TEACHING AND LEARNING BEHAVIORS IN TECHNOLOGY-ORIENTED PRECALCULUS CLASSROOMS

DISSERTATION

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

By

Ann Maureen Farrell, B.A., M.A.

* * * * *

The Ohio State University

1989

Dissertation Committee:
Alan Osborne
Marilyn N. Suydam
Bert K. Waits

Approved by

[Signature]
Adviser
Educational Theory and Practice
ACKNOWLEDGMENTS

I am very fortunate to have had the opportunity to work closely with three dedicated mathematics educators. I am deeply indebted to my adviser Alan Osborne for sharing his time, wisdom, and encouragement. All were given generously. I am also indebted to Bert Waits who has been a source of support and encouragement throughout my masters and doctoral studies. I am grateful to Marilyn Suydam for her advice and encouragement, beginning with my first mathematics education seminar. I have only had to observe the actions of these three to learn what it means to be researcher, mentor, and teacher. I will try to repay them through my future work.

I am grateful to Patricia Brosnan who asked the right questions at the right time, offered encouragement, and spent many hours viewing videotapes. I thank Don Chandler who gave generously of his time and energy to view videotapes. I thank Jill Baumer-Piña for the many hours of assistance that she provided.

There are many others to whom I am grateful. To Judith Allik and Frank Dapolito who encouraged me to go to graduate school; Frank Restle who helped me begin; Peggy Kasten who inspired me and my classmates during her time at OSU; and my colleagues, Bishnu Naraine and Laurie Wern, whose many challenging and rewarding discussions helped me learn, I acknowledge my gratitude.

Finally, I thank my classmates at UD, IU, and OSU for helping me believe that I could do it; my family, especially Mary and Meg, who were there with me; and to Bill Frapwell, who waited for me to finish.
VITA

September 10, 1958 .......................... Born - Elyria, Ohio
1980 ........................................... B.S., University of Dayton,
                                             Dayton, Ohio
1980-1983 ................................. Graduate Research Assistant,
                                             Psychology Department,
                                             Indiana University,
                                             Bloomington, Indiana
1983-1984 ................................. Mathematics Teacher,
                                             Meadowdale High School,
                                             Dayton, Ohio
1984-1985 ................................. M.A., Mathematics,
                                             The Ohio State University,
                                             Columbus, Ohio
1985-1987 ................................. Assistant Editor, Merrill
                                             Publishing Company,
                                             Westerville, Ohio
1987-Present .............................. Graduate Teaching Assistant,
                                             Department of Educational
                                             Theory and Practice,
                                             The Ohio State University,
                                             Columbus, Ohio

FIELDS OF STUDY

Major Field: Mathematics Education
With a Concentration in Teacher Education
# TABLE OF CONTENTS

ACKNOWLEDGEMENTS .......................................................... ii

VITA .................................................................................... iii

LIST OF TABLES ................................................................. vi

LIST OF FIGURES .............................................................. ix

CHAPTER  

<table>
<thead>
<tr>
<th>I. INTRODUCTION</th>
<th>PAGE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Statement of the Problem</td>
<td>1</td>
</tr>
<tr>
<td>Short Description of Methods</td>
<td>6</td>
</tr>
<tr>
<td>Significance of the Study</td>
<td>8</td>
</tr>
<tr>
<td>Definition of Terms</td>
<td>9</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>II. REVIEW OF RELATED LITERATURE</th>
<th>PAGE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Teaching and Learning in Traditional Classrooms</td>
<td>15</td>
</tr>
<tr>
<td>Teaching and Learning in Classrooms Where Technology Supplements the Curriculum</td>
<td>26</td>
</tr>
<tr>
<td>Teaching and Learning in Classrooms Where Technology is Integral to the Curriculum</td>
<td>28</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>III. PROCEDURES</th>
<th>PAGE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Instrumentation</td>
<td>31</td>
</tr>
<tr>
<td>Definitions</td>
<td>34</td>
</tr>
<tr>
<td>Methods</td>
<td>38</td>
</tr>
<tr>
<td>The Sample</td>
<td>38</td>
</tr>
<tr>
<td>Taping</td>
<td>39</td>
</tr>
<tr>
<td>Teacher Notes</td>
<td>39</td>
</tr>
<tr>
<td>Coding Tapes</td>
<td>40</td>
</tr>
<tr>
<td>Scope of the Study</td>
<td>41</td>
</tr>
<tr>
<td>Limitations of the Study</td>
<td>41</td>
</tr>
</tbody>
</table>
IV. DESCRIPTION OF CLASSROOM EVENTS: INDIVIDUAL CLASSROOMS ........................................ 43
   Classroom A ........................................ 43
   Classroom B ........................................ 64
   Classroom C ........................................ 79
   Classroom D ........................................ 103
   Classroom E ........................................ 125
   Classroom F ........................................ 147

V. DISCUSSION: SUMMARY OF SIX CLASSROOMS ........ 164
   Teaching and Pupiling in the Six Classrooms ...... 165
   The Robustness of the Instrument .................. 171

VI. CONCLUSIONS AND RECOMMENDATIONS ............. 175
   Implications ......................................... 178
   Recommendations .................................... 178

APPENDICES
   A. Summary Statistics for Each Lesson ............ 181
   B. Observers' Records for Each Lesson ............ 218
   C. Sample Instructions for Teachers .............. 322

LIST OF REFERENCES ...................................... 326
<table>
<thead>
<tr>
<th>TABLE</th>
<th>PAGE</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Summary of changes in instructional practices in 9-12 mathematics</td>
<td>11</td>
</tr>
<tr>
<td>2. Summary statistics for Classroom A</td>
<td>59</td>
</tr>
<tr>
<td>3. Summary statistics for Classroom B</td>
<td>76</td>
</tr>
<tr>
<td>4. Summary statistics for Classroom C</td>
<td>101</td>
</tr>
<tr>
<td>5. Summary statistics for Classroom D</td>
<td>123</td>
</tr>
<tr>
<td>6. Summary statistics for Classroom E</td>
<td>145</td>
</tr>
<tr>
<td>7. Summary statistics for Classroom F</td>
<td>162</td>
</tr>
<tr>
<td>8. Summary statistics for all classrooms</td>
<td>166</td>
</tr>
<tr>
<td>9. Summary statistics for Classroom A Lessons 1 to 6</td>
<td>182</td>
</tr>
<tr>
<td>10. Summary statistics for Classroom B Lessons 1 to 6</td>
<td>188</td>
</tr>
<tr>
<td>11. Summary statistics for Classroom C Lessons 1 to 6</td>
<td>194</td>
</tr>
<tr>
<td>12. Summary statistics for Classroom D Lessons 1 to 6</td>
<td>200</td>
</tr>
<tr>
<td>13. Summary statistics for Classroom E Lessons 1 to 6</td>
<td>206</td>
</tr>
<tr>
<td>14. Summary statistics for Classroom F Lessons 1 to 6</td>
<td>212</td>
</tr>
<tr>
<td>15. Observers' records for Classroom A Lesson 1</td>
<td>219</td>
</tr>
<tr>
<td>16. Observers' records for Classroom A Lesson 2</td>
<td>222</td>
</tr>
<tr>
<td>17. Observers' records for Classroom A Lesson 3</td>
<td>225</td>
</tr>
<tr>
<td>18. Observers' records for Classroom A Lesson 4</td>
<td>228</td>
</tr>
<tr>
<td>19. Observers' records for Classroom A Lesson 5</td>
<td>230</td>
</tr>
<tr>
<td>20. Observers' records for Classroom A Lesson 6</td>
<td>233</td>
</tr>
<tr>
<td>TABLE</td>
<td></td>
</tr>
<tr>
<td>-------</td>
<td></td>
</tr>
<tr>
<td>21. Observers' records for Classroom B Lesson 1</td>
<td>236</td>
</tr>
<tr>
<td>22. Observers' records for Classroom B Lesson 2</td>
<td>239</td>
</tr>
<tr>
<td>23. Observers' records for Classroom B Lesson 3</td>
<td>242</td>
</tr>
<tr>
<td>24. Observers' records for Classroom B Lesson 4</td>
<td>244</td>
</tr>
<tr>
<td>25. Observers' records for Classroom B Lesson 5</td>
<td>247</td>
</tr>
<tr>
<td>26. Observers' records for Classroom B Lesson 6</td>
<td>250</td>
</tr>
<tr>
<td>27. Observers' records for Classroom C Lesson 1</td>
<td>254</td>
</tr>
<tr>
<td>28. Observers' records for Classroom C Lesson 2</td>
<td>257</td>
</tr>
<tr>
<td>29. Observers' records for Classroom C Lesson 3</td>
<td>260</td>
</tr>
<tr>
<td>30. Observers' records for Classroom C Lesson 4</td>
<td>263</td>
</tr>
<tr>
<td>31. Observers' records for Classroom C Lesson 5</td>
<td>265</td>
</tr>
<tr>
<td>32. Observers' records for Classroom C Lesson 6</td>
<td>268</td>
</tr>
<tr>
<td>33. Observers' records for Classroom D Lesson 1</td>
<td>270</td>
</tr>
<tr>
<td>34. Observers' records for Classroom D Lesson 2</td>
<td>273</td>
</tr>
<tr>
<td>35. Observers' records for Classroom D Lesson 3</td>
<td>276</td>
</tr>
<tr>
<td>36. Observers' records for Classroom D Lesson 4</td>
<td>279</td>
</tr>
<tr>
<td>37. Observers' records for Classroom D Lesson 5</td>
<td>282</td>
</tr>
<tr>
<td>38. Observers' records for Classroom D Lesson 6</td>
<td>285</td>
</tr>
<tr>
<td>39. Observers' records for Classroom E Lesson 1</td>
<td>288</td>
</tr>
<tr>
<td>40. Observers' records for Classroom E Lesson 2</td>
<td>290</td>
</tr>
<tr>
<td>TABLE</td>
<td>PAGE</td>
</tr>
<tr>
<td>-------</td>
<td>------</td>
</tr>
<tr>
<td>41. Observers' records for Classroom E Lesson 3</td>
<td>293</td>
</tr>
<tr>
<td>42. Observers' records for Classroom E Lesson 4</td>
<td>296</td>
</tr>
<tr>
<td>43. Observers' records for Classroom E Lesson 5</td>
<td>299</td>
</tr>
<tr>
<td>44. Observers' records for Classroom E Lesson 6</td>
<td>302</td>
</tr>
<tr>
<td>45. Observers' records for Classroom F Lesson 1</td>
<td>305</td>
</tr>
<tr>
<td>46. Observers' records for Classroom F Lesson 2</td>
<td>308</td>
</tr>
<tr>
<td>47. Observers' records for Classroom F Lesson 3</td>
<td>311</td>
</tr>
<tr>
<td>48. Observers' records for Classroom F Lesson 4</td>
<td>314</td>
</tr>
<tr>
<td>49. Observers' records for Classroom F Lesson 5</td>
<td>316</td>
</tr>
<tr>
<td>50. Observers' records for Classroom F Lesson 6</td>
<td>319</td>
</tr>
</tbody>
</table>
# LIST OF FIGURES

