
<tr>
<th>Category #*</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>9</th>
<th>10</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td></td>
<td>2</td>
<td>3</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>5</td>
</tr>
<tr>
<td>3</td>
<td></td>
<td>4</td>
<td>6</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>11</td>
</tr>
<tr>
<td>4</td>
<td></td>
<td></td>
<td>13</td>
<td>18</td>
<td>14</td>
<td>45</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td></td>
<td>3</td>
<td>3</td>
<td>16</td>
<td>80</td>
<td></td>
<td></td>
<td>11</td>
<td>10</td>
<td>123</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td></td>
<td></td>
<td></td>
<td>2</td>
<td>6</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>16</td>
</tr>
<tr>
<td>7</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td>3</td>
</tr>
<tr>
<td>8</td>
<td>2</td>
<td>7</td>
<td>11</td>
<td>13</td>
<td>2</td>
<td></td>
<td></td>
<td>13</td>
<td></td>
<td></td>
<td>53</td>
</tr>
<tr>
<td>9</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10</td>
<td></td>
<td></td>
<td>1</td>
<td>12</td>
<td>6</td>
<td>8</td>
<td>1</td>
<td>11</td>
<td></td>
<td></td>
<td>48</td>
</tr>
<tr>
<td>Total</td>
<td>5</td>
<td>11</td>
<td>45</td>
<td>123</td>
<td>16</td>
<td>3</td>
<td>53</td>
<td></td>
<td></td>
<td></td>
<td>304</td>
</tr>
<tr>
<td>Percentage</td>
<td>1.64</td>
<td>3.61</td>
<td>14.80</td>
<td>40.46</td>
<td>5.2</td>
<td>.98</td>
<td>17.43</td>
<td>15.79</td>
<td>25.33</td>
<td>min.</td>
<td></td>
</tr>
</tbody>
</table>

*Teacher = Categories 1-7; Student = Categories 8 and 9.*

Percent Teacher Talk = 66.7
Percent Pupil Talk = 17.4
Percent Silence and Confusion = 15.9
Teacher Response Ratio = 45.7
Instantaneous Teacher Response Ratio = 81.8
Teacher Questions Ratio = 32.3
Instantaneous Teacher Question Ratio = 45.8
Pupil Initiation Ratio = 0
Steady State Ratio = 35.8
Content Cross Ratio = 77.3
Pupil Steady State Ratio = 24.5

Matrix 13. The Categories, Cells and Frequencies in a Second Grade Middle School Physics Lesson
The cycle of interaction took the following path: 5-5, 5-4, 4-8, 8-8, 8-4, 4-10, 10-10, 10-5, 5-10. Apparently the teacher tended to lecture and to ask questions which did not stimulate the students. The pupil initiation ratio was 0.0%. The teacher had the main role in classroom activities, while the role of the students was very weak.

The classroom verbal interaction might not be judged to fulfill the desired educational objectives of learning physics.

Matrix 14 presents the second recorded classroom verbal interaction for the same teacher and students.

The percentage of teacher talk was 1.6% higher than the ratio of the first observation. It was very close to the average percentage. The percentage of student talk was almost the same, like the average ratio (20.1%). The periods of silence and confusion were almost the same, like the average percentage.

Like the first observation, the teacher was responsive to the ideas and feelings of the students as is evident in the (TRR) which equalled 44.4%. But he was more responsive in his instantaneous questions, in the second observation, as is evident in the (TRR 89) which equalled 100%.

In the second observation, the teacher tended to ask more questions. The (TQR) equalled 35.4%, which was 9.7% above the average. But the instantaneous questions dropped to half of the first observation. The (TQR 89) equalled 18.7% and that was 26.7% below the standard ratio.

A greater emphasis on the discussion of subject matter was clear in the matrix of second observation. It was equal to 84.3% and that
<table>
<thead>
<tr>
<th>Category #</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>9</th>
<th>10</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></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>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>4</td>
</tr>
<tr>
<td>3</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>4</td>
</tr>
<tr>
<td>4</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>24</td>
<td></td>
<td></td>
<td>45</td>
</tr>
<tr>
<td>5</td>
<td></td>
<td></td>
<td>2</td>
<td>1</td>
<td>31</td>
<td>66</td>
<td>2</td>
<td>2</td>
<td>1</td>
<td></td>
<td>117</td>
</tr>
<tr>
<td>6</td>
<td></td>
<td></td>
<td>1</td>
<td>6</td>
<td></td>
<td></td>
<td></td>
<td>1</td>
<td>1</td>
<td></td>
<td>9</td>
</tr>
<tr>
<td>7</td>
<td></td>
<td></td>
<td></td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>8</td>
<td></td>
<td>2</td>
<td>2</td>
<td>6</td>
<td>25</td>
<td></td>
<td></td>
<td>15</td>
<td>2</td>
<td></td>
<td>52</td>
</tr>
<tr>
<td>9</td>
<td></td>
<td>2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>2</td>
</tr>
<tr>
<td>10</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>11</td>
<td>7</td>
<td>1</td>
<td></td>
<td>34</td>
</tr>
<tr>
<td>Total</td>
<td>4</td>
<td>4</td>
<td>45</td>
<td>117</td>
<td>9</td>
<td>1</td>
<td></td>
<td>52</td>
<td>2</td>
<td>34</td>
<td>268</td>
</tr>
<tr>
<td>Percentage</td>
<td>1.49</td>
<td>1.49</td>
<td>16.79</td>
<td>43.66</td>
<td>3.35</td>
<td>.37</td>
<td>.1940</td>
<td>.75</td>
<td>12.68</td>
<td>22.33</td>
<td></td>
</tr>
</tbody>
</table>

*Teacher = Categories 1-7; Student = Categories 8 and 9.

Percent Teacher Talk = 67.1
Percent Pupil Talk = 20.1
Percent Silence and Confusion = 12.6
Teacher Response Ratio = 44.4
Instantaneous Teacher Response Ratio = 100
Teacher Questions Ratio = 35.7
Instantaneous Teacher Question Ratio = 18.7
Pupil Initiation Ratio = 3.7
Content Cross Ratio = 84.3

Matrix 14. The Categories, Cells and Frequencies in a
Second Grade Middle School Physics Lesson
was 29.3% above the average.

The steady state ratio was 32.0% which was 18% below the average. The pupil steady state ratio was 27.7% and that was 8.7% below the average.

The cycle of interaction in the second observation did not differ from that of the first observation except there was more load on cell 8-3.

No significant differences appeared in the I/D ratio, RI/D ratio in both observations. The directness seemed to be more than indirectness in the two lessons, when eliminating the effect of category 5.

According to the standard averages, the second observation, like the first observation, cannot be judged to be well balanced in teacher-student verbal interaction which might have helped in the achievement of student behavioral changes.

Matrix 15 presents the recorded verbal interaction of the second physics female teacher.

The percentage of teacher talk was 74.6% and that was 6.6% above the average. The percentage of student talk was 18.0% and that was 2% below the average. The classroom was quiet as it was indicated by the low percentage of silence and confusion (7.4%).

Although the teacher did talk more than the students and was more active than them, the students were very initiative in the lesson as was indicated by the (PIR) which equaled 40.8%.

The cycle of interaction took the following path: 5-4, 4-8, 8-5, 5-4, 4-9, 9-8, 8-3.
<table>
<thead>
<tr>
<th>Category</th>
<th>Teacher</th>
<th>Student</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>1</td>
<td>1</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td></td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>4</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td></td>
<td></td>
<td>20</td>
</tr>
<tr>
<td>6</td>
<td></td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>7</td>
<td></td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>8</td>
<td>8</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>9</td>
<td></td>
<td>1</td>
<td>17</td>
</tr>
<tr>
<td>10</td>
<td>2</td>
<td>2</td>
<td>10</td>
</tr>
<tr>
<td>Total</td>
<td>3</td>
<td>4</td>
<td>10</td>
</tr>
<tr>
<td>Percentage</td>
<td>1.10</td>
<td>1.47</td>
<td>3.67</td>
</tr>
</tbody>
</table>

*Teacher = Categories 1-7; Student = Categories 8 and 9.

Percent Teacher Talk = 74.6
Percent Pupil Talk = 18.0
Percent Silence and Confusion = 7.4
Teacher Response Ratio = 43.5
Instantaneous Teacher Response Ratio = 80
Teacher Questions Ratio = 20.2
Instantaneous Teacher Question Ratio = 19.2
Pupil Initiation Ratio = 40.8
Content Cross Ratio = 79.0

Matrix 15. The Categories, Cells and Frequencies in a Second Grade Middle School Physics Lesson
The teacher was average in her responses as was indicated by the (TRR) which equalled 43.5%. But she was above average in her instantaneous responses, as was indicated by the (TQR 89) which was 80.0%.

Though the questions of the teacher was below the average as was indicated by the (TQR) which equalled 20.2%, the students seemed to be very responsive.

The instantaneous teacher response ratio was 19.2% and that was below the average by 25.2%.

Like the first teacher of physics, the teacher put great emphasis on the discussion of subject matter. The content cross ratio was 79.0%.

The steady state ratio was close to the standard ratio (46.7%), but the pupil steady state ratio was much below the standard ratio (14.2). The pupil-teacher interchange was very quick.

The I/D ratio and the RI/D ratio, were respectively, 0.30%, 1.40%.

According to the standard percentages and ratios, the interaction was not well balanced, though it was distinguished by the high ratio of pupil initiation.

Matrix 16 presents the second recorded observation for the same teacher and students.

Although teacher talk covered 70.7% of the recorded interaction, and the students talk covered 16.8% of the recorded interaction, the students initiation ratio was unusual. It equalled 48.8%, which was above the standard ratio by 14.8%. The students were initiative in the
<table>
<thead>
<tr>
<th>Category #*</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>9</th>
<th>10</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>3</td>
<td></td>
<td>5</td>
<td>2</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>10</td>
</tr>
<tr>
<td>4</td>
<td></td>
<td></td>
<td>2</td>
<td>2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>9</td>
<td>12</td>
</tr>
<tr>
<td>5</td>
<td></td>
<td></td>
<td></td>
<td>10</td>
<td>2</td>
<td>1</td>
<td></td>
<td>2</td>
<td>1</td>
<td>12</td>
<td>134</td>
</tr>
<tr>
<td>6</td>
<td></td>
<td></td>
<td>2</td>
<td>2</td>
<td>1</td>
<td></td>
<td></td>
<td>1</td>
<td></td>
<td></td>
<td>7</td>
</tr>
<tr>
<td>7</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>8</td>
<td></td>
<td></td>
<td></td>
<td>5</td>
<td>1</td>
<td></td>
<td></td>
<td>9</td>
<td>7</td>
<td></td>
<td>22</td>
</tr>
<tr>
<td>9</td>
<td></td>
<td></td>
<td>1</td>
<td>15</td>
<td></td>
<td></td>
<td></td>
<td>4</td>
<td>1</td>
<td></td>
<td>21</td>
</tr>
<tr>
<td>10</td>
<td>2</td>
<td>10</td>
<td>9</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td>4</td>
<td>6</td>
<td></td>
<td>32</td>
</tr>
<tr>
<td>Total</td>
<td>1</td>
<td>2</td>
<td>10</td>
<td>26</td>
<td>134</td>
<td>7</td>
<td>1</td>
<td>22</td>
<td>21</td>
<td>32</td>
<td>256</td>
</tr>
<tr>
<td>Percentage</td>
<td>.39</td>
<td>.78</td>
<td>3.9</td>
<td>10.15</td>
<td>52.34</td>
<td>2.73</td>
<td>.39</td>
<td>8.59</td>
<td>8.20</td>
<td>12.5</td>
<td>21.33</td>
</tr>
</tbody>
</table>

*Teacher = Categories 1-7; Student = Categories 8 and 9.

Percent Teacher Talk = 70.7
Percent Pupil Talk = 16.8
Percent Silence and Confusion = 12.0
Teacher Response Ratio = 61.9
Instantaneous Teacher Response Ratio = 100
Teacher Questions Ratio = 18.5
Instantaneous Teacher Question Ratio = 11.7
Pupil Initiation Ratio = 48.8
Content Cross Ratio = 78.9
Steady State Ratio = 51.5
Pupil Steady State Ratio = 30.2

Matrix 16. The Categories, Cells and Frequencies in a Second Grade Middle School Physics Lesson
first observation and more initiative in the second observation.

Average periods of silence and confusion appeared in the matrix, which was equal to 12.0%.

The cycle of interaction followed the path of: 5-8, 8-8, 8-3, 3-5, 5-4, 4-9, 9-5, 5-10.

The teacher was very responsive to the feelings and ideas of the students. The (RRT) was 61.0% which was higher than the ratio of the first observation and above the average by 17.9%. The (TRR 89) was 100% and that was much higher than the first observation and the standard ratio.

The (TQR) was 18.5% and the (TQR 89) was 11.7%. Although the questions of the teacher had dropped below the average and were less than the questions and the instantaneous questions of the first observation, the students were very responsive.

The steady state ratio was almost the same, like the standard ratio (51.5%). The pupil steady ratio was 30.2%, and that was 4.8% below the standard ratio.

The I/D was .27%, the RI/D was 1.62%. In general the social emotional climate of the classroom was more positive in the second observation when compared with that of the first.

Although the teacher was very responsive and asked instantaneously few questions, the students were active. The classroom interaction can be judged as well balanced interaction.

Matrix 17 presents the recorded verbal interaction in the classroom of the third female teacher of physics.
<table>
<thead>
<tr>
<th>Category #*</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>9</th>
<th>10</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>2</td>
<td></td>
<td>3</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>7</td>
</tr>
<tr>
<td>3</td>
<td></td>
<td>4</td>
<td></td>
<td>3</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>10</td>
</tr>
<tr>
<td>4</td>
<td></td>
<td></td>
<td></td>
<td>1</td>
<td></td>
<td>19</td>
<td>10</td>
<td></td>
<td></td>
<td></td>
<td>30</td>
</tr>
<tr>
<td>5</td>
<td></td>
<td>9</td>
<td>68</td>
<td>2</td>
<td>1</td>
<td></td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td>83</td>
</tr>
<tr>
<td>6</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>3</td>
<td></td>
<td></td>
<td></td>
<td>2</td>
<td>1</td>
<td>6</td>
</tr>
<tr>
<td>7</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1</td>
<td></td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>8</td>
<td></td>
<td>3</td>
<td>8</td>
<td>12</td>
<td>2</td>
<td></td>
<td></td>
<td>8</td>
<td></td>
<td>5</td>
<td>38</td>
</tr>
<tr>
<td>9</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>10</td>
<td></td>
<td>2</td>
<td>6</td>
<td>5</td>
<td>2</td>
<td></td>
<td>2</td>
<td></td>
<td></td>
<td>17</td>
<td>34</td>
</tr>
<tr>
<td>Total</td>
<td>1</td>
<td>7</td>
<td>10</td>
<td>30</td>
<td>83</td>
<td>6</td>
<td>1</td>
<td>38</td>
<td>1</td>
<td>34</td>
<td>211</td>
</tr>
<tr>
<td>Percentage</td>
<td>.47</td>
<td>3.32</td>
<td>4.73</td>
<td>14.22</td>
<td>39.33</td>
<td>2.84</td>
<td>.47</td>
<td>18.01</td>
<td>.47</td>
<td>16.12</td>
<td>17.58</td>
</tr>
</tbody>
</table>

*Teacher = Categories 1-7; Student = Categories 8 and 9.