<table>
<thead>
<tr>
<th>FIGURE</th>
<th>PAGE</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. A model for the study of classroom teaching</td>
<td>16</td>
</tr>
<tr>
<td>2. Classroom roles, teaching activities, and learning activities in relation to processes in the Dunkin and Biddle process-product model</td>
<td>18</td>
</tr>
<tr>
<td>3. Modified SCAN matrix used for coding classroom events</td>
<td>33</td>
</tr>
<tr>
<td>4. Observers' records for the transcription of Classroom A lesson segments</td>
<td>55</td>
</tr>
<tr>
<td>5. List of SCAN descriptors and the numeric codes used in the present study</td>
<td>56</td>
</tr>
<tr>
<td>6. Observers' records for the transcription of Classroom B lesson segments</td>
<td>74</td>
</tr>
<tr>
<td>7. Observers' records for the transcription of Classroom C lesson segments</td>
<td>98</td>
</tr>
<tr>
<td>8. Observers' records for the transcription of Classroom D lesson segments</td>
<td>120</td>
</tr>
<tr>
<td>9. Observers' records for the transcription of Classroom E lesson segments</td>
<td>142</td>
</tr>
<tr>
<td>10. Observers' records for the transcription of Classroom F lesson segments</td>
<td>159</td>
</tr>
</tbody>
</table>
CHAPTER I
INTRODUCTION

Calculators and computers are becoming more powerful and more accessible. The National Council of Teachers of Mathematics, the largest professional organization of elementary and secondary mathematics teachers and researchers in mathematics education, recommends that calculators and computers be available to all students and teachers at all levels of the curriculum (National Council of Teachers of Mathematics, 1989). Some mathematics educators claim that the use of this new technology can change the teaching and learning of mathematics. "New possibilities, including the use of the calculator and, particularly, the microcomputer, have real potential in helping teachers and students achieve classroom learning activities (discussion, non-routine problem-solving, and open investigation) that have long proved inaccessible to all but a few teachers" (Burkhardt, 1985, p. 321). "The most fundamental consequence of changes in patterns of instruction in response to technology-rich classroom environments is the emergence of a new classroom dynamic in which teachers and students become natural partners in developing mathematical ideas and solving mathematical problems" (National Council of Teachers of Mathematics, 1989, p. 126).

The present study is an exploration of the teaching and learning activities that occur when calculators and computers are integrated into a precalculus mathematics curriculum. It is a study of six precalculus classes over a two- to three-week period at the end of one year of field testing a new technology-rich curriculum. It is a naturalistic study. Care was taken not to disturb the events occurring in the classrooms under study. Teachers were asked simply to videotape their precalculus classes for ten consecutive days. No effort was made to record special lessons. Teachers knew that the purpose
of the study was to describe what goes on in the project classrooms and that no value judgment would be made about their teaching.

The Calculator and Computer Precalculus (C^2PC) Project is part of a large curriculum development project being conducted by the mathematics and education group at The Ohio State University. The purposes of the technology-enhanced curriculum are two-fold:

1. to increase the portion of students entering university level mathematics who would be ready for the study of the calculus, and

2. to increase the attention and emphasis on graphs and functions.

The large-scale project involves integrating calculators and computers throughout the mathematics curriculum in grades 9 through 12. The C^2PC Project involves development of a curriculum for precalculus mathematics, usually taught to 11th or 12th grade high school students, but also appropriate for some college students. The text places heavy emphases on graphing and investigating the graphs of functions (Demana & Waits, 1987). During the 1987-88 school year, materials for the full year-long C^2PC course were piloted in nine classes in four Columbus area high schools. During the 1988-89 school year, the materials were field-tested in 84 high schools and 40 colleges throughout the United States.

The microcomputer and hand-held graphing calculator based instruction under study in the present research provides access to one of the newest types of computer-based teaching materials for mathematics: function graphing utilities. Utilities are designed to put a powerful and flexible tool in the hands of the user. Utilities are user controlled, unlike much of the software introduced in the past 25 years in the form of programmed instruction, drill and practice programs, and tutorials. Students and teachers in the C^2PC classrooms used two function graphing utilities, one on hand-held graphing calculators and one on microcomputers. These graphing utilities are tools for investigating graphs. They are as user directed a system as a pencil and graph paper "system," awaiting the command of the user at every step and providing minimal cueing.

The purpose of the present study is to describe the teacher and student behaviors evident in the C^2PC classrooms. Fey (1980) categorized research on curricula and instruction into three types: selection of mathematical
content, structuring of mathematical content, and instructional presentation of mathematical content. Fey cautions:

The long-standing pattern of searching for the single best method of instruction has been almost uniformly unproductive in identifying appropriate instructional procedures, sequencing strategies, or forms of presentation. Research has recently turned to a more microscopic analysis of curriculum processes that searches for a picture of the effects to be expected from particular approaches in particular situations. (p. 415)

The teaching and learning behaviors of teachers and students in the technology-oriented classrooms of the C²PC project will be studied to determine what can be expected when the C²PC graphing utility and textbook are used in precalculus mathematics classrooms.

A descriptive stage is one of the necessary elements in the paradigm for studying teaching detailed by Rosenshine & Furst (1973). Research programs using this paradigm contain at least these elements: development of procedures for describing teaching in a quantitative manner, correlational studies in which the descriptive variables are related to measures of student growth, and experimental studies in which the significant variables obtained in the correlational studies are tested in a more controlled situation (Rosenshine & Furst, 1973, p. 122). This paradigm is called a descriptive-correlational-experimental research loop. The sequence of the steps is not fixed. They are presented above in the order in which the planned research program will be conducted.

Rosenshine and Furst (1973) describe the application of the descriptive-correlational-experimental paradigm to the study of special curricula. They suggest that the research loop take the following form. First, train teachers to use a certain package of materials. Then, use observational systems to describe instructional activities on variables considered important for the implementation of the specific program and also on variables considered to have general educational importance. Study the relationship between instructional activities and student growth (on a variety of outcomes) within those groups of teachers who are supposed to be using the experimental treatment. If necessary, change training procedures
and/or materials on the basis of these studies. Finally, conduct new studies to determine the effects of the modifications and to determine the new relationship between instructional activities and student growth (Rosenshine & Furst, 1973, p. 127).

Gage (cited in Shulman, 1986) supports the use of a general but qualitative description of a small number of cases as the first stage of research. "After important variables and constructs have been identified using those descriptive studies (exemplars leading to conceptual inventions), large-scale process-product correlational studies are conducted to identify discrete relationships between individual teacher behaviors and student outcomes..." (p. 32).

The present study represents this initial, qualitative stage of research on teaching and learning processes in a technology-oriented curriculum. This qualitative approach will result in careful descriptions of what goes on in the six classrooms chosen for examination.

Several observation systems have been developed and used by researchers interested in classroom teaching. In most systems, observers are provided with a set of categories and tally the teacher and student behaviors occurring at frequent and recurrent intervals. There is debate over whether such categorization schemes are too restrictive to allow for a true representation of the complexities of classroom interactions. Mehan (1979) says that there are "serious drawbacks to an approach that limits its domain to behavior tabulated into discrete categories....the contingent nature of interaction is obscured" (p. 10). Mehan cites Flander's interaction analysis scheme as one example of an instrument that "has limited utility for a rigorous description of the internal life of schools" (p. 14).

A description of the interconnected nature of teacher-student interaction in verbal and nonverbal modalities is required in order to capture the full range of activities that teachers and students engage in while coping with the complexities of classroom life. Time sampling may be useful for tabulating the frequency of occurrences, but because it treats teacher and student behavior as isolated acts, it obscures the sequential flow of classroom activity. (p. 12)
Burkhardt (1985) concludes after over two decades of experience working on the improvement of mathematics teaching, "purpose-built structured classroom observation methods are an important element of such curriculum development" (p. 321). Burkhardt and his colleagues have devised methods for structured classroom observation of teachers and students "designed to work in a robust way for teachers with a wide range of styles and approaches" (p. 327). Their observation system does not treat teacher and student behaviors as isolated acts, but rather allows the observer to record concurrently the teaching activities, learning activities, and teaching and learning roles evident in the classroom.

This observation system, the Systematic Classroom Analysis Notation (SCAN), was developed by Beeby, Burkhardt, and Fraser (1979) in order to provide its authors a means for interpreting systematically how educational computer programs were being used by teachers in various subjects, including mathematics. The SCAN categories will be used to record and describe carefully the activities evident during mathematics lessons in the C²PC classrooms.

In a study of the effect of the computer on classroom behavior of teachers and students in 17 mathematics classes, Fraser et al. (1987) used interpretations from SCAN records to describe the role shifts made by teachers and students. The roles that were considered were: manager, task setter, explainer, counselor (consultant), fellow student (investigator), and resource system. These roles may be undertaken by teacher, students, or the computer. Fraser et al. found that the use of a single classroom microcomputer "suitably programmed for use as a teaching aid" affected the role that the teacher played in the classroom. Furthermore, the researchers found a relationship between the roles undertaken by teacher and the learning activities engaged in by the students. More specifically, the researchers found that when teachers allowed the computer to take over the traditional, more authoritarian roles of manager and task setter, the teacher was free to move on to the more demanding roles of consultant, fellow investigator, and resource person. In addition, allowing the students to assume the roles of manager, task setter, and explainer made them take on
more responsibility for their own learning and use more higher level thinking skills than in their "traditional" role as passive learners. Both of these shifts, the teacher shifting from manager and task setter to fellow investigator and the students moving from passive learners to active investigators of knowledge, are dominant themes in the new standards for school mathematics proposed by the National Council of Teachers of Mathematics (National Council of Teachers of Mathematics, 1989).

Technology was used as a supplement to the regular curriculum in the classrooms studied by Fraser et al. (1987). This study differs in the use of technology in that the computer and calculator utilities are an integral part of instruction rather than serving as a supplement to the curriculum. Students have frequent access to the computers and continuous access to the calculators. Teachers frequently use the computers for demonstration in the classroom. The textbook was designed with the graphing utilities as an integral part of the curriculum.

The SCAN instrument used by Fraser et al. (1987) will be used for C²PC classroom observations and documentation. The SCAN instrument will be used to note teacher and student roles, teaching activities, and learning activities occurring in the C²PC classrooms. The authors of SCAN claim that the instrument is robust enough for use in other classrooms. A by-product of the present study will be a determination of the appropriateness of the SCAN instrument for studying classrooms in which technology is an integral part of the curriculum.

Statement of the Problem

The developers of the Calculator and Computer in Precalculus materials contend that the availability of a powerful graphing utility allows students and teachers to adopt a more investigatory approach to teaching and learning in the classroom.

The C²PC computer based approach to precalculus mathematics instruction has several important benefits...It is interactive and expects students to be active partners in the learning process by using the computer as an investigative "tool" and powerful general problem solving device...It makes generalization possible for
students by taking advantage of the speed and power of computers to investigate and study many more examples and problems than possible using limited traditional methods. (Demana & Waits, 1988, p. 54)

During Winter Quarter, 1988-89, the 84 high school teachers using the C²PC materials were sent informal questionnaires to determine whether they perceived a change in their teaching style due to their participation in the C²PC project. Thirty-seven of the 43 respondents said that they did teach differently this year than in past years. Thirteen said that they lectured less or not at all, ten said that they incorporated more problem solving, nine mentioned more cooperative learning and individual help either teacher to student or student to student, and six said that there was more individual and group work. Teachers ranked the impact on their teaching style of several changes brought on by the new curriculum. The ease of graphing with graphing utilities and the types of problems in the text were ranked as having the greatest impact on their teaching style.

The teachers suggest that their students have also incorporated some changes in the way they behave in the classroom. The changes in teaching and "pupiling" noted in the responses to the questionnaire are suggestive of the shifts in teacher and student roles reported by Fraser et al. (1987). Pupiling refers to the observable behaviors and clusters of behaviors that students use in the classroom. These behaviors are probably shaped through the years as students experience the classroom culture and teachers' expectations. The term is more appropriate than "learning behaviors" for purposes of this study because no evidence about the products of learning were collected. Students in both the Fraser et al. and the C²PC classrooms appear to be changing how they behave as learners. The changes in pupiling appear to involve more active participation in class, more cooperative learning, and more risk-taking. The descriptions of events in the C²PC classrooms will include a discussion of these pupil behaviors. The SCAN records made by observers watching videotaped lessons will be examined to answer the following questions:
What teaching and pupiling *roles* do teachers and students exhibit in precalculus classes where a hand-held calculator graphing utility or a microcomputer graphing utility is used?

What teaching and pupiling *behaviors* do teachers and students exhibit in precalculus classes where a hand-held calculator graphing utility or a microcomputer graphing utility is used?

Are the roles and behaviors exhibited by teachers and students in these classrooms when technology is in use different from when it is not?

Does the SCAN instrument, developed for use in classrooms where technology *supplements* the curriculum, adequately capture the roles and behaviors exhibited by teachers and students in classrooms where technology is an *integral part* of the curriculum?

**Methods**

Six high school teachers were recruited from among teachers involved in a curriculum development project designed to implement calculators and computers in high school mathematics. The teachers were nearing the end of their first year of teaching precalculus mathematics using the C²PC materials. The observations were made late in the year in order that changes in behavior would have stabilized into a more habituated pattern than might have been observed early in the teachers' use of technology. Their experience with computers in the classroom prior to their participation in the curriculum development project varied from very little to a coordinator of teacher inservices with emphasis on computer implementations in the K-12 curriculum. The teachers were chosen because of their long-term commitment to the curriculum development project, their willingness to videotape their classes, and the availability of videotaping equipment in their schools.

In an effort to minimize disruption to the normal classroom events, the only request made of the teachers was to videotape ten consecutive, non-testing lessons. Three teachers operated the camera themselves by setting it
up in a stationary position in the back of the classroom. In two of these cases four or five students are visible on camera. For one of these teachers, most of the time only one or two students are visible on camera. Three teachers were able to arrange for a student aide to operate the camera and make periodic sweeps of the room to show the entire class.

Significance of the Study

The results of this line of research will have implications for:
1. teacher educators,
2. researchers into classroom behaviors,
3. classroom teachers and mathematics supervisors interested in implementing the NCTM Curriculum and Evaluation Standards for School Mathematics,
4. developers of technology-based curricula and the associated instructor manuals and teacher guides.

The implication of the present study for teacher educators lies in the SCAN instrument's potential for use with preservice and inservice teachers. "Any system of recording the essentials of a lesson has obvious applications in teacher training" (Beeby, Burkhardt, & Fraser, 1979, p. 33). Beeby and his associates have used SCAN records of student teachers to provide the basis for discussion of teaching strategies and skills. They have also used SCAN records of experienced teachers for discussions with student teachers. They find that it allows a "much more detailed and particularised discussion of what went on in the lesson than the tutor's notes that are normally used. In particular the nature of the dialogue close to crucial decision points in the lesson can be analysed in retrospect and often leads the students to suggest changes to try on another occasion" (p. 33).

Detailed, low-inference descriptions of teaching episodes would also provide important data for studies of teacher effectiveness. The SCAN records are detailed enough to allow for quantitative analyses of teaching episodes. Researchers into classroom behaviors may be interested in further development of the SCAN or other instruments for use in studying teacher and student interactions in technology-rich classrooms.
Another implication of the present study becomes clear when the teaching and learning activities that form the SCAN categories are compared to those recommended in the NCTM Curriculum and Evaluation Standards (National Council of Teachers of Mathematics, 1989). NCTM recommends changes in instructional patterns and in the roles of both teachers and students. The recommended changes include greater opportunities for small-group work, individual explorations, peer instruction, and whole-class discussions in which the teacher serves as a moderator. "These alternative methods of instruction will require the teacher's role to shift from dispensing information to facilitating learning, from that of director to that of catalyst and coach" (p. 128). The role of students in the learning process in grades 9-12 should shift to that of "self-directed learners who routinely engage in constructing, symbolizing, applying, and generalizing mathematical ideas" (p. 128).

The NCTM recommendations also address the use of calculators and computers.

The use of technology in instruction should further alter both the teaching and the learning of mathematics. Computer software can be used effectively for class demonstrations and independently by students to explore additional examples, perform independent investigations...Calculators and computers with appropriate software transform the mathematics classroom into a laboratory...where students use technology to investigate, conjecture, and verify their findings. In this setting, the teacher encourages experimentation and provides opportunities for students to summarize ideas and establish connections.... (p. 128)

Table 1 is reproduced from the NCTM Curriculum and Evaluation Standards. It summarizes the instructional practices that are recommended for increased attention and those that are recommended for decreased attention. The detailed SCAN recording system may provide a method for determining whether these recommended behaviors and roles are evident in the classroom. The reader may wish to refer briefly to the description of the SCAN instrument in Chapter III and Figure 3 in particular to compare the
behaviors and roles identified by the SCAN instrument with those listed in Table 1.

Table 1. Summary of Changes in Instructional Practices in 9-12 Mathematics (NCTM, 1989, p. 129)

<table>
<thead>
<tr>
<th>INCREASED ATTENTION to-</th>
<th>DECREASED ATTENTION to-</th>
</tr>
</thead>
<tbody>
<tr>
<td>The active involvement of students in constructing and applying mathematical ideas</td>
<td>Teacher and text as exclusive sources of knowledge</td>
</tr>
<tr>
<td>Problem solving as a means as well as a goal of instruction</td>
<td>Rote memorization of facts and procedures</td>
</tr>
<tr>
<td>Effective questioning techniques that promote student interaction</td>
<td>Extended periods of individual seatwork practicing routine tasks</td>
</tr>
<tr>
<td>The use of a variety of instructional formats (small groups, individual explorations, peer instruction, whole-class discussions, project work)</td>
<td>Instruction by teacher exposition</td>
</tr>
<tr>
<td>The use of calculators and computers as tools for learning and doing mathematics</td>
<td>Paper-and-pencil manipulative skill work</td>
</tr>
<tr>
<td>Student communication of mathematical ideas orally and in writing</td>
<td>The relegation of testing to an adjunct role with the sole purpose of assigning grades</td>
</tr>
<tr>
<td>The establishment and application of the interrelatedness of mathematical topics</td>
<td></td>
</tr>
<tr>
<td>The systematic maintenance of student learning and embedding review in the context of new topics and problem situations</td>
<td></td>
</tr>
<tr>
<td>The assessment of learning as an integral part of instruction</td>
<td></td>
</tr>
</tbody>
</table>
Finally, the results of this line of research will have implications for the developers of other technology-based curricula. SCAN was developed by a group of software developers to provide a method for observation and analysis of classroom use of their software. Burkhardt et al. (1988) report that they used SCAN because they saw a need for empirically based studies of representative uses of their software to enable them to enhance the human/human/computer interactions. "For most of the software we know, far more effort has been devoted to maximizing its capability in the hands of an 'ideal user' (who probably resembles members of the software design team) than to maximizing the performance of the total system, involving people with widely differing expertise both in computers and in the specific domain of interest" (p. 3). The use of a system like SCAN may help other software developers "to understand better the important elements in the functioning of the situation and the roles played by various participants before and after the introduction of microcomputers" with the ultimate goal of developing software more effectively (p. 4).

The developers of SCAN were introducing technology into the classroom in a way that differs from the way technology has been implemented in the C²PC classrooms. The results of the present research will inform mathematics educators about teaching and pupiling behaviors that were observed in six classrooms where teachers and students made extensive use of graphing utilities to illustrate precalculus concepts and solve precalculus problems. Whether these behaviors are to be found in other classrooms where teachers and students make use of other types of software or other types of utilities is another issue to be explored.

In summary, SCAN provides a method for analyzing teaching and pupiling behaviors. The present study uses a modified version of SCAN to record teaching and pupiling behaviors in classrooms where technology is integrated with the curriculum. Since leaders in mathematics education are encouraging both a change in classroom behaviors and the implementation of technology in the classroom, the study has implications beyond the particular curriculum under study.
Definition of Terms

Several terms have been used in Chapter I and II that have been defined operationally for purposes of this study. Their definitions are provided below. Definitions of the categories used on the SCAN instrument are given in Chapter III.