Percent Teacher Talk = 65.9
Percent Pupil Talk = 18.4
Percent Silence and Confusion = 16.2
Teacher Response Ratio = 69.2
Instantaneous Teacher Response Ratio = 100
Teacher Questions Ratio = 33.7
Instantaneous Teacher Question Ratio = 80
Pupil Initiation Ratio = 2.5
Steady State Ratio = 45.0
Content Cross Ratio = 70.6
Pupil Steady State Ratio = 23

**Matrix 17. The Categories, Cells and Frequencies in a Second Grade Middle School Physics Lesson**
The percentages of teacher talk, student talk and silence and confusion were respectively 65.4%, 18.4% and 16.2%. The percentage of teacher talk was 2.6% below the average. The percentage of student talk was 1.6% below the average. The silence and confusion periods were above the average.

The cycle of interaction took the following path: 5-5, 5-8, 8-8, 8-4, 4-10, 10-8, 8-3, 3-5.

The teacher was responsive like the previously observed two female physics teachers. The (TRR) was 69.2% and the (TRR 89) was 100%. Both ratios were much above the average ratios.

The teacher asked many questions as was indicated by the (TQR) which equalled 33.7% and that was above the standard ratio by 7.7%. The instantaneous teacher question ratio was 80% which doubled the standard ratio.

All those efforts of the teacher were not enough to stimulate the students. The (PIR) was only 2.5% while the standard ratio was 34%. They kept on listening and answering the questions of the teacher.

Like the other two teachers, the third teacher put a great emphasis on the discussion of the subject matter as was indicated by the (CCR) which was equal to 70.6%, while the average ratio is 55%.

The steady state ratio was 5% below the average. The pupil steady state ratio was 12, below the average ratio, which indicates a very quick teacher pupil interchange.

The other ratios of I/D, RI/D were, respectively, 0.42%, 2.57%.

The first classroom verbal interaction of the third female physics teacher cannot be judged as well balanced, as a result of
student participation and the percentages of interaction.

Matrix 18 presents the second recorded classroom verbal interaction for the third female physics teacher and her students.

The teacher tended to be more active in lecturing. The percentage of teacher talk (78.6%) was higher than that of the first observation and above the standard percentage by 10.6%. The students did not reflect an active participation. They did not respond to the lecture of the teacher effectively. They kept silent most of the time in a quiet classroom, listening to the teacher talk. The percent of the student talk indicated their poor interaction with the teacher and with each other (15.1%). The teacher continued talking for a long time without being interrupted by a student seeking for a clarification or searching for an answer to a complicated point. The percent of silence and confusion was half of the standard percentage (6.2%), while it was above the average during the first observation.

The teacher was responsive to the ideas and feelings of the students as was indicated by both the (TRR) which equalled 70% and the (TRR 89) which equalled 100%.

The average of the teacher's questions was very low (15.3%) and the average of the instantaneous questions was very low too (25%).

The lecture of the teacher and her questions did not succeed in stimulating the students, as was evident in the low ratio of student initiation which equalled 4.8%.

The interchange between the teacher and the students was very slow as was indicated by the high ratio (SST) which equalled 67% and that was above the standard ratio by 17%. But when the students stopped
<table>
<thead>
<tr>
<th>Category #*</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>9</th>
<th>10</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2</td>
<td>2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1</td>
<td></td>
<td></td>
<td>5</td>
</tr>
<tr>
<td>2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>2</td>
</tr>
<tr>
<td>3</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></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>
<td></td>
<td></td>
<td></td>
<td></td>
<td>21 2 3</td>
<td>26</td>
</tr>
<tr>
<td>5</td>
<td>1</td>
<td>19</td>
<td>144</td>
<td>2</td>
<td></td>
<td></td>
<td></td>
<td>1</td>
<td></td>
<td></td>
<td>167</td>
</tr>
<tr>
<td>6</td>
<td></td>
<td></td>
<td>1</td>
<td></td>
<td></td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>3</td>
</tr>
<tr>
<td>7</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>15</td>
<td></td>
<td></td>
<td></td>
<td>16</td>
<td></td>
<td></td>
<td>39</td>
</tr>
<tr>
<td>9</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>2</td>
<td></td>
<td>2</td>
</tr>
<tr>
<td>10</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>5</td>
<td></td>
<td>16</td>
</tr>
<tr>
<td>Total</td>
<td>5</td>
<td>2</td>
<td>26</td>
<td>167</td>
<td>3</td>
<td></td>
<td></td>
<td>39</td>
<td>2</td>
<td></td>
<td>258</td>
</tr>
<tr>
<td>Percentage</td>
<td>1.93</td>
<td>.77</td>
<td>0.0</td>
<td>10.07</td>
<td>64.72</td>
<td>1.16</td>
<td>0.0</td>
<td>15.12</td>
<td>.77</td>
<td>6.20</td>
<td>21.5 min.</td>
</tr>
</tbody>
</table>

*Teacher = Categories 1-7; Student = Categories 8 and 9.

Percent Teacher Talk = 78.6
I/D = 0.19
Percent Pupil Talk = 15.1
RI/D = 2.33
Percent Silence and Confusion = 6.2
Teacher Response Ratio = 70
Instantaneous Teacher Response Ratio = 100
Teacher Questions Ratio = 15.3
Instantaneous Teacher Question Ratio = 25
Pupil Initiation Ratio = 4.8
Steady State Ratio = 67
Content Cross Ratio = 47.69
Pupil Steady State Ratio = 41

Matrix 18. The Categories, Cells and Frequencies in a Second Grade Middle School Physics Lesson
talking from time to time the teacher did comment immediately on their talk, as was indicated by the average ratio of \((PSSR)\) which equalled 41%.

The ratios of \(I/D\), \(RI/D\) were respectively .19%, 2.33%. No significant differences in the teacher directness compared to indirectness or in the social emotional climate of the classroom existed between the first and the second observation.

According to the standard percentages and ratios the second recorded classroom verbal interaction of the third female physics teacher cannot be considered helpful in achieving the expected curriculum objectives for the benefit of the students.

Table 9 presents the total means that were obtained from the percentages and ratios of the verbal teacher-student behavioral patterns, of the six physics classes that were taught by female teachers. The table includes two observations for each one of the three teachers who were observed.

The averages of the percentages of teacher talk, pupil talk, and silence and confusion in the first observations, were respectively: 73.3%, 17.9% and 13.1%. Although there seemed to be a little reduction in the talk of the teachers and the students with more periods of silence and confusion, the three percentages were close to the standard percentages.

The three teachers were more responsive to the students in the second observations, which averaged 58.7. The total mean of all observations indicated that the teachers were responsive more than the average to the ideas and feelings of their students. They tended to
TABLE 9
VERBAL BEHAVIOR PATTERNS IN PHYSICS
CLASSES: FEMALE TEACHERS

<table>
<thead>
<tr>
<th>Pattern of Behavior</th>
<th>First Observations</th>
<th>Second Observations</th>
<th>Average</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>T # 1</td>
<td>T # 2</td>
<td>T # 3</td>
</tr>
<tr>
<td>TT</td>
<td>66.7</td>
<td>74.6</td>
<td>78.6</td>
</tr>
<tr>
<td>PT</td>
<td>17.4</td>
<td>18.0</td>
<td>18.4</td>
</tr>
<tr>
<td>SC</td>
<td>15.9</td>
<td>7.4</td>
<td>16.2</td>
</tr>
<tr>
<td>TRR</td>
<td>45.7</td>
<td>43.5</td>
<td>69.2</td>
</tr>
<tr>
<td>TRR 89</td>
<td>81.8</td>
<td>80.0</td>
<td>100</td>
</tr>
<tr>
<td>TQR</td>
<td>32.3</td>
<td>20.0</td>
<td>33.7</td>
</tr>
<tr>
<td>TQR 89</td>
<td>45.8</td>
<td>19.2</td>
<td>80.0</td>
</tr>
<tr>
<td>PIR</td>
<td>0.0</td>
<td>40.8</td>
<td>2.5</td>
</tr>
<tr>
<td>CCR</td>
<td>77.3</td>
<td>79.0</td>
<td>70.6</td>
</tr>
<tr>
<td>SSR</td>
<td>35.8</td>
<td>46.7</td>
<td>45.0</td>
</tr>
<tr>
<td>PSSR</td>
<td>24.5</td>
<td>14.2</td>
<td>23.0</td>
</tr>
</tbody>
</table>

respond more instantaneously in the second observations. The total
mean of the (TRR 89) was 33.3% above the standard ratio.

The teachers asked more questions in the first observations
than they did in the second. The total mean of all the six observa-
tions was almost like that of the average (25.9%). The instantaneous
questions were much more in the first observations than the second, but
the total mean of the (TQR 89) was below the standard ratio (33.4%).

The students were more initiative in the second observa-
tions than they were in the first, but in spite of that improvement the
total mean indicates that the (PIR) was much below the standard ratio
(16.7%).
Greater emphasis was given by all teachers on the discussion of subject matter in the first observations than they did in the first. Though the total mean indicates that the emphasis was higher than the average by 17.9%.

The steady state ratio and the pupil steady state ratio were both higher in the second observations than they were in the first. The total mean of the (SSR) was 46.3% which was close to the average, while the (PSSR) was 26.7% which was below the average by 9.7%.

Apparently all the six teachers, as was indicated by the total means of the recorded lessons were active. Their amount of talk was average. They asked enough questions, though not very instantaneously. They were very responsive to their students. They put great emphasis on discussing the subject matter. The rapidity of their interchange with the students was close to the average. But they all were unable to stimulate their students. The students did talk enough, but they were not initiative. The verbal interaction, though it tended to indirectness more than to directness when eliminating the effect of teachers lecturing (Table 10), might not have fulfilled the desired educational objectives of physics.

Group 4: The Verbal Behavior Patterns of Physics Male Teachers

Matrix 19 presents the first classroom recorded verbal interaction for the first male physics teacher.

The teacher was very active as is indicated by the percentage of teacher talk which equalled 75.2% and that is above the average by
<table>
<thead>
<tr>
<th>Category #</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>9</th>
<th>10</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></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>
<td></td>
<td></td>
<td></td>
<td></td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>3</td>
<td></td>
<td></td>
<td></td>
<td>8</td>
<td>8</td>
<td></td>
<td></td>
<td>4</td>
<td></td>
<td>20</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td></td>
<td>3</td>
<td>5</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>9</td>
<td>16</td>
<td>2</td>
<td>35</td>
</tr>
<tr>
<td>5</td>
<td>3</td>
<td>21</td>
<td>98</td>
<td>2</td>
<td></td>
<td></td>
<td></td>
<td>6</td>
<td>130</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td></td>
<td>1</td>
<td>3</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>5</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td></td>
<td></td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td></td>
<td>17</td>
<td>7</td>
<td></td>
<td>10</td>
<td></td>
<td>1</td>
<td>35</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9</td>
<td></td>
<td></td>
<td>12</td>
<td>4</td>
<td></td>
<td></td>
<td></td>
<td>16</td>
<td></td>
<td>13</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td></td>
<td>3</td>
<td>10</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>13</td>
</tr>
<tr>
<td>Total</td>
<td>3</td>
<td>20</td>
<td>35</td>
<td>130</td>
<td>5</td>
<td>1</td>
<td>35</td>
<td>16</td>
<td>13</td>
<td>258</td>
<td></td>
</tr>
<tr>
<td>Percentage</td>
<td>1.16</td>
<td>7.75</td>
<td>13.56</td>
<td>50.38</td>
<td>1.93</td>
<td>.38</td>
<td>13.56</td>
<td>6.20</td>
<td>5.03</td>
<td>21.5</td>
<td>min.</td>
</tr>
</tbody>
</table>

*Teacher = Categories 1-7; Student = Categories 8 and 9.*

Percent Teacher Talk = 75.2
Percent Pupil Talk = 19.7
Percent Silence and Confusion = 5
Teacher Response Ratio = 79.3
Instantaneous Teacher Response Ratio = 100
Teacher Questions Ratio = 25.9
Instantaneous Teacher Question Ratio = 0.0
Pupil Initiation Ratio = 31.3
Content Cross Ratio = 56.5

I/D = 0.42
RI/D = 3.83

Matrix 19. The Categories, Cells and Frequencies in a Second Grade Middle School Physics Lesson
7.2%. The students were not less active than the teacher, as is indicated by both the percentage of student talk which equalled 19.7% and the student initiation ratio which was close to the average ratio (31.3%). The classroom was quiet as is indicated by the few periods of silence and confusion which was below the average percentage (5%).

The cycle of interaction followed the path: 5-5, 5-4, 4-9, 9-8, 8-3, 3-5, 5-10, 10-5.

The teacher was very responsive. The teacher response ratio equalled 79.3% and the instantaneous response ratio was 100%.

The teacher question ratio was almost the same as the standard ratio (25.9%), though there was no evidence for any instantaneous questions asked by the teacher (0.0%).

The emphasis of the teacher on the discussion of the subject matter was slightly above the average (56.5%).
The interchange between the teacher and the students was close to the average ratio (44.1%), though the rapidity of teacher-student interchange when students talked was below average (19.6%).

The indirectness of the teacher was less than the directness when considering the I/D ratio of 0.42%. But the revised indirectness to directness ratio introduced another positive picture for the social-emotional climate of the classroom since it equalled 3.83%.

The obtained percentages and ratios, when compared with the standard percentages and ratios, indicate that the verbal interaction in that classroom was well balanced and thus the students were more likely to benefit from what they were studying.

Matrix 20 presents the second observation for the same classroom and teacher.

The teacher spent 80.1% of the recorded time in lecturing, while the students spent 13.2% of that time. The periods of silence and confusion, though they were higher than the first observation, they were much below the average percentage (6.7%).

The cycle of interaction, as is clear from the matrix, followed the same path as the first observation.

The teacher response ratio, though it was above the average (58%), it was lower than that of the first observation, but the instantaneous responses remained very high and above the average by 40%.

A clear droppage in the ratio of the teacher's questions appeared in the second observation, which was below the average by 11.6%. Again there was no evidence for any instantaneous questions that were asked by the teacher.
| Category #* | Teacher | | | | | Student | | | | Total |  
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 2 | | | | | | | | | | |  
| 2 | 2 | | | | | | | | | | |  
| 3 | 2 | 9 | | | | | | 11 | | | |  
| 4 | 1 | 2 | 1 | | | 5 | 8 | 4 | 21 | | |  
| 5 | 2 | 14 | 11 | 2 | 1 | 1 | 8 | 139 | | | |  
| 6 | | 1 | 2 | 3 | 1 | | | | | | 7 | |  
| 7 | | | 1 | 1 | | | | | | | 2 | |  
| 8 | 1 | | 7 | | | | 4 | | | | 20 | |  
| 9 | | 9 | | | | | 8 | 2 | | | 10 | |  
| 10 | 2 | | 7 | 1 | | 2 | | | 15 | | | |  
| Total | | 2 | 11 | 21 | 139 | 7 | 2 | 20 | 10 | 15 | 227 | |  
| Percentage | .88 | 4.84 | 9.25 | 61.23 | 3.08 | .88 | 8.81 | 4.40 | 6.61 | 18.91 |  

*Teacher = Categories 1-7; Student = Categories 8 and 9.

Percent Teacher Talk = 80.1  
Percent Pupil Talk = 13.2  
Percent Silence and Confusion = 6.7  
Teacher Response Ratio = 59  
Instantaneous Teacher Response Ratio = 100  
Teacher Questions Ratio = 14.4  
Instantaneous Teacher Question Ratio = 0.0  
Pupil Initiation Ratio = 33.3  
Pupil Steady State Ratio = 20  
Steady State Ratio = 54  

Matrix 20. The Categories, Cells and Frequencies in a Second Grade Middle School Physics Lesson
Although the teacher did talk more than the students and did ask few questions, the students were responsive to the classroom discussion of the subject matter which equalled (90%) and to the questions that the teacher asked. The student initiation ratio was 33.3% and that was almost the same, like the standard ratio (34%).