Calculator and Computer Precalculus Project - A curriculum development project being conducted by The Mathematics and Education Group at the Ohio State University. The C²PC project is part of a large-scale project that involves integrating calculators and computers throughout the mathematics curriculum in grades 9 through 12.

Graphing utility - A tool for drawing graphs of mathematical expressions that is available as packaged software for use on computers and in specially designed hand-held calculators that have automatic graphing keys. Graphing utilities provide quick plotting of polynomial functions, trigonometric functions, inequalities, polar equations, conic sections, and/or parametric equations. Some graphing utilities provide access to graphs in three dimensions in addition to graphs on the coordinate plane. The graphing utilities used by students and teachers in the present study were Master Grapher software (Waits & Demana, 1988) and Casio® hand-held scientific graphing calculators. The Master Grapher software is compatible with IBM®, Apple®, and Macintosh® microcomputers. Other computer graphing utilities similar in design include ANU Grapher (Smythe & Ward, 1986), Cactus Plot (1984), and True Basic's function plotter, Mac Function (Lewis & Tecosky, 1987). Other hand-held scientific graphing calculators similar in type to those used in the classrooms in the study include ones developed by Sharp® and Hewlett-Packard®.

Learning activity - Inferred from the students' observable behaviors. The tracking sheet shown in Figure 3 in Chapter III displays the subcategories of this observation category.

Process-product research - A research paradigm in which the correlation between the teacher's and students' observable behaviors (processes) and student growth scores (products) is examined. The most commonly used growth scores are gain scores from standardized achievement tests.
Systematic Classroom Analysis Notation (SCAN) - A notation scheme developed by Beeby, Burkhardt, and Fraser (1979) for recording classroom dialog. A taxonomy of learning and teaching activities was developed from the detailed records of classroom dialog.

Teaching activity - Inferred from the teacher's observable behaviors. Cockcroft (1982) suggests several teaching activities that should be used in the mathematics classroom. These include exposition; discussion; application of mathematics; consolidation, practice, and exercise; problem solving; investigation; and work in small groups.

Technology as an "integral part" of the curriculum - The curriculum is designed for use with a specific type or types of technology. The textbook and lab manuals are written for use with technology and take advantage of the special strengths of the technology. The expectation is that technology will be freely accessible during all class periods and on homework assignments. The teacher may also shift between several software packages rather than making repeated, exclusive use of a single utility or software package.

Technology as a "supplement" to the curriculum - At times during the course some technology (either calculators or computers) is used as an addition to the regular curriculum. For example, students may use computer simulation software during one unit of a course. The curriculum was not written with the use of computers and calculators in mind. The technology is only accessible during some class periods.

"Traditional" classrooms - Classrooms that conform to the established pattern of practice as noted in the mathematics education literature and use the established curriculum.
CHAPTER II
REVIEW OF RELATED LITERATURE

Three areas of the research literature are examined: research on teaching and learning in traditional mathematics classrooms, research on teaching and learning in classrooms where technology supplements the curriculum, and research on teaching and learning in mathematics classrooms where technology is an integral part of the curriculum.

This chapter is not a comprehensive review of the literature on teaching and learning behaviors. Comprehensive reviews of the literature can be found in Fey (1979), Medley (1979), Romberg and Carpenter (1986), Rosenshine and Furst (1973), Rosenshine and Stevens (1986), Shulman (1986), and Suydam and Osborne (1977) and so are not duplicated here. This review is restricted to studies that provide a context to the present research because of the teacher and student behaviors that are described. This review is designed to provide an overview of the course that research has taken from studies in traditional classrooms to more recent research in classrooms with technology-enhanced curricula.

Teaching and Learning in Traditional Classrooms

Research on teaching behavior conducted since the early 1970's has focused mainly on finding correlations between processes observed in the classroom and the products or outcomes of teaching as indicated by measures of student achievement. This research paradigm is called the process-product paradigm. Dunkin and Biddle (1974) and Rosenshine and Furst (1971) have extensively reviewed the process-product literature. Teaching behaviors such as clarity, variability, enthusiasm, task-oriented or businesslike behavior, and providing opportunity to learn were given some support by these reviewers for their relationship to student achievement. A model of the relationships between variables in the process-product paradigm of research is shown in Figure 1.
Figure 1. A model for the study of classroom teaching (Dunkin & Biddle, 1974, p. 38).
Doyle (1985) found the process-product paradigm too narrow. He argued that there is little concern for theoretical models in process-product research and consequently "any variable can be incorporated into an observation scheme and entered into an analysis" (p. 3761). Because of its focus on teachers and inattention to processes that intervene between what teachers do and what students learn, "several factors operating to affect student outcomes have slipped through the empirical net of this paradigm" (p. 3761). Doyle expanded the process-product paradigm to include the student responses and psychological processes that govern learning - "such mediating processes as attending, translating, segmenting, rehearsing, task persistence, time utilization, active learning time, and pupil engagement with the learning tasks" (Gage, 1978, p. 70). "The student-process, or mediating-process, variables should become as much the focus of our concern as the teacher's behavior or process. For it is the student's responses or processes that bring about his learning or achievement" (Gage, 1978, p. 71).

The classroom roles and pupiling activities indicated by SCAN records represent mediating processes. Figure 2 shows the classroom roles and teaching and pupiling activities in relation to the processes and products in the Dunkin and Biddle Model (1974).
Teacher behaviors will indicate the teaching activity being used and the role that the teacher is assuming in the lesson segment. Teacher role affects student role and vice versa. Student classroom roles both affect and are indicated by pupiling activities and other observable student classroom behaviors.

Two areas of inquiry have informed research on teaching behaviors in traditional classrooms. One line of research describes typical classroom events and activities. In order to put the descriptions of the C²PC classrooms into perspective, descriptions of "typical" or "traditional" mathematics classrooms are examined. The second line of research has sought to identify behaviors used by effective teachers and has relied heavily on the process-product paradigm. Both areas are briefly reviewed.

Suydam and Osborne (1977) reviewed journals, committee reports, influential books, institution and state archives, and the ERIC database to determine what goes on in mathematics classrooms. Some of their findings are that:

The teacher talks 2/3 of the time.
Over 50% of the questions teachers ask are at the knowledge level, requiring relatively low-level cognitive processes from students. The teacher initiates most exchanges, with students doing little more than answering questions -- in addition to sitting and listening. Tell-and-show and seatwork at the elementary school level, and homework-lecture-new homework at the secondary school level are the prevailing patterns of instruction. Seatwork consumes up to 50% of the time in class; questions and answers or discussion and explaining involve about 25% of the time. After reviewing four reviews of mathematics teaching, Romberg and Carpenter (1986) describe the typical mathematics classroom in the following way.

A single text is used in whole-class instruction. The text is followed fairly closely, but students are likely to read at most one or two pages out of five pages of textual materials other than problems...[T]he text, at least as far as the students are concerned is primarily a source of problem lists....Teachers are essentially teaching the same way they were taught in school. Almost none of the concepts, methods, or big ideas of modern mathematics programs have appeared in the classroom. (Conference Board of Mathematical Sciences, 1975, cited in Romberg & Carpenter, 1986, p. 851)

[T]he predominant pattern is "extensive teacher-directed explanation and questioning followed by student seatwork on paper-and-pencil assignments." (Fey, 1979, cited in Romberg & Carpenter, 1986, p. 851)

First, answers are given for the previous day's assignment. The more difficult problems are worked by the teacher or a student at the chalkboard. A brief explanation, sometimes none at all, is given of the new material, and problems are assigned for the next day. The remainder of the class is devoted to working on homework while the teacher moves about the room answering questions. The most noticeable thing about math classes is the repetition of this routine. (Fey, 1979, cited in Romberg & Carpenter, 1986, p. 851)
Mathematics is assumed to be a static, bounded discipline, divorced from science and other disciplines, ideas are selected, separated, and reformulated into a rational order. This is followed by subdividing each subject into topics, each topic into studies, each study into lessons. This fragmentation of mathematics has divorced the subject from reality and from inquiry. Such essential characteristics of mathematics as abstracting, inventing, proving, and applying are often lost. (Romberg & Carpenter, 1986, p. 851)

Students spend their time absorbing what other people have done, rather than in having experiences of their own. (Romberg & Carpenter, 1986, p. 851)

The role of teachers in the traditional classroom is managerial or procedural in that "their job is to assign lessons... start and stop the lessons according to some schedule, explain the rules and procedures of each lesson, judge the action of the students during the lesson, and maintain order and control throughout. (Romberg, 1985, cited in Romberg & Carpenter, 1986, p. 851)

This pattern prevails in most classrooms today. After studying recent analyses of mathematics teaching in this country, the Research Advisory Committee of the NCTM concludes that the pattern of activity in mathematics classrooms has changed little from earlier reports (Research Advisory Committee, 1988). Teacher explanations constitute most of mathematics instruction: there is extensive reliance on textbooks; and students spend very little time working in small groups or engaging in independent activities such as projects or investigations (p. 341).

Fey (1970) conducted an extensive study of the verbal communication in five junior high school mathematics classes. From audio tape recordings of four sessions in each classroom, the verbal utterances were categorized according to the type of pedagogical move (Bellack, 1966). A pedagogical move is a verbal utterance intended for structuring, soliciting, responding, or reacting. Fey also categorized each verbal utterance by source, length, content, mathematical activity, and logical process. Overall, the ratio of teacher to student talk was about 3:2 in terms of number of verbal
communications (moves) and about 5 : 2 in terms of lines of transcript. Approximately 5% of all moves were structural, 32% solicited information or action, 32% were responses to solicitations, and 31% were reactions to a prior move or moves. Fey notes that the analysis of verbal communication in the classroom according to pedagogical purpose and source "gives unmistakable evidence of a dichotomy between teacher and student roles in the classroom. Teachers did most of the structuring, soliciting, and reacting. The student was expected mainly to respond to teacher solicitations and only occasionally structure, react, or ask a question of his own" (p. 43).

A large amount of research on teacher behaviors has focused on identifying behaviors used by "effective" teachers. Effectiveness has usually been defined as the ability to produce greater than predicted gains on standardized achievement tests. Much of the research on teacher effectiveness has utilized the process-product paradigm and has been conducted in elementary and junior high school reading and mathematics classrooms. Most of the content being taught in the lessons under observation has been basic skills.