The interchange between the teacher and the students was slightly higher than the average (54%), though the rapidity of teacher-student interchange when students talked was below the average (20%) which was nearly the same, like that of the first observation.

The ratio of indirectness to directness indicates that the teacher tended to be more direct than the first observation (0.24%). But the revised indirect to direct ratio indicates that the teacher tended to be more indirect almost the same, like the first observation.

When comparing the obtained percentages and ratios with the standard percentages and ratios, it becomes clear that the verbal interaction was not well balanced, though the students were initiative, and thus they were more likely to benefit from what was being taught to them.

Matrix 21 presents the frequencies of teacher-student talk, that occurred in the classes of the second physics male teacher.

The percentage of teacher talk was above the average percentage by 4.3%. The students talk was below the average percentage by 1.3%, and the silence and confusion periods were below the average by 2-3%.

Apparently a typical cycle of verbal interaction occurred in that classroom, as is indicated by the matrix. The flow of interaction followed the path of: 5-5, 5-4, 4-5, 8-8, 8-3, 3-5, 5-6. The teacher
### Matrix 21. The Categories, Cells and Frequencies in a Second Grade Middle School Physics Lesson

<table>
<thead>
<tr>
<th>Category #*</th>
<th>Teacher</th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1</td>
<td>3</td>
<td>2</td>
<td>1</td>
<td>7</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>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td></td>
<td>12</td>
<td>3</td>
<td>4</td>
<td>19</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td></td>
<td>16</td>
<td>1</td>
<td>17</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>2</td>
<td>9</td>
<td>83</td>
<td>8</td>
<td>3</td>
<td>107</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>4</td>
<td>12</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>2</td>
<td>19</td>
<td>5</td>
<td>2</td>
<td>13</td>
<td>1</td>
<td>42</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10</td>
<td></td>
<td>3</td>
<td>3</td>
<td>5</td>
<td>7</td>
<td>20</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>7</td>
<td>19</td>
<td>17</td>
<td>107</td>
<td>12</td>
<td>42</td>
<td>20</td>
<td>224</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Percentage</td>
<td>3.12</td>
<td>0.0</td>
<td>8.48</td>
<td>7.59</td>
<td>47.76</td>
<td>5.35</td>
<td>18.75</td>
<td>8.92</td>
<td>18.66</td>
<td></td>
</tr>
</tbody>
</table>

*Teacher = Categories 1-7; Student = Categories 8 and 9.*

- **Percent Teacher Talk** = 72.3
- **I/D** = 0.31
- **Percent Pupil Talk** = 18.7
- **RI/D** = 0.21
- **Percent Silence and Confusion** = 9
- **Teacher Response Ratio** = 68.4
- **Instantaneous Teacher Response Ratio** = 91.3
- **Teacher Questions Ratio** = 15.6
- **Instantaneous Teacher Question Ratio** = 0.0
- **Pupil Initiation Ratio** = 0.0
- **Steady State Ratio** = 47.3
- **Content Cross Ratio** = 69.6
- **Pupil Steady State Ratio** = 30.9

---

135
was lecturing, asking questions, receiving answers from the students, and praising them for the answers. Then lecturing and giving directions that were met by some responses by the students or by some periods of silence and confusion.

The teacher had responded to the feelings and ideas of the students. The (TRR) was 68.4% and that was above the average ratio by 26.4%. The teacher immediate responses, the moment students stopped talking was above the average ratio too. The (TRR 89) was 91.3%.

Most of the recorded time the teacher was talking. The questions he asked were few according to the standard ratio (15.6%). There is no evidence for any instantaneous questions that were asked by him. Those questions did not stimulate the students. They did not show any initiative responses to the whole discussion of the classroom.

The emphasis of the teacher on the discussion of the subject matter was above the average (69.6%). An average interchange of ideas between the teacher and the students concerning the subject matter did occur. The steady state ratio was (47.3%). The rapidity of the interchange was close to the average (30.9%).

The teacher was direct more than indirect in the interaction with the students, as it is indicated by the I/D ratio which equalled 0.31%. The revised indirect to direct ratio introduced another evidence for the teacher directness since it equalled 0.21%.

According to the standard percentages and ratios the verbal interaction was imbalanced. The students did not have an active role in classroom activities and the lesson cannot be judged as to fulfill the educational objectives that were intended for students benefit.
Matrix 22 presents the second recorded classroom verbal interaction that took place between the same teacher and students.

The teacher reflected similar behavioral patterns like those which were reflected in the first observation. The percentage of teacher talk was 75.1% and that was higher than the percentage of his talk in the first observation. Like the first observation, the percentage of students talk was below the average (18%). The classroom was more quiet than during the first observation as is indicated by the percentage 6.9%.

The responses of the teacher to the feelings and ideas of the students were above the average by 8%. The instantaneous responses were above the average by 40%.

Fewer questions were asked by the teacher in the second observation as is indicated by the (TQR) which equalled 13.6%. A very low percentage of teacher instantaneous questions did appear in the matrix of the second observation (15.7%).

The teacher emphasized the discussion of the subject matter more than he did in the first observation. It was above the average ratio by 22.2%.

An average interchange of ideas between the teacher and the students concerning the subject matter did occur (49.6%).

An average student steady ratio of 41.5% was obtained from the recorded frequencies in the matrix.

The cycle of interaction took the following path: 5-5, 5-6, 6-8, 8-8, 8-5, 5-4, 4-8, 8-10, 10-5.
Matrix 22. The Categories, Cells and Frequencies in a Second Grade Middle School Physics Lesson

<table>
<thead>
<tr>
<th>Category #*</th>
<th>Teacher</th>
<th>Student</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1 2 3 4 5 6 7</td>
<td>8 9 10</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>1</td>
<td>1 5</td>
<td>1</td>
</tr>
<tr>
<td>2</td>
<td>2</td>
<td>1 1 1</td>
<td>20</td>
</tr>
<tr>
<td>3</td>
<td>1</td>
<td>1</td>
<td>4</td>
</tr>
<tr>
<td>4</td>
<td>1</td>
<td>1</td>
<td>24</td>
</tr>
<tr>
<td>5</td>
<td>2</td>
<td>1 17 117 19</td>
<td>1 157</td>
</tr>
<tr>
<td>6</td>
<td>1</td>
<td>1</td>
<td>4</td>
</tr>
<tr>
<td>7</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>8</td>
<td>2</td>
<td>1 7 3 15</td>
<td>22</td>
</tr>
<tr>
<td>9</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>10</td>
<td>2</td>
<td>1 13</td>
<td>1 3  20</td>
</tr>
<tr>
<td>Total</td>
<td>8 4 8 24 157 19</td>
<td>1 52 1 20</td>
<td>294</td>
</tr>
<tr>
<td>Percentage</td>
<td>2.72 1.36 2.72 8.16 53.40 6.46 .34 17.68 .34</td>
<td>6.80</td>
<td>24.5 min.</td>
</tr>
</tbody>
</table>

*Teacher = Categories 1-7; Student = Categories 8 and 9.

Percent Teacher Talk = 75.1
Percent Pupil Talk = 18.0
Percent Silence and Confusion = 6.9
Teacher Response Ratio = 50
Instantaneous Teacher Response Ratio = 100
Teacher Questions Ratio = 13.6
Instantaneous Teacher Question Ratio = 15.7
Pupil Initiation Ratio = 18.8
Steady State Ratio = 49.6
Content Cross Ratio = 77.2
Pupil Steady State Ratio = 41.5
Apparently there was no load on cell 9 which indicates that the students were not initiative in the classroom discussion. Although, the ratio of students initiation was higher in the second observation than it was in the first observation, the ratio remained much lower than the standard ratio (18.8%).

Like the first observation, the indirectness of the teacher to the directness was very low. The I/D ratio was 0.24%. The revised I/D ratio indicates a balanced social emotional classroom climate.

In general, the obtained percentages and ratios reflected an imbalanced verbal interaction that might not have helped students gain the desired educational outcomes.

Matrix 23 presents the first recorded classroom verbal interaction for the third male physics teacher.

The obtained percentages indicate that the teacher had the most active role in the classroom verbal activities. The percent of teacher talk was 80.5% and that was above the average percentage by 12.5%. The percentage of students talk was 13.8% which was below the average by 6.2%. The classroom was quiet as it is indicated by the low percentage of silence and confusion (5.7%).

The cycle of interaction followed the path of: 5-5, 5-8, 8-8, 8-5, 5-6, 6-10, 10-4, 4-5.

The teacher response ratio was 57.1% and that was above the average by 14.9%. Though the teacher was responsive to the ideas of the students, the instantaneous responses were not always immediate. The (TRR 89) was below the average by 10%.
<table>
<thead>
<tr>
<th>Category #*</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>9</th>
<th>10</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>2</td>
<td></td>
<td></td>
<td>2</td>
</tr>
<tr>
<td>2</td>
<td>1</td>
<td></td>
<td>3</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1</td>
<td>1</td>
<td>6</td>
</tr>
<tr>
<td>3</td>
<td>4</td>
<td>3</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>8</td>
</tr>
<tr>
<td>4</td>
<td></td>
<td>10</td>
<td>5</td>
<td>1</td>
<td></td>
<td>6</td>
<td>1</td>
<td></td>
<td>10</td>
<td>34</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>1</td>
<td>4</td>
<td>5</td>
<td>91</td>
<td>8</td>
<td></td>
<td></td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>112</td>
</tr>
<tr>
<td>6</td>
<td>2</td>
<td>4</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1</td>
<td>3</td>
<td>11</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>2</td>
<td></td>
<td>6</td>
<td>2</td>
<td></td>
<td>17</td>
<td></td>
<td>1</td>
<td>28</td>
<td></td>
<td></td>
</tr>
<tr>
<td>9</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>2</td>
<td>2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>1</td>
<td>1</td>
<td>2</td>
<td>9</td>
<td>3</td>
<td></td>
<td></td>
<td>2</td>
<td>3</td>
<td>21</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>2</td>
<td>6</td>
<td>8</td>
<td>34</td>
<td>122</td>
<td>11</td>
<td>1</td>
<td>28</td>
<td>2</td>
<td>21</td>
<td>216</td>
</tr>
<tr>
<td>Percentage</td>
<td>.92</td>
<td>2.77</td>
<td>3.71</td>
<td>15.74</td>
<td>51.85</td>
<td>5.09</td>
<td>.46</td>
<td>12.96</td>
<td>.92</td>
<td>5.55</td>
<td>18 min.</td>
</tr>
</tbody>
</table>

*Teacher = Categories 1-7; Student = Categories 8 and 9.

Percent Teacher Talk = 80.5
Percent Pupil Talk = 13.8
Percent Silence and Confusion = 5.7
Teacher Response Ratio = 57.1
Instantaneous Teacher Response Ratio = 50
Teacher Questions Ratio = 27.6
Instantaneous Teacher Question Ratio = 0.0
Pupil Initiation Ratio = 6.6
Steady State Ratio = 56.9
Content Cross Ratio = 88.4
Pupil Steady State Ratio = 56.6

Matrix 23. The Categories, Cells and Frequencies in a Second Grade Middle School Physics Lesson
The activity of the teacher was not only evident in his talk, but in the number of his questions. The teacher question ratio was 27.6% and that was above the average by 1.6%. The questions were not based on student ideas as was indicated by the (TQR 89) which equalled 0.0%. The teacher concentrated on the discussion of the subject matter as it is reflected by the high (CCR) which equalled to 88.4% and that was above the average by 33.4%.

The rapidity of the teacher-student interchange when student talked was above average (56.9%).

The steady state ratio was 56.6%.

The ratio of indirectness to directness indicates that the teacher tended to be more direct than indirect, while the revised ratio of indirectness to directness indicates that the teacher was more indirect in the interaction with the students (1.33%).

In spite of the fact that the teacher was active and did ask many questions concerning the subject matter which was the main focus of the classroom interaction, the students were quiet as is evident in the percentages and ratios concerning their activities, especially the students initiation ratio which equalled 6.6% while the standard ratio is 34%.

Students might not have had the chance to benefit, as it was intended for them, from the study of physics, through this teacher's behavioral patterns of interaction.

Matrix 24 presents the second recorded observation for the same teacher and students.
Matrix 24. The Categories, Cells and Frequencies in a Second Grade Middle School Physics Lesson

<table>
<thead>
<tr>
<th>Category #*</th>
<th>Teacher</th>
<th>Student</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1</td>
<td>1</td>
<td>8</td>
</tr>
<tr>
<td>2</td>
<td>2</td>
<td>2</td>
<td>4</td>
</tr>
<tr>
<td>3</td>
<td>1</td>
<td>3</td>
<td>6</td>
</tr>
<tr>
<td>4</td>
<td>2</td>
<td>10</td>
<td>12</td>
</tr>
<tr>
<td>5</td>
<td>3</td>
<td>13</td>
<td>16</td>
</tr>
<tr>
<td>6</td>
<td>1</td>
<td>7</td>
<td>15</td>
</tr>
<tr>
<td>7</td>
<td>1</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>8</td>
<td>3</td>
<td>17</td>
<td>20</td>
</tr>
<tr>
<td>9</td>
<td>6</td>
<td>6</td>
<td>15</td>
</tr>
<tr>
<td>10</td>
<td>1</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>Total</td>
<td>8</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>Percentage</td>
<td>2.97</td>
<td>.74</td>
<td>1.11</td>
</tr>
</tbody>
</table>

*Teacher = Categories 1-7; Student = Categories 8 and 9.

Percent Teacher Talk = 80.3
Percent Pupil Talk = 13.4
Percent Silence and Confusion = 6.3
Teacher Response Ratio = 43.3
Instantaneous Teacher Response Ratio = 83.3
Teacher Questions Ratio = 13.5
Instantaneous Teacher Question Ratio = 83.3
Pupil Initiation Ratio = 16.6
Content Cross Ratio = 84.7

Matrix 24. The Categories, Cells and Frequencies in a Second Grade Middle School Physics Lesson
The teacher consumed 80.3% of the recorded classroom interaction in talking, while the students consumed only 13.4% of that time. Like the first observation the percentage of teacher talk was much higher than the average percentage, while the students talk was much below the average percentage. The classroom activities were interrupted by very few periods of silence and confusion (6.3%).

The typical cycle of interaction followed this path: 5-5, 5-4, 4-8, 8-5, 5-6, 6-10, 10-8, 8-4.

The teacher response ratio was slightly above the average (43.3%). The teacher instantaneous response ratio was much higher than the average (83.3%).

The teacher asked few questions as is indicated by the low teacher question ratio which was equal to 13.5%. The instantaneous teacher question ratio was much lower than the average ratio.

The students responded few times to teacher activities as is indicated by the student initiation ratio which equalled 16.6% which was much lower than the standard ratio.

Like the first observation, the emphasis of the teacher on the discussion of the subject matter was much above the average ratio (84.7%).

The steady state ratio was equal to 53.1% and that was above the average ratio by 3.1% which indicates an average interchange of ideas between the teacher and the students. But the student steady state ratio was equal to 13.8% which indicates that the interchange of ideas happened very quickly.
The ratio of indirectness to directness indicates that the teacher tended to be more direct than indirect in the second observation (0.20%). The revised indirect to direct ratio indicates that the teacher was more direct than indirect (0.76%).

According to the standard percentages and ratios, the behavioral patterns in the observed two lessons might not have helped students to gain the desired educational outcomes of learning physics.

Table 11 presents the total means that were obtained from the percentages and ratios of the behavioral patterns, in the six physics classes that were taught by male teachers. Both total means of the first and second observations are presented in this table.