Rosenshine and Furst (1971) reviewed 50 process-product studies and, as noted above, determined that five variables in teacher behavior were strongly related to student achievement gains. These variables are clarity, enthusiasm, variability, provision of opportunity to learn, and a task-orientation or business-like approach. Good and Grouws (1977) found that more effective fourth-grade mathematics teachers used more whole-class instruction, spent less time going over homework, asked fewer process questions, had a more relaxed class atmosphere, and had more clarity in their presentations than less effective teachers. Everson, Emmer, and Brophy (1980) found similar results in junior high mathematics classes. In addition, high levels of student achievement were associated with teachers who displayed strong management skills, more questioning behaviors, and whose behavior manifested higher expectations, and high confidence and enthusiasm. More effective teachers asked more questions, praised student responses more frequently, asked more new questions after a correct answer, had fewer behavioral and procedural contacts with students, assigned homework more frequently, had more productive class time, and seemed
more concerned with academic achievement (pp. 173-174). Achievement is higher when the greater proportion of time is spent on developmental activities rather than individual practice (Suydam and Osborne, 1977).

Robitaille (1975) examined background characteristics and teaching behaviors of secondary mathematics teachers. The teachers who were more effective at encouraging and eliciting student participation in the development portion of mathematics lessons differed from the less effective teachers on several background characteristics. More effective teachers had a greater number of years of teaching experience, more background in mathematics, and a higher percentage of teaching time spent teaching mathematics as opposed to any other discipline. The more effective teachers had higher mean scores than the less effective teachers on the following tests and attitude surveys: Contemporary Mathematics Test, the Teaching Situation Reaction test, the Minnesota Teacher Attitude Survey, and the Satisfaction with Teaching Subscale of the Purdue Teacher Opinionnaire. More effective teachers also had higher frequencies of each of the following classroom behaviors: asking thought-provoking questions, encouraging students to participate in the lesson, and praising a student or the class.

In most studies on teacher effectiveness all of the teachers are engaged in direct instruction, using a standard curriculum and textbook. Within this context, the behaviors mentioned above have been related to teacher effectiveness.

Similarly a general model of effective instruction developed by Rosenshine and Stevens (1986) must be accepted with caution. Rosenshine and Stevens developed their model by pulling together ideas from a number of sources, including seven experimental studies. In the experiments, teachers were trained in specific instructional procedures, implemented the training, and their students had higher student academic achievement and/or academic engaged time than students in control classes. The model includes six fundamental instructional functions: reviewing and checking previous day's work (reaching if necessary), presentation of new content skills, guided student practice (and checking for understanding), feedback and correctives (reaching if necessary), independent student practice, and weekly and monthly reviews.
Rosenshine and Stevens (1986) provide the following caveat: These explicit teaching procedures are most applicable in those areas where the objective is to master a body of knowledge or learn a skill which can be taught in a step-by-step manner. Thus, these procedures apply to the teaching of facts that students are expected to master...arithmetic facts, decoding procedures, vocabulary, musical notation, English grammar, the factual parts of science and history. Similarly, these procedures apply to the teaching of processes or skills that students are expected to apply to new problems or situations...mathematical computation, blending sounds in decoding,...the mechanics of writing personal and business letters,...applying scientific laws, solving algebraic equations, or tuning an automobile engine. In these cases, the student is taught a general rule which is then applied to new situations.

These findings are least applicable for teaching in areas which are "ill-structured," that is, where the skills to be taught do not follow explicit steps, or areas which lack a general skill which is applied repeatedly. Thus, the results of this research are less relevant for teaching composition and writing of term papers,...problem solving in specific content areas,...or the development of unique or creative responses.

Almost all content areas are composed of well-structured and ill-structured parts. For example, when teaching a foreign language, explicit teaching can be used to teach vocabulary and grammar, but these procedures are less relevant for teaching fluency in conversation or reading comprehension. (Rosenshine & Stevens, 1986, p. 377)

If problem solving is to receive greater emphasis in the curriculum, then this model of effectiveness will apply to a smaller part of teaching activities. Yet, it describes most of current classroom teaching practices.

Romberg & Carpenter (1986) note that students who work in closely supervised small groups have been found to be more cooperative and less competitive than students in control groups. Also, greater group productivity is related to cooperative small groups. It is just this type of
cooperative learning arrangement that is necessary for true problem solving, where the problems are complex, unfamiliar, and probably have more than one possible route to a solution. The use of a graphing utility often provides multiple solution routes. Reports from teachers indicate that it does induce more student cooperation and interaction.

Two more individual studies of mathematics teaching are noted because of their recency and the particular variables under study. Friedman and Stomper (1988) compared effective and less effective college mathematics instructors. The measure of effectiveness was class mean score on the departmental examination. All instructors in the department who had taught the basic mathematics course any time during the previous six semesters were ranked according to their class mean scores on the examination. The instructors who ranked first, second, and fourth were compared to the instructors who ranked thirteenth, seventeenth, and twentieth. Friedman and Stomper found that the two set of instructors differed on two variables: format (interrogative versus declarative) and degree of control over pedagogical moves (verbal communications). The more effective instructors taught primarily by means of an interrogative format while the less effective instructors used a declarative format. Seventy-one percent of the more effective instructors' verbal utterances were questions, compared to 53% for the less effective instructors. The more effective instructors directed more of the pedagogical moves than their less effective counterparts. The more effective instructors initiated 94% of the pedagogical moves that occurred in their classroom, while the less effective instructors initiated only 78%. The other 22% of the moves in the less effective instructors' classrooms were initiated by students, mainly asking for an explanation of some part of the previous night's homework assignment.

Leinhardt (1989) compared novice teachers and expert teachers (above-average student teachers and effective fourth-grade teachers). The analysis performed by Leinhardt leads to detailed descriptions of the mathematics teachers' lesson planning, lesson implementation, and explanations of concepts. Differences between novices and experts appeared in their lesson agendas, time allocation, and explanations. A lesson agenda is
a mental plan that include the goals and activities planned for a lesson, and
markers about how and when student progress will be checked. Experts'
agendas were more detailed, had more "test points" for checking students'
understanding, and included more instructional activities than novices'
agendas. Experts spent less time in transition between lesson segments than
did novices and were more consistent from day to day in their use of time
than were novices.

Leinhardt (1989) provides a model of an explanation. A well-
structured explanation includes a representation of the concept using a
familiar analogy or model; includes a complete numerical or concrete
demonstration; includes a complete verbal description; uses only accessible
subskills; shows unique features of the concept and gives the circumstances
and principles of use of the concept. In addition, Leinhardt provides a
method for diagramming explanations. The diagram consists of nodes
representing concepts presented during the lesson and arrows between the
nodes to show how concepts were connected and organized in relation to one
another. Experts' explanations were better structured than novices'
explanations. Experts' lessons were more connected and more integrated
than novices' lessons. The diagrams of experts' lessons were connected
graphs. The diagrams of novices' lessons were often disconnected graphs,
with many disjointed segments and unfinished or unrelated explanations.

Some say that technology in the classroom provides access to a rich
environment for exploration and multiple representations of concepts. If
this is true, then analyses such as Leinhardt's (1989) might reveal
differences between lessons taught with technology and lessons taught
without it.

The results of research in traditional classrooms suggest that a similar
analysis of the C²PC classrooms should be directed toward revealing patterns
of time allocation, interrogative versus declarative format, initiation of
instructional moves, and the connections that are made between different
representations of a concept.
Teaching and Learning in Classrooms Where Technology Supplements the Curriculum

What behaviors do teachers and students exhibit in classrooms where technology is used to supplement the curriculum? How do these classroom behaviors compare with those found in technology-free environments? The research reported above on the behavior of teachers and students in traditional classrooms includes many reviews of the literature and even some reviews of reviews of the literature. The literature on technology used as a supplement to the curriculum, for purposes other than drill and practice, is much too young to include reviews or reviews of reviews.

Kellogg and Leonard (1987) watched eight teachers and their students using a single microcomputer in high school science and biology classes. The software consisted of four instructional programs designed to be used for four consecutive lessons in a genetics unit. The researchers found that the teacher's role shifted from being lecturer and conclusion-giver to initiator and facilitator. "[T]he computer was given the role of the information authority while the teacher was freed to assume a facilitator role" (p. 9). The teachers used about the same total number of questions, but more higher level inquiry questions, than traditionally reported in the literature. In addition students became actively engaged in the lessons. They asked questions and tested hypotheses using the simulation software; they were actively involved in using the scientific method.

Kellogg and Leonard's (1987) observations are similar to those made by Fraser et al. (1987) described in Chapter I of this report. Recall that Fraser et al. found that when mathematics teachers allowed the classroom microcomputer to take over the traditional, more authoritarian roles of manager and task setter, the teacher was free to move on to the more demanding roles of consultant, fellow investigator, and resource person. In addition, allowing the students to assume the roles of manager, task setter, and explainer made them take on more responsibility for their own learning and use more higher level thinking skills than in their "traditional" role as passive learners.

Mathematics and science teachers in upper elementary grades were observed by Hawkins and Sheingold (1986) as they field-tested software
modules for one month. Two software modules were noteworthy for the learning interactions that were observed. One was a simulation designed to help children learn and use navigation and geometry concepts. Students worked in teams to locate and rescue a trapped whale. They collected and interpreted information from computer-based charts, radar, and radio direction-finder to reach their goal. The other piece of software was a series of games to teach the fundamental commands and programming concepts for turtle graphics.

Hawkins and Sheingold (1986) note that new forms of interaction occurred in some classrooms. "The computer structured the experience so that teachers did not have to be centrally involved and could observe children's work or be freed to work individually with other students" (p. 49). At times, the role of the teacher did not seem to differ from traditional classroom interactions. When the teacher was demonstrating the software to students and explaining its use, interactions were similar to those in traditional whole-class instruction. When the teacher was managing the physical and social demands of the activity (booting the software, handing out supplies, ensuring that students took turns at the computer), interactions were similar to those in traditional individualized instruction.

Between these extremes, however, were three roles that gave the students opportunities for learning interactions with each other and provided the teacher with significant instructional functions. These three roles varied from the teacher's active participation in the game, to her active monitoring of the game, to her being available as a resource person when called upon. (p. 50)

Dick and Shaughnessy (1988) found only minor changes in the dynamics of classroom interaction when students in Algebra II, Trigonometry, and Calculus at two high schools used a powerful hand-held programmable symbolic/graphic calculator, the HP-28, for six months. The calculator was used in conjunction with the standard textbook and curriculum. The authors note that the students tended to help each other with questions concerning the calculator. The calculator gave teachers opportunities to try different teaching approaches. Four of the five teachers reported taking a more "exploratory" approach to teaching graphing than
they ever had before. Teachers and students were able to cover some more complicated topics and some topics in more depth than without the technology (p. 327).