### TABLE 11

VERBAL BEHAVIOR PATTERNS IN PHYSICS CLASSES: MALE TEACHERS

<table>
<thead>
<tr>
<th>Pattern of Behavior</th>
<th>First Observations</th>
<th>Second Observations</th>
<th>Average</th>
<th>Mean</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>T # 1</td>
<td>T # 2</td>
<td>T # 3</td>
<td>Average</td>
</tr>
<tr>
<td>TT</td>
<td>75.2</td>
<td>72.3</td>
<td>80.5</td>
<td>76.0</td>
</tr>
<tr>
<td>PT</td>
<td>19.7</td>
<td>18.7</td>
<td>13.8</td>
<td>17.4</td>
</tr>
<tr>
<td>SC</td>
<td>5.0</td>
<td>9.0</td>
<td>5.7</td>
<td>6.5</td>
</tr>
<tr>
<td>TRR</td>
<td>79.3</td>
<td>68.4</td>
<td>57.1</td>
<td>68.2</td>
</tr>
<tr>
<td>TRR 89</td>
<td>100</td>
<td>90.3</td>
<td>50.8</td>
<td>80.4</td>
</tr>
<tr>
<td>TQR</td>
<td>25.9</td>
<td>15.6</td>
<td>27.6</td>
<td>23.0</td>
</tr>
<tr>
<td>TQR 89</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>PIR</td>
<td>31.3</td>
<td>0.0</td>
<td>6.6</td>
<td>12.6</td>
</tr>
<tr>
<td>CCR</td>
<td>56.5</td>
<td>69.6</td>
<td>88.4</td>
<td>71.5</td>
</tr>
<tr>
<td>SSR</td>
<td>44.4</td>
<td>47.3</td>
<td>56.9</td>
<td>49.5</td>
</tr>
<tr>
<td>PSSR</td>
<td>19.6</td>
<td>30.9</td>
<td>56.6</td>
<td>39.0</td>
</tr>
</tbody>
</table>
The total mean of the teacher talk in the first observations was 76% and that was above the average by 8%. The total mean of teacher talk in the second observations increased to 78.5%.

The students in the first observations talked more than they did in the second observations as is indicated by the total means of student talk, 17.4%, then down to 14.8%. The general total mean was 16.1%.

Although the general total mean of silence and confusion of all observations can be measured as to equal half of the standard mean (6.6%), the classrooms were more quiet in the first observations when compared with the second.

The teachers were more responsive during the first observations than they were in the second. The total mean of the first observations was 68.2%. The total mean of the second observation was 50.7%. The general total mean of all observations was 59.5% and that was higher than the standard mean by 17.5%.

The instantaneous teacher response mean for the first observations was 80.4% and for the second observations was 94.4%. The general total mean of the instantaneous teacher responses was 87.4% and that was higher than the standard mean by 27.4%.

The teachers tended to show more activity through asking many questions in the first observations, but they did not reflect the same level of activity in the second observations. The total mean of teacher questions in the first observations was 23% while in the second observations it dropped to 13.8%. The general total mean of teacher questions was 18.4% which was lower than the standard mean by 7.6%.
The instantaneous teacher question total mean for the first observations equalled 0.0%, while in the second observations the teachers did ask some questions instantaneously as it is evident in the total mean of 13.9%. The general total mean of (TRR 89) was 6.9% and that is much lower than the standard mean 44%.

The students were more initiative in the second observations than they were in the first. The total of student initiation of the first observations was 12.6% while it increased to 22.9% in the second observations. The general total mean of students initiation was 17.8% which equalled only half of the standard mean.

The teachers put more emphasis on the discussion of the subject matter than they did in the first observations. The total mean of the (CCR) was 71.5% for the first observations and 83.9% for the second observations. The general total mean was 77.7% which was higher than the standard mean by 22.7%.

The interchange of ideas between the teacher and the students was about average both in the first and in the second observations. The general total mean of the (SSR) was 50.8%. The rapidity of interchange in the first observations had a higher total mean (39%) than it had in the second observations (25.1%). The general total mean of the (PSSR) was 30.4% which was close to the average mean.

The total mean of indirectness to directness, though low, indicates that the teacher tended to be more indirect in the first observations than they did in the second. The total mean of I/D in the first observations was 0.35% while it was 0.23% in the second observations. The revised indirectness to directness total mean was higher in
the first observations (1.79%) than it was in the second (1.06%) (Table 12).

**TABLE 12**

TEACHERS INDIRECTNESS/DIRECTNESS IN PHYSICS CLASSES: MALE TEACHERS

<table>
<thead>
<tr>
<th>Teacher #</th>
<th>First Observations</th>
<th>Second Observations</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>I/D</td>
<td>RI/D</td>
</tr>
<tr>
<td>1</td>
<td>0.42</td>
<td>3.83</td>
</tr>
<tr>
<td>2</td>
<td>0.31</td>
<td>0.21</td>
</tr>
<tr>
<td>3</td>
<td>0.32</td>
<td>1.33</td>
</tr>
<tr>
<td>Average</td>
<td>0.35</td>
<td>1.79</td>
</tr>
</tbody>
</table>

Table 13 presents a comparison between the total means of the verbal behavioral patterns of both female and male physics teachers. The following results were obtained for each behavioral pattern:

1. For teacher talk, the male teachers tended to talk more than the female teachers. The total mean of male teacher talk was 77.2% while it was 70.5% for female teachers. The general total mean of both sexes was 5.8% above the average.

2. For pupil talk, in the classes of female teachers the students tended to talk more than the students in the classes of male teachers. The total mean of girls talk was 17.6% while the total mean of boys talk was 16.1%. Both total means of boys and girls talk were 3.2% below the average.
TABLE 13

VERBAL BEHAVIOR PATTERNS IN PHYSICS CLASSES:
A COMPARISON BETWEEN FEMALE AND MALE TEACHERS

<table>
<thead>
<tr>
<th>Pattern of Behavior</th>
<th>First Observations</th>
<th>Second Observations</th>
<th>Average</th>
<th>Mean</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>T # 1</td>
<td>T # 2</td>
<td>T # 3</td>
<td>Average</td>
</tr>
<tr>
<td>Female Teachers</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>TT</td>
<td>66.7</td>
<td>74.6</td>
<td>78.6</td>
<td>73.3</td>
</tr>
<tr>
<td>PT</td>
<td>17.4</td>
<td>18.0</td>
<td>18.4</td>
<td>17.9</td>
</tr>
<tr>
<td>SC</td>
<td>15.9</td>
<td>7.4</td>
<td>16.2</td>
<td>13.1</td>
</tr>
<tr>
<td>TRR</td>
<td>45.7</td>
<td>43.5</td>
<td>69.2</td>
<td>52.8</td>
</tr>
<tr>
<td>TRR 89</td>
<td>81.8</td>
<td>80.0</td>
<td>100</td>
<td>87.2</td>
</tr>
<tr>
<td>TQR</td>
<td>32.3</td>
<td>20.0</td>
<td>33.7</td>
<td>28.6</td>
</tr>
<tr>
<td>TQR 89</td>
<td>45.8</td>
<td>19.2</td>
<td>80.0</td>
<td>48.3</td>
</tr>
<tr>
<td>PIR</td>
<td>0.0</td>
<td>40.8</td>
<td>2.5</td>
<td>14.4</td>
</tr>
<tr>
<td>CCR</td>
<td>77.3</td>
<td>79.0</td>
<td>70.6</td>
<td>75.6</td>
</tr>
<tr>
<td>SSR</td>
<td>35.8</td>
<td>46.7</td>
<td>45.0</td>
<td>42.5</td>
</tr>
<tr>
<td>PSSR</td>
<td>24.5</td>
<td>14.2</td>
<td>23.0</td>
<td>20.5</td>
</tr>
<tr>
<td>Male Teachers</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>TT</td>
<td>75.2</td>
<td>72.3</td>
<td>80.5</td>
<td>76.0</td>
</tr>
<tr>
<td>PT</td>
<td>19.7</td>
<td>18.7</td>
<td>13.8</td>
<td>17.4</td>
</tr>
<tr>
<td>SC</td>
<td>5.0</td>
<td>9.0</td>
<td>5.7</td>
<td>6.5</td>
</tr>
<tr>
<td>TRR</td>
<td>79.3</td>
<td>68.4</td>
<td>57.1</td>
<td>68.2</td>
</tr>
<tr>
<td>TRR 89</td>
<td>100</td>
<td>91.3</td>
<td>50.4</td>
<td>80.4</td>
</tr>
<tr>
<td>TQR</td>
<td>25.9</td>
<td>15.6</td>
<td>27.6</td>
<td>23.0</td>
</tr>
<tr>
<td>TQR 89</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>PIR</td>
<td>31.3</td>
<td>0.0</td>
<td>6.6</td>
<td>12.6</td>
</tr>
<tr>
<td>CCR</td>
<td>56.5</td>
<td>69.6</td>
<td>88.4</td>
<td>71.5</td>
</tr>
<tr>
<td>SSR</td>
<td>44.4</td>
<td>47.3</td>
<td>56.9</td>
<td>49.5</td>
</tr>
<tr>
<td>PSSR</td>
<td>19.6</td>
<td>30.9</td>
<td>56.6</td>
<td>39.0</td>
</tr>
</tbody>
</table>

General total percentages of female and male physics teachers:
TT = 73.8; PT = 16.8; SC = 9.1; TRR = 57.6; TRR 89 = 90.5; TQR = 22.1; TQR 89 = 20.1; PIR = 17.2; CCR = 75.3; SSR = 48.5; PSSR = 28.5.
3. For silence and confusion, the classes of female teachers had more periods of silence and confusion (11.7%) than the classes of male teachers (6.6%). The classes of teachers of both sexes had a general total mean that was 1.9-2.9% lower than the average.

4. For teacher responses, the male teachers were more responsive to their students than female teachers. The (TRR) of male teachers had a mean of 59.5%, while the female teachers had a mean of 55.7%. The general total mean of teacher responses of both sexes was higher than the average by 15.6%.

5. For instantaneous teacher response, the total mean of female teachers was 93.6%, and that was higher than the total mean of male teachers by 6.2%. The general total mean of teacher responses of both sexes was higher than the average by 30.5%.

6. For teachers questions, the female teachers tended to ask more questions than male teachers. The total mean of female teachers was 25.9%, while it was 18.4% for male teachers. The general total mean of (TQR) was 22.1% and that can be considered close to the average.

7. For instantaneous teacher questions, the female teachers had a total mean of 33.4% while the male teachers had a total mean of 6.9%. The general total mean of the (TQR 89) was 20.1% and that was 23.9% lower than the average.

8. For pupil initiation, the students in the classes of male teachers had a (PIR) total mean of 17.8%, while in the classes of female teachers they had a (PIR) total mean of 16.7%. The general total mean of pupil initiation was 17.2% and that equalled only half of the average total mean. The students in the classes of both male and
female teachers cannot be described as initiative students.

9. For subject matter emphasis, although the male teachers had a (CCR) total mean that was higher by 4.8% than that of the female teachers, both teachers reflected a great emphasis on subject matter discussion. The general total mean of the (CCR) was 75.3% which was 20.3% higher than the average.

10. For teacher-student interchange of ideas, though the (SSR) total mean of male teachers (50.8%) was higher than that of female teachers (46.3%), in general for both sexes it was close to the average (48.5%).

11. For the rapidity of teacher-student interchange of ideas, the (PSSR) total mean of male teachers (30.4%) was higher than that of the female teachers (26.7%). The general (PSSR) total mean for both sexes indicated a rather quick interchange of ideas (28.5%).

Table 14 indicates that the female physics teachers indirectness when compared to directness was higher than that of male teachers in classroom interaction. The total mean of I/D for female teachers

<table>
<thead>
<tr>
<th>Teachers</th>
<th>I/D</th>
<th>RI/D</th>
</tr>
</thead>
<tbody>
<tr>
<td>Females</td>
<td>0.33</td>
<td>1.59</td>
</tr>
<tr>
<td>Males</td>
<td>0.29</td>
<td>1.42</td>
</tr>
<tr>
<td>Average</td>
<td>0.31</td>
<td>1.50</td>
</tr>
</tbody>
</table>
was 0.33%, while it was 0.29% for male teachers. The total mean of the revised indirectness to directness in the classes of female teachers (1.59%) was higher than that of male teachers (1.42%). The general RI/D total mean of both sexes indicate a proper social emotional classroom climate.

In sum, the general total means of behavioral patterns of physics teachers in the second year of the middle schools, according to the standard percentages and ratios, tended to be higher than the average for teacher talk, but lower than the average for students talk, and for the periods of silence and confusion.

The teachers were responsive. The questions they asked were lower than the average. The students were very poor in their initiation. The interchange of ideas between the teacher and the students were close to the average, but the interchange was rather quick. The teachers put great emphasis on the discussion of the subject matter. The teachers were direct in their interaction, but when their tendency to lecture is eliminated they seemed to be indirect.

In the following section three kinds of data treatment will be presented. The first one concerns the indication of the correlations that might exist between each verbal behavioral pattern and the number of the observation in order to find out whether the behavior was influenced by the presence of the observer in the classrooms of chemistry and physics teachers of both sexes, or not. The second treatment concerns the indication of the differences, if any, in the behavioral patterns of teachers according to sex. The third treatment concerns
the indication of the differences in the behavioral patterns of teachers according to subject matter being taught.

A Comparison Between the Verbal Behavior Patterns of Science Teachers in the First Observations with the Second

Table 15 presents the total means of the different verbal behavior patterns that occurred in the first and in the second classroom observations for the four groups of teachers: female chemistry teachers, male chemistry teachers, physics female teachers and physics male teachers.

### TABLE 15

<table>
<thead>
<tr>
<th>Pattern of Behavior</th>
<th>First Observations Total Mean</th>
<th>Second Observations Total Mean</th>
</tr>
</thead>
<tbody>
<tr>
<td>TT</td>
<td>71.5</td>
<td>70.9</td>
</tr>
<tr>
<td>PT</td>
<td>19.3</td>
<td>19.2</td>
</tr>
<tr>
<td>SC</td>
<td>10.5</td>
<td>10.4</td>
</tr>
<tr>
<td>TRR</td>
<td>64.1</td>
<td>62.2</td>
</tr>
<tr>
<td>TRR 89</td>
<td>89.6</td>
<td>93.1</td>
</tr>
<tr>
<td>TQR</td>
<td>25.1</td>
<td>22.9</td>
</tr>
<tr>
<td>TQR 89</td>
<td>32.2</td>
<td>25.5</td>
</tr>
<tr>
<td>PIR</td>
<td>9.9</td>
<td>17.5</td>
</tr>
<tr>
<td>CCR</td>
<td>72.4</td>
<td>75.2</td>
</tr>
<tr>
<td>SSR</td>
<td>45.2</td>
<td>46.6</td>
</tr>
<tr>
<td>PSSR</td>
<td>28.7</td>
<td>28.9</td>
</tr>
</tbody>
</table>

Total means of all teachers Directness/Indirectness are presented in Table 16.
In comparing the behavioral patterns of the first observations with that of the second observations, the following results are stated:

1. No significant difference appeared for teacher talk since the total mean of the first observations was 71.5 and the total mean of the second observations was 70.9.

2. No significant difference appeared for pupil talk since the total mean of the first observations was 19.3 and the total mean of the second observations was 19.2.

3. No significant difference appeared for the periods of silence and confusion, since the total mean of the first observations was 10.5 and the total mean of the second observations was 10.4.

4. No significant difference appeared for teacher responses since the total mean of the first observations was 64.1 and the total mean of the second observations was 62.2.

5. Little difference appeared for instantaneous teacher responses. The total mean of the TRR 89 in the first observations was 89.6 while it increased in the second observations to 93.1.

<table>
<thead>
<tr>
<th></th>
<th>First Observations</th>
<th>Second Observations</th>
</tr>
</thead>
<tbody>
<tr>
<td>I/D</td>
<td>0.36</td>
<td>0.26</td>
</tr>
<tr>
<td>RI/D</td>
<td>1.69</td>
<td>1.32</td>
</tr>
<tr>
<td>Total Means</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
6. Little difference appeared for teachers questions. The total mean of the TQR in the first observations was 25.1 while it decreased to 22.9 in the second observations.

7. A significant difference appeared for pupil initiation. The total mean of pupil initiation in the first observations was 9.9 while it increased nearly double to 17.5 in the second observations.

8. Little difference appeared for instantaneous teacher questions. The total mean of the TQR 89 in the first observations was 32.2 while it decreased to 25.5 in the second observations.

9. Little difference appeared for content emphasis. The total mean of the CCR in the first observations was 72.4 while it increased to 75.2 in the second observations.

10. No significant difference appeared for the steady state cells since the total mean of the first observations was 45.2 and the total mean of the second observations was 46.6.

11. No significant difference appeared for the pupil steady state since the total mean of the PSSR in the first observations was 28.7 and the total mean of the second observations was 28.9.

12. No significant differences appeared for science teachers in Indirectness/Directness and Revised Indirectness/Directness (Table 16).

In sum, it does not seem that the amount of teacher talk, pupil talk, silence and confusion, teacher-student interchange of ideas and teacher responses were influenced by the presence of the investigator in the classroom, since there were no significant changes in those classroom aspects. But the teachers instantaneous responses did reflect some changes since the teachers were more responsive in the
second observations than they were in the first. The teachers were less active in asking questions in the second observations. Though student initiation was very low, it did increase appreciably in the second observations. Perhaps the students became more accustomed to the presence of the investigator in the classroom. The teachers showed more emphasis in discussing the subject matter in the second observations than they did in the first observations. Thus, it was possible to conclude that the patterns of verbal behavior in the different classes were not influenced by the presence of the observer in the classroom.

Determining the Verbal Behavioral Patterns of Chemistry and Physics Teachers and Students According to Sex

In order to determine the verbal behavioral patterns of teachers and students according to sex, two comparisons were made. In the first comparisons, chemistry female teachers were compared with male chemistry teachers, and chemistry female students were compared with chemistry male students. Also, physics female teachers and female students were compared with physics male teachers and male students. In the second comparison chemistry female teacher and female students were compared with physics male teachers and male students. Also, physics female teachers and female students were compared with chemistry male teachers and male students.

It was expected that the comparisons would indicate if there was any correlation between the behavior and the sex, in terms of constant increase or decrease in the percentages of behavior.
The results of the two comparisons were obtained from Table 17.

TABLE 17

VERBAL BEHAVIOR PATTERNS IN CHEMISTRY AND PHYSICS
CLASSES: A COMPARISON BETWEEN
FEMALE AND MALE TEACHERS

<table>
<thead>
<tr>
<th>TT</th>
<th>PT</th>
<th>SC</th>
<th>TRR</th>
<th>TRR89</th>
<th>TQR</th>
<th>TQR89</th>
<th>PIR</th>
<th>CCR</th>
<th>SSR</th>
<th>PSSR</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total Female (Chemistry)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
70.5 | 17.6 | 11.7 | 55.7 | 93.6 | 25.9 | 33.4 | 16.7 | 72.9 | 46.3 | 26.7 |
| Total Male (Chemistry) |
68.0 | 21.7 | 10.0 | 68.2 | 86.1 | 28.5 | 32.7 | 8.9 | 71.9 | 43.1 | 27.3 |
| General Total Percentages of Female and Male Chemistry Teachers |
67.1 | 21.4 | 11.3 | 67.1 | 92.3 | 27.5 | 37.4 | 10.1 | 72.4 | 43.3 | 26.8 |
| Total Female (Physics) |
66.2 | 21.1 | 12.6 | 66.0 | 98.6 | 26.5 | 42.1 | 11.4 | 72.9 | 43.6 | 26.4 |
| Total Male (Physics) |
77.2 | 16.1 | 6.6 | 59.5 | 87.4 | 18.4 | 6.9 | 17.8 | 77.7 | 50.8 | 30.4 |
| General Total Percentages of Female and Male Physics Teachers |
73.8 | 16.8 | 9.1 | 57.6 | 90.5 | 22.1 | 20.1 | 17.2 | 75.3 | 48.5 | 28.5 |

The results of the first comparison were:

1. Chemistry female teachers talked less than chemistry male teachers. Physics female teachers talked less than physics male teachers. Thus it was possible to conclude that the percent of teacher talk related positively with the sex of the teacher.

2. Chemistry female students talked less than chemistry male students. Physics female students talked more than physics male students. Thus it was possible to conclude that the percent of student talk had no relationship with the sex of the student.
3. Chemistry female classrooms had more periods of silence and confusion than chemistry male classrooms. Physics female classrooms had more periods of silence and confusion than physics male classrooms. Thus it was possible to conclude that the percent of silence and confusion related positively with the sex of the teacher and the students.

4. Chemistry female teachers were less responsive to the ideas and feelings of students than chemistry male teachers. Physics female teachers were less responsive to the ideas and feelings of students than physics male teachers. Thus it was possible to indicate that the teacher response ratio related positively with the sex of the teacher and the students.

5. Chemistry female teachers reflected more instantaneous responses to the ideas and feelings of students, than chemistry male teachers. Physics female teachers reflected more instantaneous responses to students than physics male teachers. Thus it was possible to conclude that the instantaneous teacher response ratio related positively with the sex of the teacher.

6. Chemistry female teachers asked less questions than chemistry male teachers. Physics female teachers asked more questions than male physics teachers. Thus it was possible to conclude that the teacher question ratio had no relationship with the sex of the teacher.

7. Chemistry female teachers asked more instantaneous questions than chemistry male teachers. Physics female teachers asked more instantaneous questions than physics male teachers. Thus it was possible to conclude that the teacher instantaneous question ratio related positively with the sex of the teacher.
8. Chemistry female students were more initiative than chemistry male students. Physics female students were less initiative than physics male students. Thus it was possible to conclude that the pupil initiation ratio had no relationship with the sex of the student.

9. Chemistry female teachers put more emphasis on subject matter than chemistry male teachers. Physics female teachers put less emphasis on subject matter than physics male teachers. Thus it was possible to conclude that the content cross ratio had no relationship with the sex of the teacher.

10. Chemistry female teachers interchanged ideas with students more than chemistry male teachers. Physics female teachers interchanged ideas with students less than physics male teachers. Thus it was possible to conclude that the steady state ratio had no relationship with the sex of the teacher.

11. Chemistry female teachers interchanged ideas with students more rapidly than chemistry male teachers. Physics female teachers interchanged ideas with students more rapidly than physics male teachers. Thus it was possible to conclude that the pupil steady state ratio related positively with the sex of teacher.

Table 18 presents additional ratios concerning teacher-student verbal behavior, of which the following results were obtained:

- Chemistry female teachers tended to be more direct than indirect when compared with chemistry male teachers.

- Physics female teachers tended to be more indirect than direct when compared with physics male teachers.
Thus directness and indirectness had no relation with the sex of the teacher.

<table>
<thead>
<tr>
<th>Teachers</th>
<th>I/D</th>
<th>RI/D</th>
</tr>
</thead>
<tbody>
<tr>
<td>Female Chemistry</td>
<td>.40</td>
<td>1.80</td>
</tr>
<tr>
<td>Male Chemistry</td>
<td>.42</td>
<td>4.79</td>
</tr>
<tr>
<td>Total</td>
<td>.41</td>
<td>3.29</td>
</tr>
<tr>
<td>Female Physics</td>
<td>.33</td>
<td>1.59</td>
</tr>
<tr>
<td>Male Physics</td>
<td>.29</td>
<td>1.42</td>
</tr>
<tr>
<td>Total</td>
<td>.31</td>
<td>1.50</td>
</tr>
<tr>
<td>Total Mean of Chemistry and Physics</td>
<td>.36</td>
<td>2.42</td>
</tr>
</tbody>
</table>

In order to probe the above mentioned verbal behavioral patterns of chemistry and physics teachers and students according to sex, a second comparison was made. Instead of comparing teachers and students of both sexes within the limits of each studied subject matter, like comparing chemistry female teachers and students with chemistry male teachers and students, another comparison was made that compared teachers and students of both sexes in chemistry classrooms with those in physics classrooms.

Table 18 indicates:

1. Chemistry female teachers talked less than physics male teachers. Physics female teachers talked less than male chemistry
160

teachers. Thus it is possible to conclude that the percent of teacher talk related positively with the sex of the teacher.

2. Chemistry female students talked more than physics male students. Physics female students talked less than male chemistry students. Thus it is possible to conclude that the percent of student talk had no relationship with the sex of the student.

3. Chemistry classes of female teachers had more periods of silence and confusion than the classes of male chemistry teachers. Physics classes of female teachers had more periods of silence and confusion than the classes of male teachers. Thus it is possible to conclude that the percent of silence and confusion related positively with the variable of the teacher's sex.

4. Chemistry female teachers responded to the ideas and feelings of students more than physics male teachers. Physics female teachers responded to the ideas and feelings of their students less than chemistry male teachers. Thus it is possible to conclude that the ratio of teacher response had no relationship with the sex of the teacher.

5. Chemistry female teachers responded instantaneously to the ideas and feelings of students more than physics male teachers. Physics female teachers responded instantaneously to the ideas and feelings of students more than chemistry male teachers. Thus it is possible to conclude that the percent of instantaneous teacher response related positively with the sex of the teacher.

6. Chemistry female teachers asked more questions than physics male teachers. Physics female teachers asked less questions than chemistry male teachers. Thus it is possible to conclude that the
ratio of teacher's questions had no relationship with the sex of the teacher.

7. Chemistry female teachers instantaneously asked more questions than physics male teachers. Physics female teachers instantaneously asked more questions than chemistry male teachers. So, it is possible to conclude that the ratio of instantaneous teacher's questions related positively with the sex of the teacher.

8. Chemistry female students initiation was less than physics male students. Physics female students initiation was less than chemistry male students. Thus it is possible to conclude that the percent of students initiation had related positively with the sex of the student.

9. Chemistry female teachers put less emphasis on the discussion of subject matter than physics male teachers. Physics female teachers put more emphasis on the discussion of subject matter than chemistry male teachers. Thus it is possible to conclude that the percent of content emphasis had no relationship with the sex of the teacher.

10. Chemistry female teachers interchanged ideas with students less than physics teachers. Physics female teachers interchanged ideas with students more than chemistry male teachers. Thus it is possible to conclude that the ratio of steady state had no relationship with the sex of the teacher.

11. Chemistry female teachers had a more rapid interchange of ideas with students than male physics teachers. Physics female teachers had a less rapid interchange of ideas with students than male chemistry teachers. Thus it is possible to conclude that the student steady state
ratio related positively with the sex of the teacher.

12. Chemistry female teachers were more indirect than physics male teachers, when considering the I/D ratio, but more direct than physics male teachers when considering the RI/D. The time consumed by students versus teacher talk in the classes of chemistry female teachers was more than that in the classes of physics male teachers. Chemistry female teachers extended indirect talk was more than physics male teachers.

13. Physics female teachers were more direct than chemistry male teachers as is indicated by both the I/D and RI/D ratios. The time consumed by students versus teacher talk in the classes of physics female teachers was less than chemistry male teachers. Physics female teachers extended indirect talk was more than chemistry male teachers. Thus it is possible to conclude that the I/D ratio related positively with the sex of the teacher. But the RI/D did not relate positively with the sex of the teacher.

On comparing the results of the previous two comparisons it was possible to make the following conclusions concerning the effect of sex variable on the patterns of verbal behavior:

1. The percent of teacher talk correlated positively with the sex of the teacher.

2. The percent of student talk did not relate with the sex of the student.

3. The periods of silence and confusion related positively with the sex of teacher and students.
4. The teacher response ratio did not relate with the sex of the teacher.

5. The instantaneous teacher question ratio did not relate negatively with the sex of the teacher.

6. The teacher question ratio did not relate with the sex of the teacher.

7. The instantaneous teacher question ratio related positively with the sex of the teacher.

8. The pupil initiation ratio did not relate with the sex of the students.

9. The content cross ratio did not relate with the sex of the teacher.

10. The steady state ratio did not relate with the sex of the teacher and students.

11. The pupil steady state ratio related positively with the sex of the teacher and students.

12. Direct/indirectness did not relate with the sex of the teacher.

Another treatment for the data concerning the general patterns of behavior in the classes of all female teachers compared to those patterns of behavior in the classes of all male teachers is presented in Table 19, from which the following results were obtained:

1. Male teachers in the classes of physics and chemistry talked more than female teachers.

2. Female students in the classes of chemistry and physics talked more than male students.
TABLE 19

VERBAL BEHAVIOR PATTERNS IN SCIENCE CLASSES: A GENERAL COMPARISON BETWEEN FEMALE AND MALE TEACHERS

<table>
<thead>
<tr>
<th>Pattern of Behavior</th>
<th>Total Mean of Female Teachers</th>
<th>Total Mean of Male Teachers</th>
</tr>
</thead>
<tbody>
<tr>
<td>TT</td>
<td>68.35</td>
<td>72.60</td>
</tr>
<tr>
<td>PT</td>
<td>19.35</td>
<td>18.90</td>
</tr>
<tr>
<td>SC</td>
<td>12.15</td>
<td>8.80</td>
</tr>
<tr>
<td>TRR</td>
<td>60.85</td>
<td>63.85</td>
</tr>
<tr>
<td>TRR 89</td>
<td>96.10</td>
<td>86.75</td>
</tr>
<tr>
<td>TQR</td>
<td>26.20</td>
<td>23.45</td>
</tr>
<tr>
<td>TQR 89</td>
<td>37.75</td>
<td>19.80</td>
</tr>
<tr>
<td>PIR</td>
<td>14.05</td>
<td>13.35</td>
</tr>
<tr>
<td>CCR</td>
<td>72.90</td>
<td>74.80</td>
</tr>
<tr>
<td>SSR</td>
<td>44.79</td>
<td>46.95</td>
</tr>
<tr>
<td>PSSR</td>
<td>26.55</td>
<td>28.60</td>
</tr>
</tbody>
</table>

3. Female teachers classrooms had more periods of silence and confusion than male teachers.

4. Male teachers were more responsive to the ideas and feelings of students than female teachers.

5. Female teachers reflected more instantaneous responses to the ideas and feelings of students than male teachers.

6. Female teachers asked more questions than male teachers.

7. Female teachers asked more instantaneous questions than male teachers.

8. Female students were more initiative than male students.
9. Male teachers put more emphasis on the discussion of subject matter than female teachers.

10. Male teachers interchanged ideas with students more than female teachers.

11. Male teachers were slower in the interchange of ideas with students than female teachers.

Table 20 presents additional results concerning the verbal behavior patterns in the classes of female and male teachers. When considering the ID ratio, female teachers tended to be more indirect than did male teachers. But when considering the RI/D ratio, male teachers tended to reflect more indirectness than did female teachers.