What is missing from the studies on technology as a supplement to the curriculum are measures of classroom interactions and patterns of behavior in the classroom. More evidence is needed in the form of careful descriptions of interactions in these classrooms.

Teaching and Learning in Classrooms Where Technology is an Integral Part of the Curriculum

What behaviors do teachers and students exhibit in classrooms where technology is an integral part of the curriculum? Very little exists in the literature about curricula that are designed around the use of calculators and computers. What does exist seems to imply that these curricula place different demands on students and teachers than we have come to expect from traditional schooling. Information about the integration of technology into the mathematics curriculum is coming from the developers of software such as Geometric Supposer and Logo; users of a variety of software applications such as function graphers, spreadsheets, and symbolic manipulators; and users of hardware such as the HP-28 graphics calculator.

Wiske et al. (1988) of the Educational Technology Center conducted in-depth interviews with teachers around the country about their use of the computer, the training and support available for computer use, the effect of computers on teachers and students, and teachers' influence on technology. The researchers used the responses to the interview questions to write profiles of representative points of view regarding the use of computers in education. Their profile of a secondary school mathematics teacher depicts a veteran teacher whose use of computers began with drill-and-practice programs and has evolved into the use of software with more open-ended activities for whole-class demonstration and small group work. Geometric Supposer is typical of this type of software. When Geometric Supposer was in use the following activities occurred. Students formed and tested their own hypotheses. The teacher posed questions and students actively investigated
and "tested things out." Students made generalizations. Students shared ideas and group problem solving became commonplace. Students talked to each other about mathematics, allowing the teacher to use a less teacher-centered, more discovery-oriented approach. Students saw teachers learning.

Lampert (1988) also described the behavior of students and teachers using Geometric Supposer. Students in the Supposer classrooms first explored concepts and conjectures inductively then proved theorems deductively. The explorations aroused students' "need to know" and this increased their interest in deductive proofs. Students communicated more with each other about mathematics. Teachers and students began to behave as mathematicians. Students became empowered to ask questions, to explore, to really do mathematics. What students learned with Supposer, they knew "deep down in their guts" because they had explored it themselves rather than watched, listened, and memorized while the teacher told it to them. The new demands placed on teachers required them to expand their role to include paying close attention to students' thinking, following students' lead through the subject matter, guiding students' investigations, and legitimizing knowledge that was acquired in the process.

Hawkins and Sheingold (1986) saw changes in learning interactions when Logo programming work was incorporated into the ongoing curriculum of two elementary school classrooms. Two classrooms, a mixed third- and fourth-grade class and a mixed sixth- and seventh-grade class, were studied for a two-year period. The researchers found significant changes in students' interactions. Students were observed to collaborate (to talk together about their work) more when they were working on programming projects than on other classroom tasks, even though they were encouraged to work together on these other classroom tasks. Some students acquired expertise in programming and came to be called upon by their peers for help with a problem or to contribute sections of program-code to an ongoing project. The implementation of Logo in these classrooms gave students an opportunity to practice behaviors that are necessary for success in many occupations, and helpful in problem solving in school or in the workplace.
Students studying an Algebra I curriculum that utilizes several computer software packages were found to behave similarly to the students in Lampert's Geometric Supposer classrooms. Heid (1988) described students who were using MuMath Symbolic Manipulator, a function grapher, an inequality and relation grapher, a curve fitter, a table generator, and spreadsheets. Students became better problem solvers. They were better able to construct representations of problem situations, solve or evaluate algebraic expressions and equations, interpret problems, link representations, and explain the modeling processes used. Students developed greater independence from the teacher and more student-to-student interaction occurred. Students engaged in mutual decision-making, positive competition and cooperation in the laboratory, and some became the recognized "experts" of sorts with certain software applications. These students, like the students using Geometric Supposer exhibited behaviors that most employers today would value highly.

The results of research in classrooms where technology has been integrated into the curriculum are promising in terms of the kinds of student behaviors observed. The present study will extend this research by including more detailed analyses of time allocation and patterns of teacher-student interaction. Such information is necessary in order that teachers beginning the process of implementing technology in their own classrooms can be informed as to the types of student and teacher behaviors that will lead to greater student independence, more student-to-student interactions, cooperation, and other desired "pupiling" behaviors.
CHAPTER III
PROCEDURES

The present study was designed to obtain a description of the learning and teaching activities that take place in classrooms in which technology is completely integrated with the curriculum. In order to study how teachers and students operate in a technology-rich environment, an observational approach was adopted. The observation instrument is described in the next two sections. Following the description of the observation instrument and its categories, a summary of the videotaping and coding procedures is given.

Instrumentation

The instrument chosen for recording events in the C²PC classrooms is a modified version of the SCAN Matrix (Fraser et al., 1987). Figure 3 shows the version of the SCAN Matrix used in this study. The first section of the instrument provides information about the teaching activity in use, the number of questions being asked by teacher and students, the demand placed on students by teacher questions or directions, the type of lesson segment, and what technology is in use. The next section of the instrument lists roles that the teacher, students, or the technology may assume in the classroom. Listed in the final sections are learning activities that may occur in the classroom.

The categories for teaching activities are taken from a taxonomy of teaching activities described by Cockcroft (1982). These teaching activities are exposition; pupil exercise, consolidation, and practice; discussion; investigational work; applied mathematics; and problem solving. Fraser et al. (1987) provide a taxonomy of roles that teacher, students, or technology may assume in the classroom. These are manager, task setter, explainer, counselor, fellow investigator, and resource. Fraser et al. also provide a taxonomy of student learning activities: didactic, symbolizing, investigation,
problem solving, and higher level skills. The instrument provides for classification of observable student activities into passive and active. All of the categories are described in more detail in the next section.
### Codes

<table>
<thead>
<tr>
<th>E, P, D, I, A, P, S, W(n)</th>
<th>Teaching Activity</th>
</tr>
</thead>
<tbody>
<tr>
<td>A, B, G</td>
<td>Demand on STs</td>
</tr>
<tr>
<td>(number)</td>
<td>#QUESTs by TCHR</td>
</tr>
<tr>
<td>(number)</td>
<td>#QUESTs by STs</td>
</tr>
<tr>
<td>-</td>
<td>Homework Review</td>
</tr>
<tr>
<td>-</td>
<td>Lesson Development</td>
</tr>
<tr>
<td>-</td>
<td>Guided Practice</td>
</tr>
<tr>
<td>-</td>
<td>Go Over Test</td>
</tr>
<tr>
<td>-</td>
<td>Review Previous Material</td>
</tr>
<tr>
<td>Ca, Com, BB, OP, M</td>
<td>Technology</td>
</tr>
<tr>
<td>T, S, Ca, Com</td>
<td>Manager</td>
</tr>
<tr>
<td>T, S, Ca, Com</td>
<td>Task Setter</td>
</tr>
<tr>
<td>T, S, Ca, Com</td>
<td>Explainer</td>
</tr>
<tr>
<td>T, S, Ca, Com</td>
<td>Counselor</td>
</tr>
<tr>
<td>T, S</td>
<td>Fellow Investigator</td>
</tr>
<tr>
<td>T, S, Ca, Com, B</td>
<td>Resource</td>
</tr>
<tr>
<td>W, L, R, T</td>
<td>STs Passive</td>
</tr>
<tr>
<td>N, R, X, S (Ca, Com), P</td>
<td>STs Writing</td>
</tr>
<tr>
<td>A, W, I, U, E, H, S</td>
<td>STs Talking</td>
</tr>
<tr>
<td>A, R, U</td>
<td>STs Didactic</td>
</tr>
<tr>
<td>U, I (Ca, Com)</td>
<td>STs Symbolizing</td>
</tr>
<tr>
<td>G, C, P</td>
<td>STs Investigating</td>
</tr>
<tr>
<td>R, E, P, I, C</td>
<td>STs Problem Solving</td>
</tr>
<tr>
<td>I, A, G, B, L, P, R</td>
<td>STs High Level</td>
</tr>
</tbody>
</table>

Figure 3. Modified SCAN Matrix used in the present study for coding classroom events.
The validity of the SCAN instrument as a tool for obtaining descriptions of the activities occurring in the C²PC classrooms has two sources. The teachers who responded to the open-ended questions on the informal survey described in Chapter I mentioned using teaching styles and activities in their classrooms nearly identical to the teaching and learning activities on the instrument. Secondly, the SCAN method and original instrument were used by the developers to describe teaching and learning events in 17 classrooms (176 lessons). The instrument was found to provide a record of events detailed enough to allow a researcher, not present in the classroom at the time of the lesson, to take the account of the lesson and read back a fairly accurate picture of what had occurred in the classroom. A possible source of invalidity for the SCAN instrument's use in the present study is that it was developed for use in classrooms in which technology was a supplement to the curriculum. There may be behaviors or patterns of interaction in the classrooms in the present study, where technology is an integral part of the curriculum, that are not captured on the SCAN instrument.

Definitions

The following definitions are to clarify the meaning of the categories on the instrument. The definitions are based on descriptions used by Beeby, Burkhardt, & Fraser (1979); Burkhardt et al. (1988); Cockeroff (1982); and Fraser et al. (1987). The categories are not mutually exclusive, nor are they exhaustive of all of the possible behaviors and activities that may occur in the classroom. For example, no mention is made of off-task student behaviors.

The codes in parentheses are given in the form (A, n) where A is the alphabetic code used by the observers to code that particular activity, behavior, or role while viewing the tapes. The numeric code n was assigned during data processing. They are listed because they will aid in understanding the raw data tables in Appendix B and the figures in Chapter IV.
Teaching Activities - Activity in use by the teacher that generates the lesson or lesson segment.

**Exposition** (E, 1)- Teacher conveying information to class as a group.

**Exercise, consolidation, or practice** (P, 2)- Students working exercises to practice skills just learned or previously taught.

**Discussion** (D, 3)- Dialog that includes an interchange of ideas, a give and take of questions and answers.

**Investigational work** (I, 4)- Extensive study of an example or examples that includes student participation.

**Applied mathematics** (A, 5)- Using or showing the utility of mathematics in other academic disciplines such as science, or in non-academic situations such as architecture or politics.

**Problem solving** (PS, 6)- Attempting to solve a problem for which the solution strategy is not known because the problem or problem type is unfamiliar.