**TABLE 20**

**TEACHERS INDIRECTNESS/DIRECTNESS IN SCIENCE CLASSES: A COMPARISON BETWEEN FEMALE AND MALE TEACHERS**

<table>
<thead>
<tr>
<th>Teachers</th>
<th>I/D</th>
<th>RI/D</th>
</tr>
</thead>
<tbody>
<tr>
<td>Female</td>
<td>0.36</td>
<td>1.69</td>
</tr>
<tr>
<td>Male</td>
<td>0.30</td>
<td>3.10</td>
</tr>
<tr>
<td>Total Mean</td>
<td>0.33</td>
<td>2.39</td>
</tr>
</tbody>
</table>

A Comparison of Verbal Behavior Patterns According to Subject

In order to compare the patterns of verbal behavior in the classes of science according to subject matter, various percentages and ratios were obtained from Table 19. Thus it was possible to indicate
the following results:

1. Chemistry teachers talked less than physics teachers. The percent of teacher talk for chemistry teachers was 67.1% and that was very close to the standard average teacher talk. The percent of teacher talk for physics teachers was 73.8% and that was above the standard average by 6.7%.

2. Chemistry students talked more than physics students. The percent of student talk for chemistry students was 21.4% and that was slightly above the standard average by 1.4%. The percent of student talk for physics students was 16.8% and that was below the standard average by 3.2%.

3. Chemistry classrooms had more periods of silence and confusion than physics classroom. The percent of silence and confusion for chemistry classrooms was 11.3% and that was similar to the standard average 11-12%. The percent of silence and confusion for physics classrooms was 9.1% and that was 1.9-2.9% below the standard average.

4. Chemistry teachers were more responsive to the feelings and ideas of the students, than physics teachers. The ratio of teacher response for chemistry teachers was 67.1% and that was 25.1% higher than the standard average. The ratio of teacher response for physics teachers was 57.6% and that was 15.6% higher than the standard average.

5. Chemistry teachers reflected more immediate responses to students, the moment they stopped talking, than did physics teachers. The percent of instantaneous teacher response for chemistry teachers was 92.3% and that was higher than the standard average by 32.3%. The percent of instantaneous teacher response for physics teachers was
90.5% and that was higher than the standard average by 30.5%.

6. Chemistry teachers asked more questions than physics teachers. The teacher question ratio for chemistry teachers was 27.5% and that was higher than the standard average by 1.5%. The teacher question ratio for physics teachers was 22.1% and that was below the standard average by 3.9%.

7. Chemistry teachers asked more instantaneous questions than physics teachers. The instantaneous teacher question ratio of chemistry teachers was 37.4% and that was below the standard average by 6.6%. The instantaneous teacher question ratio of physics teachers was 20.1% and that was 23.9% below the standard average.

8. Chemistry students were less initiative than physics students. The student initiation ratio for chemistry students was 10.1% and that was below the standard average by 23.9%. The student initiation ratio of physics students was 17.2% and that was 16.8% below the standard average.

9. Chemistry teachers put less emphasis on the discussion of subject matter content than physics teachers. The cross content ratio of chemistry teachers classrooms was 72.4% and that was 17.4% higher than the standard average. The cross content ratio of physics teachers classrooms was 75.3% and that was 20.3% higher than the standard average.

10. Chemistry teachers had less interchange of ideas with students than physics teachers. The steady state ratio of chemistry classes was 43.3% and that was 6.7% below the standard average. The
steady state ratio of physics classes was 48.5% and that was 1.5% below the standard average.

11. Chemistry teachers had more rapid interchange of ideas with students than physics teachers. The student steady state ratio of chemistry classes was 26.8% and that was 8.2% below the standard average. The student steady state ratio of physics classes was 28.5% and that was 6.5% below the standard average.

In order to formulate a general outlook concerning the various verbal behavioral pattern of Iraqi teachers and students in the second year chemistry and physics classes of selected middle schools which were made in the light of American (Flanders) research results, Table 21 indicates the following results:

1. The percentage of teacher talk was slightly above the average. The percentage was 70.4% compared to that of Flanders 68%.

2. The percentage of students talk was very close to the average. The percentage was 19.1% compared to that of Flanders 20%.

3. The percentage of silence and confusion was very close to the average. The percentage was 10.4% compared to that of Flanders 11-12%.

4. The teacher response ratio was above the average. The percentage was 62.3% compared to that of Flanders 41%.

5. The teacher instantaneous response ratio was 91.4% much higher than the average. The ratio was 91.4% compared to that of Flanders 60%.

6. The teacher question ratio was very close to the average. The percentage was 24.8% compared to that of Flanders 26%.
7. The instantaneous question ratio was much below the average. The percentage was 28.7% compared to that of Flanders 44%.

8. The students initiation ratio was much below the average. The percentage was 13.6% compared to that of Flanders 34%.

9. The content cross ratio was much higher than the average. The percentage was 73.8% compared to that of Flanders 55%.

10. The steady state ratio was close to the average. The percentage was 45.9% compared to that of Flanders 50%.

11. The pupil steady ratio was below the average. The percentage was 27.6% compared to that of Flanders 35-40%.

<table>
<thead>
<tr>
<th>Pattern of Behavior</th>
<th>Total Mean Chemistry T (%)</th>
<th>Total Mean Physics T (%)</th>
<th>Average (%)</th>
<th>Flanders Averages (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>TT</td>
<td>67.1</td>
<td>73.8</td>
<td>70.4</td>
<td>68</td>
</tr>
<tr>
<td>PT</td>
<td>21.4</td>
<td>16.8</td>
<td>19.1</td>
<td>20</td>
</tr>
<tr>
<td>SC</td>
<td>11.3</td>
<td>9.1</td>
<td>10.4</td>
<td>11-12</td>
</tr>
<tr>
<td>TRR</td>
<td>67.1</td>
<td>57.6</td>
<td>62.3</td>
<td>42</td>
</tr>
<tr>
<td>TRR 89</td>
<td>92.3</td>
<td>90.5</td>
<td>91.4</td>
<td>60</td>
</tr>
<tr>
<td>TQR</td>
<td>27.5</td>
<td>22.1</td>
<td>24.8</td>
<td>26</td>
</tr>
<tr>
<td>TQR 89</td>
<td>37.4</td>
<td>20.1</td>
<td>28.7</td>
<td>44</td>
</tr>
<tr>
<td>PIR</td>
<td>10.1</td>
<td>17.2</td>
<td>13.6</td>
<td>34</td>
</tr>
<tr>
<td>CCR</td>
<td>72.4</td>
<td>75.3</td>
<td>73.8</td>
<td>55</td>
</tr>
<tr>
<td>SSR</td>
<td>43.3</td>
<td>48.5</td>
<td>45.9</td>
<td>50</td>
</tr>
<tr>
<td>PSSR</td>
<td>26.8</td>
<td>28.5</td>
<td>27.6</td>
<td>35-40</td>
</tr>
</tbody>
</table>
The I/D ratios that were obtained from Table 21 indicated that chemistry and physics teachers tended to be more direct than indirect (.36%), while the RI/D ratios indicated that they tended to be much more indirect than direct in their verbal classroom behavior.

Additional results concerning verbal behavioral patterns in chemistry and physics classrooms were obtained from Table 22. Chemistry teachers tended to be more indirect in their classroom behavior than physics teachers. The I/D ratio of chemistry teachers was .41%, while the I/D ratio of physics teachers was .31%. The RI/D ratio of chemistry teachers was 3.29%, while the RI/D ratio of physics teachers was 1.50%.

**TABLE 22**

**TEACHERS INDIRECTNESS/DIRECTNESS IN THE SCIENCE CLASSES:**
**A COMPARISON BETWEEN CHEMISTRY AND PHYSICS**

<table>
<thead>
<tr>
<th>Teachers</th>
<th>I/D</th>
<th>RI/D</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chemistry</td>
<td>0.41</td>
<td>3.29</td>
</tr>
<tr>
<td>Physics</td>
<td>0.31</td>
<td>1.50</td>
</tr>
<tr>
<td>Total Mean</td>
<td>0.36</td>
<td>2.42</td>
</tr>
</tbody>
</table>

Discussion of the Results of the Comparisons Between Chemistry and Physics Teachers

The results indicated that chemistry teachers' talk was close to the average which reflects that teacher activity did meet the expected level. Such results need to be questioned. What teachers were actually doing was explaining the curriculum that was presented in the textbook. Teachers are not encouraged to introduce extra
information concerning the subject under discussion and they have no
time for doing so since they are required to complete the curriculum
by the end of the scholastic year. Yet, it is expected that the unified
one textbook is to meet the individual differences between thousands of
middle school students, as is hoped for by science educational objec-
tives that are stated by the Iraqi Ministry of Education. Iraqi
educators do not know the effects of such patterns of teacher behavior
on students.

The results indicated that the students tended to talk slightly
more than the average. But this cannot be considered as an indication
of their initiative activities. What was happening was that they were
introducing short answers as responses to teachers' short questions.

The periods of silence and confusion in the classrooms were
average. Students were not always put on the spot with questions they
could not answer. Sometimes they responded to teachers' questions in a
collective manner in order to have the chance to answer. Sometimes
they were writing or observing what the teacher was demonstrating on
the blackboard. Nonfunctional periods were limited.

Chemistry teachers were responsive to the ideas and feelings of
students, more than the required level. Such constructive reactions
might be good to exist in the classroom, yet the quantity might not
always reveal the quality of response. What the students were actually
praised for was their proper recitation of the textbook.

Chemistry teachers instantaneous responses were much higher
than the expected level, but it does not seem that those responses were
of a suitable quality since the students did not make statements which showed initiative.

Chemistry teachers questions were higher than the expected average. But the questions were not always clear or simple and the teacher repeated some of them many times. That situation does not seem to help students in formulating a logical unity for the verbal activities being discussed. The questions were not thought of previously by teachers to serve changing students behavior. In spite of that, teachers had attempted to know how much their students had memorized of the textbook. The low percentage of students initiation indicates that the students had very limited responses to teachers questions.

The instantaneous teachers questions were below the average and that indicates that teachers were not responsive enough to student talk with questions based on their ideas compared to their tendency to lecture.

The very low percentages of student initiation indicates chemistry lessons did not succeed in stimulating students. The students showed a very limited tendency to present their own ideas or questions. They seemed to be receiving what was being discussed rather than being involved in it.

Great emphasis was put by chemistry teachers on content discussion. This reflects that teacher attention and interest was directed to subject matter and not to students. To cover the required amount of the content seems to be more important than to motivate students to open their minds and to become initiative in their thinking.
Chemistry teachers and students interchange of ideas was below the average and that indicates that the interchange happened very quickly. It is likely that the teacher was asking questions that demanded very short answers. The low average of students steady ratios emphasizes that the interchange of ideas was very quick.

Chemistry teachers did use many criticisms or directions in their classrooms. They tended to be indirect more than direct in motivating and controlling their students.

The Actual Verbal Behavior Patterns of Physics Teachers

The results indicated that the physics teachers talk was above the average. Teachers tended to lecture most of the class time. They had the most active role in their classes. This situation might be related to the difficulty of subject matter, which needed much teacher explanations.

The students' talk was below the average. The students had few chances to participate in subject matter discussion. They did not have an active role.

The classrooms were quiet places as is indicated by the percentages of periods of silence and confusion which were below the average. Teachers did not waste much time in keeping their students busy doing a silent activity or in demanding them to answer questions in a collective manner which disturbed the classroom.

The teacher was responsive to the feelings and ideas of students more than they were expected to be. They permitted their students to participate in the discussion but they were not successful
in stimulating them. Their **instantaneous responses** were very encoura-
ging to the students but the students took a negative attitude to what was going on.

The **questions of the teachers** were below average. It seems that teachers were more interested in ending the required annual curriculum that is stated in the textbook, than in stimulating students to make sure of what they really learned in the lecture.

The **instantaneous teachers questions** were much lower than the average. Teachers did not show enough tendency to give students an opportunity to talk with questions based on their ideas, compared to their tendency to lecture. This situation eliminated the chances for students to present answers that can be discussed with other students.

The **students' initiation** was much lower than the average. It seems that the students were not well trained in expressing their own ideas or questions. The students were dependent in learning physics on their teachers.

A very great emphasis was put by physics teachers on **content** of textbook discussion. The main interest of teachers was the subject matter and not the development of students' different abilities.

The **teacher-student interchange** of ideas was appropriate and close to the average.

The **student interchange** of ideas with their teachers occurred very quickly. The students did not have many chances to express themselves or to discuss a part of the lecture for a long time. The interchange of ideas depended on asking short questions that demanded short answers.
Physics teachers tended to have an indirect classroom environment that might encourage learning of science.

It is to be concluded that the analysis of verbal interaction of both chemistry and physics classes has indicated what might be considered proper quantities of teachers talk, student talk and silence and confusion periods. But the rest of the verbal behavior patterns were not so, and might not be considered as to have led to proper teacher-student interaction. Also the analysis indicated that the educational objectives that are stated in the "Curriculum of the Iraqi Middle Schools Science" might not have been met in the lessons being investigated. The emphasis of teachers was put on student memorization for subject matter. Teachers had the most active role in classroom activities. The verbal interaction cannot be described as a satisfactory interaction which met all the required levels of the proper interaction, according to updated research findings.

The Effect of Sex Variable on the Patterns of Verbal Behavior

Positive correlations were found between the sex of the teacher and each of the following verbal behavior patterns:

1. Teacher talk. Male teachers in the classes of physics and chemistry talked more than female teachers.

2. Periods of silence and confusion. Female teachers' and students' classes of chemistry and physics had more periods of silence and confusion than male teachers' and students' classes.

3. Instantaneous teacher responses. Female teachers of chemistry were more responsive to their students than male teachers of
physics. Female teachers of physics were more responsive to their students than male teachers of chemistry.

4. **Instantaneous teachers questions.** Female teachers of chemistry asked more instantaneous questions than male teachers of physics. Female teachers of physics asked more instantaneous questions than male teachers of chemistry.

5. **Students steady state.** Female teachers of chemistry had more rapid interchange of ideas with students than male teachers of physics. Female teachers of physics had more rapid interchange of ideas with students than male teachers of chemistry.

No relationships were found between the sex of the teacher and each of the following verbal behavior patterns: students talk, teachers response, teachers questions, students initiation, content cross and steady state. No consistent results between teachers of opposite sexes who taught the same subject and who taught a different subject were found.

Male teachers were found to be more indirect than direct when compared with female teachers.

In general, Iraqi middle schools science teachers tended to use little criticism and directions.

There was an indication that when getting more used to the presence of the investigator in the classroom, teachers became more responsive, less active in asking questions, more active in emphasizing content, and their students became more initiative.

In Iraq, schools exist and teachers are employed to promote certain desirable learnings in students. It is obvious that a teacher
is effective to the extent that he causes students to learn what they are supposed to learn. The results have indicated the actual verbal patterns of behavior in some selected Science Middle School Classes. It was not possible to make judgments concerning whether those behaviors were good or bad. The study did not intend to determine the effects of each pattern of behavior on the product of students. Such judgments need further intensive research, in order to set forth some ground rules which can improve classroom teaching in Iraq.

Summary

In this chapter the investigator introduced the data that represented the process of verbal interaction of the twenty-four observations covered by the sample. The patterns of interaction were illustrated by numbers and percentages that served in answering different questions concerning interaction.

Comparisons were made between the patterns of classroom verbal behavior in the first and second observations to find out if the interaction was influenced by the presence of the investigator or not.

Comparisons were made between teachers according to sex in order to find out whether there was an effect for the sex of teachers and students on verbal interaction patterns.

Comparisons were made between the verbal behavior patterns of teachers and students of chemistry and physics in order to determine whether the subject matters being taught had an effect on the patterns of behavior or not.

These comparisons were made in the light of Flanders research findings that were assumed to be an appropriate measure for classroom verbal interaction.
CHAPTER V

SUMMARY, CONCLUSIONS AND IMPLICATIONS

Summary

The purpose of this investigation was the following:

* To analyze the verbal interaction that occurred between the teacher and students in some selected Middle Schools in Baghdad. The sample covered some second grade physics and chemistry classes of both sexes.

* To determine the relationship that existed between the interaction patterns of Iraqi classrooms and the interaction patterns in American classrooms as indicated by Flanders research.