**Working in Groups** (Wn, 7)- Working in groups of size n.

Demand Placed on Students - Cognitive demands required of students in order to complete the task at hand. Three levels are coded:

**Level alpha** (A, 1)- Recall of a single fact or step in a process.

**Level beta** (B, 2)- Recalling and putting together two or more previously learned facts or steps.

**Level gamma** (G, 3)- Extending previous skills and understanding in which new skills and understanding are required or developed.

Number of Questions by the Teacher - Count of the number of questions asked by the teacher that direct student thought. Includes instances when the teacher asks a question but does not wait for a response. If the teacher rewords a question intending to draw the same response to both the original and reworded question, the instance was counted as one question. If the teacher redirects or refocuses students' attention on another aspect of the problem or another possible solution path, the instance was counted as a new question.
Number of Questions by Students - Similar to description above, but with a student as questioner.

Lesson Segments - Parts of a lesson that are differentiated by unique goals and actions for teacher and students.

Homework (1, 1)- Working and explaining exercises or problems from a homework assignment.

Lesson development (1, 1)- Introduction of new material, concepts, or skills.

Guided practice (1, 1)- Time during the lesson when students work exercises or problems to consolidate skills and the teacher works closely with the class as a whole or with groups of students.

Reviewing a recently completed test (1, 1)- Working and explaining exercises or problems from a previous examination.

Reviewing previously learned material (1, 1)- Reteaching content or working exercises and explaining content that has been the subject of previous class sessions. Sometimes done in anticipation of an upcoming examination.

Technology in Use - System in use by teacher and/or students: calculator(s) (CA, 1), microcomputer(s) (COM, 2), chalk board (BB, 3), overhead projector (OP, 4), manipulatives or models (M, 5).

Classroom Roles - These roles may be assumed by the teacher (T, 1), students (S, 2), hand-held graphing calculator (CA, 3), microcomputer (COM, 4), or textbook (B, 5).

Manager - Tactical manager, director, authoritarian.

Task setter - Questioner, example-setter, strategy setter, decision maker.

Explainer - Demonstrater, context-setter, rule giver, image builder, focuser.

Counselor - Consultant familiar with the problem or similar problems and able to advise and help when called upon to do so; devil's advocate,
encourager, stimulator, diagnostician, observer who has stepped back somewhat from the problem solving process.

**Fellow investigator** - True participant in the problem solving process because also unfamiliar with the problem and its solution.

**Resource** - System to explore, giver of information.

**Student Behaviors** - These are observable student behaviors that can be seen on the videotape or directly inferred with near certainty from the sound recording.

**Passive** - Watching (W, 1), listening (L, 2), reading (R, 3), and thinking (T, 4).

**Writing** - Note taking (N, 1); recording (R, 2); doing exercises (X, 3); symbolizing, using mathematical symbols, with paper and pencil (S, 4), with calculator (S, 5), with computer (S, 6); explaining (E, 7).

**Talking** - Asking (A, 1), answering (W, 2), describing (I, 3), discussing (U, 4), explaining (E, 5), hypothesizing (H, 6), asserting (S, 7), reading aloud (R, 8).

**Pupiling** - Student activities inferred from students’ observable behaviors.

**Didactic** - Absorbing (A, 1), recalling (R, 2), and imitative rule following (U, 3).

**Symbolizing** - Any activity where students employ symbols to represent information in an exercise or problem being studied. Symbols can be employed on paper, or by pressing calculator or computer keys. Subcategories include using symbols: on paper or chalk board (U, 1), on calculator (U, 2), or on computer (U, 3) and translating from one symbol or set of symbols to another as in manipulating algebraic expressions: on paper or chalk board (T, 1), on calculator (T, 2), or on computer (T, 3).

**Investigation** - Guessing (G, 1), checking (C, 2), particularizing (P, 3). The first two, guessing and checking, generally but not necessarily occur together. Particularizing includes the study of one example or a series of examples or cases.
Problem solving - Reading (R, 1), representing (E, 2), planning (P, 3), implementing (I, 4), checking or verifying (C, 5). Attempting to find a solution in an unfamiliar problem situation.

Higher level skills - Image building (I, 1), analyzing (A, 2), generalizing (G, 3), abstracting (B, 4), linking (L, 5), proving (P, 6), and reflecting (R, 7).

Methods

The Sample

Six high school teachers were recruited from among teachers involved in a large curriculum development project that involves implementing calculators and computers throughout the mathematics curriculum in grades 9 through 12. During the 1988-89 school year the teachers who participated in this study field-tested a precalculus mathematics course that places heavy emphases on graphing and investigating the graphs of functions. The teachers and their students were nearing the end of their first year of experience with the text, graphing calculators, and a microcomputer graphing utility. These six teachers were all in public high schools, including two large high schools in urban areas, three large high schools in suburban areas, and one high school in a small city. All of the teachers were male. In one of the urban schools, the C²PC class had 13 students; two white students and 11 black students, four females and nine males. Except for that class, nearly all of the students in the study were white and the classes were divided approximately evenly between males and females.

The six teachers were asked in January, 1989, to videotape ten consecutive, non-testing lessons in their project precalculus classes. A "yes" response was followed up with correspondence explaining in detail what was required. Appendix C contains the instructions given to the teachers. All had videotaping equipment available to them and agreed to participate. The taping took place during April and May at the end of the first year of experience with the materials. Due to special schedules for end-of-year
school functions and attendance at professional meetings, not all teachers were able to tape ten consecutive lessons. One teacher was able to tape only six lessons. Five tapes were not viewable due to equipment malfunctions. Therefore, the sample viewed consisted of six lessons from each of six teachers.

If more than six lessons were taped, the first six lessons for which there were no mechanical difficulties with the videotaping equipment were coded. The decision to code the first six viewable tapes rather than a random sample of the tapes available was made because of the nature of the C²PC curriculum materials. Typically a section in the textbook was too long to be taught in a single class session. Therefore, to provide the opportunity to view introductory and summary behaviors, consecutive lessons were coded. Teachers were requested to tape ten lessons because it was believed that a fairly complete range of teacher and student behaviors could be captured in a two-week period. Although ten lessons were not available for coding for each teacher, the number of tapes viewed is enough to represent more than one week of classroom activity for each teacher.

Taping

Three teachers operated the camera themselves by setting it up in a stationary position in the back of the classroom. In two of these cases, four or five students are visible on camera. For one of these teachers, most of the time only one or two students are visible on camera. Three teachers were able to arrange for a student aide to operate the camera and make periodic sweeps of the room to show the entire class.

Teacher Notes

Teachers were asked to make a few notes about each day's lesson. They were supplied with a journal page that requested information about the time the lesson began and ended, the text pages covered, lesson topic, and whether the lesson was review or new material. They were asked for any other comments that they thought relevant to someone observing the lesson. A copy of the journal page supplied to teachers is provided in Appendix C.
Coding Tapes

Dunkin and Biddle (1974) distinguish between two formats for coding classroom events. In a sign system "the observer is given a list of events to watch for in the classroom and is asked to check off those events that occur during a given time period" (p. 71). Under a category system the observer will try to tally every instance of a given behavior occurring during the lesson (p. 72). The instrument used for the present study consists of a list of roles, behaviors, and activities that the observers watch for during five minute segments of the lesson. Therefore, the instrument uses a sign system. Since every question asked by teacher or students is tallied, the instrument uses a category system for number of questions.

Two observers assisted the author in coding the videotapes. All three observers had high school mathematics teaching experience. Two were doctoral students and one was a faculty member in mathematics education. Training occurred in two-hour sessions over three consecutive days. The observers worked together discussing the category definitions and coding segments of videotape that were not used in the study. At the end of the training period observers' codings were nearly identical.

The observers viewed the tapes individually. The order of viewing was randomized for each observer. Each tape was viewed and coded separately by two observers. Observers viewed five minutes of videotape, then stopped the tape to record their observations directly on a computerized spreadsheet. Observers made notes while the tape was running but could stop the tape at any time to review a section. They worked from their notes and memory while completing the record on the spreadsheet for each five minute segment of the class. They would then start the tape again and repeat the process for the next five minutes of videotape. Observers coded the classroom events using the alphabetic codes listed in Figure 3. For purposes of data tabulation, these alphabetic codes were translated to the numeric codes listed with the definitions for the categories given earlier in this chapter. The observers' records for each lesson are given in their numeric format in Appendix B. These tables contain the observers' records for each five-minute segment of tape viewed and summary statistics for the entire lesson, the segments of the lesson during which technology was not in use, and the
segments of the lesson during which technology was in use. Appendix A contains a lesson summary for each teacher's lessons.

Scope of the Study

The study provides an analysis of classroom activities in six precalculus classes in which technology is integrated with the curriculum. The observations were made at the end of the first year of experience with the new curriculum, so the behaviors that were observed were established behaviors. Teachers and students had developed some expertise and were comfortable using the graphics calculators and graphing software, and other classroom equipment such as overhead projection pallettes, personal computers, and large-screen television monitors.

Observations were made of six lessons, so a reasonably large cross-section of classroom behaviors were coded. In order to capture the natural behaviors of the teachers and students, minimal instructions were given to teachers.

Teachers reported that they did not change the way they had been doing things because of the presence of the camera. Teacher A reported teaching a specially prepared unit during the videotaping period. All reported that after the first day, the students seemed not to notice the presence of the camera. This is corroborated by pilot studies conducted in two other high school classrooms. Pilot teachers reported that after the first part of the first day of taping, students behaved normally. The researcher did the taping in the pilot study and observed little disruption after the first few minutes of the first day of taping.

Limitations of the Study

The limitations of the study are of two types: limitations due to sample selection and limitations due to method of observation. These limitations restrict the generalizability of the study.

The study was limited to a description of activities in particular classrooms at a particular time of the school year. The teachers represented a select group. They volunteered and made a commitment to participate in a three-year curriculum development project in which technology is being
integrated with the high school mathematics curriculum. They agreed to be videotaped and knew when the camera would be present in the classroom. Their schools had videotaping equipment available.

The videotaping was conducted during a two-week period toward the end of the school year, so the mathematical content of the lessons was restricted to the unit that was being covered at the time of taping. The range of topics included polar equations, conic equations, and parametric equations.