* To determine the relationships between the patterns of interaction in the chemistry classes with that of the physics classes in both the classes for boys and girls.

The problem of the study was concerned with answering the following questions:

1. What percentages of classroom time was spent in teacher talk, student talk, silence and confusion?

2. What were the ratios of teacher response, teacher instantaneous response, teacher questions, teacher instantaneous questions?

3. What ratio of classroom time was spent by students in initiative activities?
4. How quick was the teacher-student interchange of ideas as indicated by the steady state ratio and the pupil steady state ratio?

5. What was the ratio of indirect to direct teacher influence?

Data concerning all of these questions were gathered according to the sex of the teachers and the subjects taught. The data for answering these questions related directly to the problem under investigation.

Six chemistry classes were observed; (three that were taught by female teachers and three that were taught by male teachers) and six physics classes (three that were taught by female teachers and three that were taught by male teachers), from selected Middle Schools in the Rasafa Area of Baghdad. Each teacher was visited during two class periods by the investigator. As a trained observer, she observed, classified and recorded the verbal behavior that took place in the classroom according to the method of Interaction Analysis developed by Flanders.

The observational data was converted to a matrix form for detailed analysis of the sequences of behavior patterns as well as for the frequency of their occurrence. Various percentages of verbal behavior patterns were obtained for the twenty-four observations, then compared with Flanders Standard Percentages.

The twenty-four observations were classified into four groups: chemistry female classrooms, chemistry male classrooms, physics female classrooms and physics male classrooms; in order to determine the actual verbal behavior patterns; to find out the differences in the existed verbal behavior patterns according to sex and subjects that were taught;
and to find out whether the interaction was influenced by the presence of the investigator in the classroom or not.

Conclusions

In comparison with Flanders research findings, the levels of the verbal behavior patterns were actually existing in some selected Iraqi Middle schools second grades chemistry and physics classes can be described according to the results drawn from the observational data analysis.

For chemistry classrooms:

1. An average amount of teacher talk (67.1%)
2. An average amount of student talk (21.4%)
3. An average amount of periods of silence and confusion (11.3%)
4. A high average of instantaneous teachers response (92.3%)
5. A high average of teachers responses (67.1%)
6. An average amount of teachers questions (27.5%)
7. A low average of instantaneous teacher questions (37.4%)
8. A very low average of student initiation (10.1%)
9. A very high average of content cross (72.4%)
10. Low averages of teachers-students interchange (26.8%)

When including the tendency of teachers to lecture, their behaviors were direct, (.41%) but when that tendency is eliminated their behaviors tended to be indirect (3.29%)

Iraqi chemistry teachers and students spent what might be considered normal periods in talk which was accompanied by periods of silence and confusion. They were very responsive to their students.
They did accept students feelings. They did praise students. They did accept or used students ideas. They did ask what might be considered a typical enough amount of questions. Their tendency to lecture on subject matter was very strong. Their tendency to give commands and to criticize students was low. Students talk in response to teacher talk was very low. Teachers interchanged ideas with their students few times and in a rapid manner.

For physics classrooms:

1. A high average amount of teacher talk (73.8%)
2. A low average amount of student talk (16.8%)
3. A low average amount of periods of silence and confusion (9.1%)
4. A high average of teachers responses (57.6%)
5. A very high average of instantaneous teacher response (90.5%)
6. A low average amount of teachers questions (22.1%)
7. A very low average of teachers instantaneous questions (20.1%)
8. A very low average of students initiation (17.2%)
9. A very high average of content cross (75.3%)
10. An average teacher student interchange, though very quick (48.5%)
11. Teachers tended to be more direct than indirect in their behavior .31% and 1.50%

Unlike chemistry teachers, Iraqi physics teachers spent what might be considered above normal periods in talk. Their students had spent what might be considered below normal periods in talk. Verbal classroom activities were accompanied by few periods of silence and confusion. This situation might be caused by the difficulty of the
matter. Like chemistry teachers, physics teachers were very responsive to their students. They did accept students feelings. They did praise students. They did accept or use students ideas. Differently from chemistry teachers they did not ask what might be considered an average amount of questions. Their tendency to lecture on subject matter was very high and even higher than that of the chemistry teachers. Like chemistry teachers their students showed very limited amount of responses to their long lectures. They put a very great emphasis on content discussion which was even higher than that of chemistry teachers. Teachers interchanged ideas with students but in a rather rapid manner.

The results of data analysis have indicated positive correlations between the sex of the teacher and each of the following verbal behavior patterns: teacher talk—male teachers (72.6%) talked more than female teachers (68.35%); periods of silence and confusion—female classrooms (12.15%) had more of those periods than male classrooms (8.8%); instantaneous teacher responses—female teachers (60.85%) were more responsive than male teachers (63.85%); instantaneous teachers questions—female teachers (37.75%) asked more questions than did male teachers (19.8%); students steady state—female teachers (26.55%) had more quick interchanged of ideas than male teachers (28.6%).

No relationships were found between the sex of the teacher and each of the following behavioral patterns: students talk, teacher responses, teacher questions, student initiation, content cross, steady state.

Although both sexes, by the influence of their strong tendency to lecture, tended to be direct in their behaviors, the results did
indicate that male teachers tended to be more indirect than female teachers.

There was evidence that some behavioral patterns were influenced by the presence of the investigator in the classroom. In getting more used to the investigator's presence, the teachers became more responsive to their students, more involved in discussing subject matter, less active in asking questions. But the students initiated more activities.

**Recommendations**

The investigation revealed patterns of classroom verbal behavior that were equal to the expected levels or higher or lower. In order to increase science teachers effectiveness, attention should be given to the programs of teachers education in Iraq. Teachers, student teachers, instructors of methods of teaching, and supervisors need to understand more fully the techniques of improving the process of teaching if the desired students' behavioral changes are to be fulfilled.

The Interaction Analysis System described in this study is one of those techniques. It can give student teachers and inservice teachers a way of gathering objective data about their behavior in the classroom and a way to try different patterns of influence. The use of this study depends on putting it into real practice.

A course on Flanders verbal interaction analysis in the Colleges and Institutes of teachers might provide student teachers with more understanding for classroom verbal activities. The differences in the behaviors of teachers who receive such training and those who do not can be researched in order to find out teacher training effects on student achievement.
The results of this study have only a limited meaning. However, when coupled with the findings of similar studies in the future, these results could assume an added dimension of significance.

Additional studies concerned with analyzing Middle School science classroom interaction are needed in order to find out if the verbal behavior patterns that were found in this investigation are typical in Iraq or not.

Other studies that cover all middle school subjects need to be conducted to determine if such behavioral patterns are typical of other school subjects.

Extensive studies on how teachers of average and below average verbal behavior patterns were effected by each of the following variables needs to be done:

- teacher formative experiences; social class; age; sex.
- teacher teaching experiences; professional training
- teacher properties; teaching skills; motivation; personality traits.

Context variables:

- students formative experiences; social class; age; sex.
- students properties; abilities, knowledge, attitudes
- school and community contexts; climate; ethnic composition; school size.
- classroom context; class size; text books; educational aids.

Product variables:

- immediate student growth; subject matter learning; attitudes toward subjects; growth of other skills.
In working only with verbal behavior in the classroom it became evident that the whole area of non-verbal behavior is one which needs more investigation. For example, it was noticed that during classroom observation that some teachers frequently substituted teacher demonstration instead of laboratory work. It was also apparent that the teacher kept a distance between self and students, that rigidity of positioning one's self in the classroom occurred, that a silent method for criticizing students occurred, and was different from teacher to teacher. What effect such factors may have on students needs to be studied in depth.

Research findings have evidence that an analysis of interaction in classrooms reflects the importance of teacher influence on pupil behavior, learning and attitude by associating influence with the teachers verbal behavior and non-verbal behavior, since all behaviors have the possibility of communicating information to students (42, p. 2). The technique for analyzing such complicated combinations of behaviors is available. A video tape of the teacher for analysis is appliable in this area (42, p. 10).

This study has provided a preliminary step for the initiation of subsequent studies of teacher-student interaction, and in this regard merely represents a beginning step for Iraqi educators.
APPENDIX A

IN THE NAME OF GOD
THE REPUBLIC OF IRAQ

Bureau of Education for Baghdad Province/Rasafa
Section: Schools activities
Number: 6/16/33297
Date: 4/12/1977

To: 1. Al-Gharbia Middle School for Boys
    2. Al-Tahrir Middle School for Boys
    3. Al-Shabab Middle School for Boys

Subject: A visit

Visits are going to be paid for your schools, by instructor Muna Younis Al-Bahri, for the purpose of observing and recording some lessons of chemistry and physics, that are needed for her dissertation. Please be notified to introduce the possible aid for her, with appreciation.

Ahmed Yousef Al-Ahmed
Co. Chief of Educational Staff

A copy to:
Schools Activities
Instructor Muna Younis Al-Bahri
APPENDIX B

IN THE NAME OF GOD
THE REPUBLIC OF IRAQ

Bureau of Education for Baghdad Province/Rasafa
Section: Schools Activities
Number: 6/16/33815
Date: 4/12/1977

To: 1. Al-Muthana Middle School for Girls
    2. Al-Wazweria Middle School for Girls
    3. Al-Numan Middle School for Girls

Subject: A visit

Visits are going to be paid for your schools by instructor Muna Younis Al-Bahri, for the purpose of observing and recording some lessons of chemistry and physics, that are needed for her dissertation. Please be notified to introduce the possible aid for her, with appreciation.

Ahmed Yousef Al-Ahmad

Co. Chief of Educational Staff

A copy to:
Schools Activities
Instructor Muna Younis Al-Bahri

187
APPENDIX C

The Tally Sheet of Coding Symbols and Recording the Observations

<table>
<thead>
<tr>
<th>Code</th>
<th>Observations</th>
<th>Code</th>
<th>Observations</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The school : The subject :
The location: The time and date : The class :
No. of observation:
APPENDIX D

How to Compute Inter-Observer Agreement
(Using Scott's Coefficient $\pi$)

When you compute your inter-observer agreement with another observer you do so to determine the degree to which your coding of a lesson and another person's coding of the same lesson agree. When you have gone through the procedures for computing your agreement with another observer you will end up with a figure somewhere between .00 and 1.00. This figure called $\pi$ is an index of the degree of your agreement with another observer and may be interpreted as follows:

<table>
<thead>
<tr>
<th>.00</th>
<th>.25</th>
<th>.50</th>
<th>.75</th>
<th>1.00</th>
</tr>
</thead>
<tbody>
<tr>
<td>Almost No Agreement</td>
<td>Low Agreement</td>
<td>Moderate Agreement</td>
<td>High Agreement</td>
<td>Very High Agreement</td>
</tr>
</tbody>
</table>

Steps in Computing Inter-Observer Agreement

1. Count the number of times you recorded each category of behavior. Start with the first category and count each code symbol you recorded and each hash mark that stands for continued five second intervals of the behavior. For our purposes combine both teacher and student categories. Enter the number of tallies for category #1, column 1 of the table on the worksheet in the row called number of tallies for observer B. Now do the same thing for the second
category. Continue to count the number of tallies for the remaining categories until the row called number of tallies for observer B is filled in.

2. Sum the figures you have just entered into the row, number of tallies for observer B, to get the total number of tallies categories that you recorded, and enter that number in the box called Total Tallies.

3. Compute the percentage of behavior for each category by dividing the total number of tallies into the number of tallies for each category. (Or use any other procedure you want to to get the percentages). Enter the percentage for each category in the row called percentages for observer B. By using a consistent procedure for rounding off, you should end up with around 100% when you sum the percentages.

4. Now find the difference of the percentages for you and observer A (the standard) for each category. Just find the actual difference. (It doesn't matter whether observer A or B has the larger percentage; e.g., the difference between 19 and 22 is 3, and the difference between 22 and 19 is also 3).

5. Enter the differences of percentages for each category in the row called difference of percentages.

6. Sum the differences of percentages for each category and put that figure in the box called sum of differences of percentages.

7. Subtract the sum of the differences of percentages from 100 and enter your answer in the box called Po. Po = The proportion of agreement for observers A and B.
8. You now have all of the information you need to compute your inter-observer agreement with the exception of one figure called Pe.

Pe = The proportion of agreement that could have been expected by chance. To obtain the Pe value find the highest and second highest category percentages for observer A. Turn to the Pe Table on the work sheet and find the curve on the graph that represents the highest percentage (note: The curves are drawn at 10 point intervals so if the highest category percentage for observer A was 35% the curve would be half way between 30% and 40%. In such a case you would draw in an imaginary curve between 30% and 40% that represents 35%). Now find the point at the bottom of the Pe Table that represents the second highest percentage for observer A. (Note: Once again you may have to interpolate, because the scale is drawn at 10 point intervals). Now that you have found the point on the bottom line that represents the second highest category for observer A, draw a line straight up to the point where the line intersects with the curve that represents the highest category percentage for observer A. On the left hand side of the Pe Table are the Pe values. Move straight across to the left of the table from the point where the curve for the highest, and the line for the second highest categories intersect and read your Pe value from the scale. (Note: Once again you will probably have to interpolate). Enter the Pe value in the box called Pe.
9. Now solve for \( \pi \) (coefficient of inter-observer agreement) by using

the following formula:

\[
\pi = \frac{Po - Pe}{100 - Pe}
\]

**Note:** If your sum of percentages (because of rounding errors) is less than or greater than 100% add the difference between your sum of percentages and 100% to the Po value. For example, if your sum of percentages is 98% and your Po value 83, add 2 to the Po value to make it 85.
**Inter-Observable Agreement Worksheet**

<table>
<thead>
<tr>
<th>Name</th>
<th>Date</th>
<th>Observation</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Number of Tallies</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>9</th>
<th>10</th>
</tr>
</thead>
<tbody>
<tr>
<td>For Observer A</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Percentages</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Number of Tallies</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>9</th>
<th>10</th>
</tr>
</thead>
<tbody>
<tr>
<td>For Observer B</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Percentages</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Differences of Percentages For Observers A and B</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>9</th>
<th>10</th>
</tr>
</thead>
</table>

**Pe Table**

<table>
<thead>
<tr>
<th>%</th>
<th>0</th>
<th>10</th>
<th>20</th>
<th>30</th>
<th>40</th>
<th>50</th>
<th>60</th>
<th>70</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>20%</td>
<td></td>
<td>30%</td>
<td></td>
<td>40%</td>
<td></td>
<td>50%</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>60%</td>
<td></td>
<td>70%</td>
<td></td>
<td>80%</td>
<td></td>
</tr>
</tbody>
</table>

**Formula for Scott's π**

\[ \pi = \frac{Po - Pe}{100 - Pe} \]

\[ \pi = \left( \frac{Po}{100} \right) - \left( \frac{Pe}{100} \right) \]
Inter-Observable Agreement Worksheet

<table>
<thead>
<tr>
<th>Observation</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>9</th>
<th>10</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of Tallies</td>
<td>1</td>
<td>5</td>
<td>13</td>
<td>32</td>
<td>85</td>
<td>8</td>
<td>2</td>
<td>40</td>
<td>2</td>
<td>36</td>
</tr>
<tr>
<td>Percentages For Observer A</td>
<td>0.4</td>
<td>2.2</td>
<td>5.8</td>
<td>4.2</td>
<td>3.9</td>
<td>9.3</td>
<td>0.8</td>
<td>7.8</td>
<td>0.8</td>
<td>16</td>
</tr>
<tr>
<td>Number of Tallies For Observer B</td>
<td>1</td>
<td>7</td>
<td>10</td>
<td>30</td>
<td>83</td>
<td>6</td>
<td>1</td>
<td>38</td>
<td>1</td>
<td>34</td>
</tr>
<tr>
<td>Percentages For Observer B</td>
<td>0.4</td>
<td>3.3</td>
<td>4.7</td>
<td>14.2</td>
<td>39.3</td>
<td>2.8</td>
<td>0.4</td>
<td>18.0</td>
<td>0.4</td>
<td>16.1</td>
</tr>
<tr>
<td>Differences of Percentages For Observers A and B</td>
<td>--</td>
<td>1.1</td>
<td>1.1</td>
<td>--</td>
<td>1.4</td>
<td>0.7</td>
<td>0.4</td>
<td>0.2</td>
<td>0.4</td>
<td>0.1</td>
</tr>
</tbody>
</table>

**Total Tallies**
- Observer A: 225
- Observer B: 211

**Total Percents**
- Observer A: 99.4
- Observer B: 99.6

**Difference of Percentages A - B**
- 5.4

**Pe Table**

<table>
<thead>
<tr>
<th>%</th>
<th>20%</th>
<th>30%</th>
<th>40%</th>
<th>50%</th>
<th>60%</th>
<th>70%</th>
<th>80%</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>0</td>
<td>10</td>
<td>20</td>
<td>30</td>
<td>40</td>
<td>50</td>
<td>60</td>
</tr>
<tr>
<td>10</td>
<td>0</td>
<td>10</td>
<td>20</td>
<td>30</td>
<td>40</td>
<td>50</td>
<td>60</td>
</tr>
<tr>
<td>20</td>
<td>0</td>
<td>10</td>
<td>20</td>
<td>30</td>
<td>40</td>
<td>50</td>
<td>60</td>
</tr>
<tr>
<td>30</td>
<td>0</td>
<td>10</td>
<td>20</td>
<td>30</td>
<td>40</td>
<td>50</td>
<td>60</td>
</tr>
<tr>
<td>40</td>
<td>0</td>
<td>10</td>
<td>20</td>
<td>30</td>
<td>40</td>
<td>50</td>
<td>60</td>
</tr>
<tr>
<td>50</td>
<td>0</td>
<td>10</td>
<td>20</td>
<td>30</td>
<td>40</td>
<td>50</td>
<td>60</td>
</tr>
<tr>
<td>60</td>
<td>0</td>
<td>10</td>
<td>20</td>
<td>30</td>
<td>40</td>
<td>50</td>
<td>60</td>
</tr>
<tr>
<td>70</td>
<td>0</td>
<td>10</td>
<td>20</td>
<td>30</td>
<td>40</td>
<td>50</td>
<td>60</td>
</tr>
<tr>
<td>80</td>
<td>0</td>
<td>10</td>
<td>20</td>
<td>30</td>
<td>40</td>
<td>50</td>
<td>60</td>
</tr>
</tbody>
</table>

**Formula for Scott's \( \pi \)**

\[
\pi = \frac{Po - Pe}{100 - Pe}
\]

\[
\pi = \frac{(94.6) - (60)}{100 - (60)}
\]
# Inter-Observer Agreement Worksheet

<table>
<thead>
<tr>
<th>Name</th>
<th>Date</th>
<th>Observation</th>
</tr>
</thead>
</table>

## Number of Tallies

<table>
<thead>
<tr>
<th>Observer A</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>9</th>
<th>10</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>15</td>
<td>5</td>
<td>20</td>
<td>87</td>
<td>15</td>
<td>2</td>
<td>50</td>
<td>1</td>
<td>52</td>
<td>249</td>
</tr>
</tbody>
</table>

## Percentages for Observer A

| 0.8 | 6 | 2 | 8 | 34.9 | 6 | 0.8 | 20 | 0.4 | 20.8 |

## Number of Tallies

<table>
<thead>
<tr>
<th>Observer B</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>9</th>
<th>10</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>17</td>
<td>4</td>
<td>20</td>
<td>90</td>
<td>16</td>
<td>1</td>
<td>46</td>
<td>1</td>
<td>50</td>
<td>247</td>
</tr>
</tbody>
</table>

## Percentages for Observer B

| 0.8 | 6.8 | 1.6 | 8.0 | 36.4 | 6.4 | 0.4 | 18.6 | 0.4 | 20.2 | 99.6 |

## Differences of Percentages

| 0.8 | 0.4 | -- | 1.5 | 0.4 | 0.4 | 1.4 | -- | 0.6 | 5.5 |

## Total Tallies

| Observer A | 249 |
| Observer B | 247 |

## Total Percentages

| Observer A | 99.7 |
| Observer B | 99.6 |

## Difference of Percentages A - B

### Formula for Scott's $\pi$

$$\pi = \frac{Po - Pe}{100 - Pe}$$

With $Po = 94.5$ and $Pe = 48$:

$$\pi = \frac{(94.5) - (48)}{100 - (48)}$$
A COMPARISON BETWEEN THE FIRST AND SECOND
CLASSROOM OBSERVATIONS OF ALL TEACHERS

<table>
<thead>
<tr>
<th>Pattern of Behavior</th>
<th>First Observations</th>
<th>Second Observations</th>
<th>Average</th>
<th>Mean</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>T # 1</td>
<td>T # 2</td>
<td>T # 3</td>
<td>Average</td>
</tr>
<tr>
<td>Chemistry Female Teachers</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>TT</td>
<td>60.7</td>
<td>72.8</td>
<td>68.8</td>
<td>67.4</td>
</tr>
<tr>
<td>PT</td>
<td>19.0</td>
<td>17.7</td>
<td>24.3</td>
<td>20.3</td>
</tr>
<tr>
<td>SC</td>
<td>20.3</td>
<td>9.5</td>
<td>6.8</td>
<td>12.2</td>
</tr>
<tr>
<td>TRR</td>
<td>57.5</td>
<td>70.3</td>
<td>78.9</td>
<td>68.9</td>
</tr>
<tr>
<td>TRR 89</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
</tr>
<tr>
<td>TQR</td>
<td>18.8</td>
<td>25.9</td>
<td>37.1</td>
<td>21.2</td>
</tr>
<tr>
<td>TQR 89</td>
<td>69.2</td>
<td>12.5</td>
<td>36.8</td>
<td>39.5</td>
</tr>
<tr>
<td>PIR</td>
<td>2.1</td>
<td>12.7</td>
<td>6.6</td>
<td>7.1</td>
</tr>
<tr>
<td>CCR</td>
<td>55.0</td>
<td>83.7</td>
<td>87.4</td>
<td>75.3</td>
</tr>
<tr>
<td>SSR</td>
<td>45.3</td>
<td>41.8</td>
<td>40.0</td>
<td>42.3</td>
</tr>
<tr>
<td>PSSR</td>
<td>27.6</td>
<td>19.1</td>
<td>18.3</td>
<td>21.6</td>
</tr>
<tr>
<td>Pattern of Behavior</td>
<td>First Observations</td>
<td>Second Observations</td>
<td>Average</td>
<td>Mean</td>
</tr>
<tr>
<td>---------------------</td>
<td>--------------------</td>
<td>---------------------</td>
<td>---------</td>
<td>------</td>
</tr>
<tr>
<td></td>
<td>T # 1</td>
<td>T # 2</td>
<td>T # 3</td>
<td>T # 1</td>
</tr>
<tr>
<td>Chemistry Male Teachers</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>TT</td>
<td>59.0</td>
<td>75.0</td>
<td>69.4</td>
<td>67.8</td>
</tr>
<tr>
<td>PT</td>
<td>21.9</td>
<td>21.0</td>
<td>22.0</td>
<td>21.6</td>
</tr>
<tr>
<td>SC</td>
<td>19.1</td>
<td>3.0</td>
<td>8.6</td>
<td>10.2</td>
</tr>
<tr>
<td>TRR</td>
<td>50.0</td>
<td>64.2</td>
<td>86.3</td>
<td>66.8</td>
</tr>
<tr>
<td>TRR 89</td>
<td>100</td>
<td>73.3</td>
<td>100</td>
<td>91.1</td>
</tr>
<tr>
<td>TQR</td>
<td>17.7</td>
<td>34.7</td>
<td>31.5</td>
<td>27.9</td>
</tr>
<tr>
<td>TQR 89</td>
<td>39.1</td>
<td>50.0</td>
<td>32.0</td>
<td>40.3</td>
</tr>
<tr>
<td>PIR</td>
<td>6.4</td>
<td>2.0</td>
<td>8.4</td>
<td>5.6</td>
</tr>
<tr>
<td>CCR</td>
<td>70.6</td>
<td>52.6</td>
<td>79.1</td>
<td>67.4</td>
</tr>
<tr>
<td>SSR</td>
<td>49.9</td>
<td>45.6</td>
<td>44.4</td>
<td>46.6</td>
</tr>
<tr>
<td>PSSR</td>
<td>51.6</td>
<td>16.6</td>
<td>25.4</td>
<td>31.2</td>
</tr>
<tr>
<td>Physics Female Teachers</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>TT</td>
<td>66.7</td>
<td>74.6</td>
<td>78.6</td>
<td>73.3</td>
</tr>
<tr>
<td>PT</td>
<td>17.4</td>
<td>18.0</td>
<td>18.4</td>
<td>17.9</td>
</tr>
<tr>
<td>SC</td>
<td>15.9</td>
<td>7.4</td>
<td>16.2</td>
<td>13.1</td>
</tr>
<tr>
<td>TRR</td>
<td>45.7</td>
<td>43.5</td>
<td>69.2</td>
<td>52.8</td>
</tr>
<tr>
<td>TRR 89</td>
<td>81.8</td>
<td>80.0</td>
<td>100</td>
<td>87.2</td>
</tr>
<tr>
<td>TQR</td>
<td>32.3</td>
<td>20.0</td>
<td>33.7</td>
<td>28.6</td>
</tr>
<tr>
<td>TQR 89</td>
<td>45.8</td>
<td>19.2</td>
<td>80.0</td>
<td>48.3</td>
</tr>
<tr>
<td>PIR</td>
<td>0.0</td>
<td>40.8</td>
<td>2.5</td>
<td>14.4</td>
</tr>
<tr>
<td>CCR</td>
<td>77.3</td>
<td>79.0</td>
<td>70.6</td>
<td>75.6</td>
</tr>
<tr>
<td>SSR</td>
<td>35.8</td>
<td>46.7</td>
<td>45.0</td>
<td>42.5</td>
</tr>
<tr>
<td>PSSR</td>
<td>24.5</td>
<td>14.2</td>
<td>23.0</td>
<td>20.5</td>
</tr>
<tr>
<td>Pattern of Behavior</td>
<td>First Observations</td>
<td>Second Observations</td>
<td>Average</td>
<td>Mean</td>
</tr>
<tr>
<td>--------------------</td>
<td>--------------------</td>
<td>---------------------</td>
<td>---------</td>
<td>------</td>
</tr>
<tr>
<td></td>
<td>T # 1</td>
<td>T # 2</td>
<td>T # 3</td>
<td></td>
</tr>
<tr>
<td>Physics Male Teachers</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>TT</td>
<td>75.2</td>
<td>72.3</td>
<td>80.5</td>
<td>76.0</td>
</tr>
<tr>
<td>PT</td>
<td>19.7</td>
<td>18.7</td>
<td>13.8</td>
<td>17.4</td>
</tr>
<tr>
<td>SC</td>
<td>5.0</td>
<td>9.0</td>
<td>5.7</td>
<td>6.5</td>
</tr>
<tr>
<td>TRR</td>
<td>79.3</td>
<td>68.4</td>
<td>57.1</td>
<td>68.2</td>
</tr>
<tr>
<td>TRR 89</td>
<td>100</td>
<td>91.3</td>
<td>50.8</td>
<td>80.4</td>
</tr>
<tr>
<td>TQR</td>
<td>25.9</td>
<td>15.6</td>
<td>27.6</td>
<td>23.0</td>
</tr>
<tr>
<td>TQR 89</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>PIR</td>
<td>31.3</td>
<td>0.0</td>
<td>6.6</td>
<td>12.6</td>
</tr>
<tr>
<td>CCR</td>
<td>56.5</td>
<td>69.6</td>
<td>88.4</td>
<td>71.5</td>
</tr>
<tr>
<td>SSR</td>
<td>44.4</td>
<td>47.3</td>
<td>56.9</td>
<td>49.5</td>
</tr>
<tr>
<td>PSSR</td>
<td>19.6</td>
<td>30.9</td>
<td>56.6</td>
<td>39.0</td>
</tr>
</tbody>
</table>
APPENDIX F

TEACHERS INDIRECTNESS/DIRECTNESS IN THE SECOND YEAR MIDDLE SCHOOLS CHEMISTRY AND PHYSICS CLASSES

<table>
<thead>
<tr>
<th>Teacher</th>
<th>Observations No. 1</th>
<th>Observations No. 2</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>I/D</td>
<td>RI/D</td>
</tr>
<tr>
<td>Chemistry</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Female T # 1</td>
<td>0.40</td>
<td>1.35</td>
</tr>
<tr>
<td>T # 2</td>
<td>0.38</td>
<td>2.30</td>
</tr>
<tr>
<td>T # 3</td>
<td>0.50</td>
<td>0.37</td>
</tr>
<tr>
<td>Average</td>
<td>0.42</td>
<td>1.34</td>
</tr>
<tr>
<td>Total Mean</td>
<td>0.40</td>
<td>1.80</td>
</tr>
<tr>
<td>Male T # 1</td>
<td>0.23</td>
<td>1.00</td>
</tr>
<tr>
<td>T # 2</td>
<td>0.50</td>
<td>4.50</td>
</tr>
<tr>
<td>T # 3</td>
<td>0.46</td>
<td>6.30</td>
</tr>
<tr>
<td>Average</td>
<td>0.39</td>
<td>3.93</td>
</tr>
<tr>
<td>Total Mean</td>
<td>0.42</td>
<td>4.79</td>
</tr>
<tr>
<td>Average all T</td>
<td>0.40</td>
<td>2.63</td>
</tr>
<tr>
<td>Total all Mean</td>
<td>0.41</td>
<td>3.29</td>
</tr>
<tr>
<td>Physics</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Female T # 1</td>
<td>0.42</td>
<td>0.84</td>
</tr>
<tr>
<td>T # 2</td>
<td>0.30</td>
<td>1.40</td>
</tr>
<tr>
<td>T # 3</td>
<td>0.42</td>
<td>2.57</td>
</tr>
<tr>
<td>Average</td>
<td>0.38</td>
<td>1.60</td>
</tr>
<tr>
<td>Total Mean</td>
<td>0.33</td>
<td>1.59</td>
</tr>
<tr>
<td>Male T # 1</td>
<td>0.42</td>
<td>3.83</td>
</tr>
<tr>
<td>T # 2</td>
<td>0.31</td>
<td>0.21</td>
</tr>
<tr>
<td>T # 3</td>
<td>0.32</td>
<td>1.33</td>
</tr>
<tr>
<td>Average</td>
<td>0.35</td>
<td>1.79</td>
</tr>
<tr>
<td>Total Mean</td>
<td>0.29</td>
<td>1.42</td>
</tr>
<tr>
<td>Average all T</td>
<td>0.36</td>
<td>1.69</td>
</tr>
<tr>
<td>Total all Mean</td>
<td>0.31</td>
<td>1.50</td>
</tr>
<tr>
<td>General Total Ratio</td>
<td>0.38</td>
<td>2.21</td>
</tr>
<tr>
<td>Final Ratio</td>
<td>0.36</td>
<td>2.42</td>
</tr>
</tbody>
</table>
BIBLIOGRAPHY


3. Al-Bahri, Muna. The Efficiency of the College of Education in Baghdad University. Educational Research Center, Baghdad University, Baghdad: 1975, p. 94.