In some cases, the method of observation was too restrictive. In some classrooms where the camera was put in one position and left unattended, it was difficult to ascertain what most of the students were doing. In these instances, the errors in observation are errors of omission. For the most part, the only activities omitted are when off-camera students were writing or consulting quietly with each other.
CHAPTER IV

DESCRIPTION OF CLASSROOM EVENTS: INDIVIDUAL CLASSROOMS

In order to provide a more complete description of the classroom environment when technology was used in these classrooms, a profile of the events in each of the six classrooms is provided in this chapter. A summary description of the events in all six classrooms is provided in Chapter V. Individual lesson summaries are provided in Appendix A. Individual lesson records made by both observers are provided in Appendix B.

Summary information for each teacher's classroom is displayed in this chapter in Tables 2 through 7. The first use of such a table will include a detailed explanation of how to interpret the values. A transcription of a portion of a lesson is provided for each teacher in this chapter. The transcriptions are provided in order to illustrate typical classroom exchanges and to demonstrate how the observers coded the classroom activities. The transcriptions reflect only the teacher-student communication occurring in the classroom. The observers recorded student behaviors as well. The first set of observers' records will be accompanied by a key that will be useful in translating the observers' records to the descriptor categories defined in Chapter III.

Classroom A

The lessons taught during the six days of taping in Classroom A formed a carefully planned unit on polar equations and their graphs. During Lesson 1 students were introduced to polar coordinates and plotting polar coordinates, polar to rectangular conversion, and the polar to rectangular conversion keys on their calculators. They entered into their calculators a polar graphing subroutine and discussed, debugged, and modified the program during class. Lesson 2 began with a review of Lesson 1 for those students who were absent. The new material included the graphing of some
polar equations on the board and then on the demonstration computer with students guessing how many petals the graphs would have. During the second half of Lesson 3 students moved to the computer laboratory to work individually or in pairs on a worksheet written by the teacher. Students spent all of Lesson 4 at the computers. The worksheet was designed to lead students through an analysis of polar graphs. Students were expected to discover the relationships between the coefficients in the polar equation, the orientation of the graph, and the number of petals in the graph; the trigonometric function present in the equation and the orientation of the graph; and the relationship between conic equations and polar equations and their graphs. During Lesson 5 students and teacher discussed the students' findings. Lesson 6 included a review of polar coordinates, equations, and graphs in preparation for an examination.

A transcription of the videotape recording of parts of two lessons taught by Teacher A follows. An explanation using the observers' categories is provided in the right-hand column. This lesson segment was chosen to illustrate some of the classroom interactions that took place in Classroom A and how they were recorded by the observers. The transcription reflects the teacher-student communication occurring in the classroom during 11 minutes of class time. The observers recorded observable student to student interactions as well. Figure 4 displays the observers' records for the transcribed sections of videotape. Figure 5 provides information necessary to interpret the observers' records.
TEACHER: Okay, let's get back to this one and then I'm going to get you up out of your seats and to the computers.

Minus 1 plus 2 cosine theta.

(REFERS TO THE EQUATION
\[ y = -1 + 2 \cos x \]  WRITTEN ON THE BOARD.) The usual bit, let's find out what happens at the crucial values. So we have a zero here, so a one here, so 2 plus negative one is ... one. Here we're going to have a 0 so this will be a ... (STUDENTS ANSWER) negative one. At one eighty this is going to be a negative one ...

(STUDENTS ANSWER) so it's going to be a negative three. At two seventy we're going to have ... (STUDENTS ANSWER) zero so this'll be negative one and of course we're back to one.

So if we plot those points, zero, one. At ninety degrees we have a negative one. So at ninety degrees we have to come back. At one eighty degrees we have a negative three. So all the way at one eighty we have to go back a negative three. So, here's one, excuse me, one, two, three. We're back at this point. And then at two seventy, we're back to negative one. Here's two seventy and then we go in the opposite direction. What in the world are we going to get out

The teacher is at the board reviewing the previous night's homework assignment. He has just finished sketching the graphs of three polar equations by compiling tables of values and point plotting. He checked each sketch using the computer graphing utility.

The teacher is closely guiding the construction of the tables. He has set the strategy of determining "what happens at the crucial values," which he has defined as 0, 90, 180, and 270 degrees. He chooses the strategy and leads every step of the solution process.

Students recall the values of the trigonometric functions at the "crucial values." They call out answers to fill in the blanks when the teacher pauses in mid-sentence.

Students are recording the values in their notes (Writing 1,2). Some students use calculators to find the values (Writing 5).

One observer interpreted the teaching activity as Exposition and Investigation (1,4). The other recorded it as Exercise, Consolidation and Practice (2). While working each exercise, the teacher talked through
of that?

STUDENT: (mumble)

TEACHER: (DOES NOT RESPOND TO STUDENT.) Well what happens on this problem is ... (COMPLETES GRAPH OF LIMACON) ... you come up with a very interesting graph. It looks like that. Now you're going to have to plot a few more points to make the, to achieve, to achieve that. But since the time is running out, I really would like to move on to this. You're going to have a chance to do this on the assignment that I've put together for you. What I'd like to conclude with is simply to say in order to achieve this, after you plot the crucial points you have to plot a few others. And then type it in your graphing utility to get the answer.

On this worksheet that I'm going to pass out to you, I want you to get started on this today and you're going to work on it tomorrow and I hope that you'll do some of it at home tonight on your calculator. I have a number of objectives. I want you to explore the computer graphing utility. That's number one. That's why I want to get you to the computers at least to get started

the method from start to finish.

The teacher has directed, or managed, the complete solution process. Now with time running short, he quickly gives the information.

The teacher is managing classroom activities.

The teacher is counseling, offering advice about how to tackle the exercises.

The teacher is setting the task.
today. But then I want you to explore, uh, the, uh, graphs of some very well known polar graphs, the equations I should say. We've already discussed the rose. We have the cardioid. This is a, another name a special one that we're going to discuss.

TEACHER: I have a little role here, a venture I should say, where you're going to disc ... (uh), hopefully explore to see what happens when you change the coefficients.

Here we have a two and a two.

(POINTS AT EQUATIONS ON BOARD.)

Here we have a negative one and a two and a change took place in the graph. That's the idea, but I want you to explore.

I also want you to explore what's the difference between using a cosine and a sine. If you see a graph that has cosine in it, how's that going to compare with a sine. So those are the things that I'd like you to do on this assignment.

The teacher is setting the context for the upcoming worksheet assignment.

(Near the end of Segment 1.)

Students go to the computers. Some work alone and some work in pairs. They work on the worksheet for the remainder of Lesson 3 (15 minutes) and for the entire class on the following day (40 minutes) during Lesson 4. Students appear intent upon completing the assignment. They discuss the graphs with their partners.
Transcription of Classroom A Lesson Segments (continued)

TEACHER: Okay, in the first group of problems, we have the difference between (uh) sine and cosine. Now I hope that you all realized as you looked at this that you were going to have a circle in each case. What was our conclusion? I think that most of you had the conclusion. Brian, would you tell us the conclusion that we have when we did this, compared the difference between sine and cosine?

BRIAN: Uhh ... the graph of the cosine is sort of along the x-axis. The sine is ... along the y-axis?

TEACHER: Okay. By the way, Mr. Spinella tells me that we have to speak out if we're going to have this taped (CANNOT HEAR THE REST OF SENTENCE). Okay. The sine tends to be more on the vertical, the y-axis. Cosine tends to be and with others working nearby. The next sequence occurs at the beginning of Lesson 5 when teacher and students are back together to discuss the students' findings. Some students are graphing equations on their calculators while the discussion takes place. Most are reading from their worksheets.

The teaching activity was recorded by an observer as Discussion (3). It is a review of previous material.

The teacher does not use the blackboard at all, but rather refers to the worksheet and stands and talks through the problems.
more on the horizontal or called the x-axis.

TEACHER: There were a couple other things you were to discover in that little experiment between those four problems. The positive and the negative - how would you generalize about the difference between the positive coefficient and the negative coefficient? Ann?

ANN: (VERY QUIETLY) The sine function is (TEACHER: Speak up now.) The sine function (um) plus or minus it makes it upside down or rightside up. The cosine is either on the left or right side of the y-axis.

TEACHER: Okay. Al, how would you have stated that?

AL: Same way. TEACHER: Same way? AL: Yessir.

TEACHER: I thought you were going to say (uh) ... You had a smile on your face. (POINTS TO ANOTHER STUDENT WHOSE HAND IS RAISED.)

JOHN: Negative is a reflection of the positive. John asserts the fact confidently.

The teacher is managing the discussion. Students are, for the most part, passive. They watch, listen, and read from their worksheets (1,2,3). Students answer (Talking-2).
TEACHER: If there is a negative there is a reflection. Exactly. So, if we have said on the (CANNOT HEAR THE END OF THIS SENTENCE).

Okay, there was something else we were supposed to try and that was having the domain from zero to pi and then zero to two pi. Shonti, what did you come up with when we did that one?

SHONTI: (CANNOT HEAR THE BEGINNING.) When it's zero to two pi it goes around twice. (TEACHER: Okay, what goes around twice?) (Student makes drawing motions with her hand.) The ... the graph?

TEACHER: The graph. Okay, notice there is a repetition of points being plotted. (SHONTI: Yes, that's what I was trying ... TEACHER RESPONDS KIDDINGLY: Nice language there.)

Repetition of points. What I tried to establish in that nice little statement there is that sometimes our domain from zero to two pi is more than we need. In some problems zero to pi is sufficient. Sometimes, most times, zero to two pi is standard. That problem right there should answer the question of why on the problem, the calculator or the computer

The teacher explains why the graphing utility does not automatically use 0 to 2π as the domain.
it always asks $T_{\text{min}}$? $T_{\text{max}}$? Because not all of them need zero to two pi. I'm sure you get bored putting that in all the time. That's the reason for it. (STUDENT: Yeah, 'cuz we were saying there should be something you push. TEACHER: A default, right.)

Okay, the next group was something we already talked about previously. So, this problem was a little reinforcement. Or for those of you who hadn't done it, a chance to do the problem. And that is, when you have a rose, which is established as a sine or a cosine $nT$, $n$ has something to do with the number of petals. What was our conclusion on this, Keith?

KEITH: When $n$ is odd that's the number of petals, $n$ petals. And when $n$ is even, you have two $n$ petals.

TEACHER: Now, the next part was to ask you, could you tell us how long it takes to grow a petal. So many people asked about that one, I guess my question wasn't very (uh) clear. But I wanted to see if you could establish the formula. Now most people in this class can catch it for what would you need to have for how long it takes to grow a petal. Tony?

(End of Segment 2.)

Keith asserts his conjecture. In all cases, in response to the teacher's prompt the students have been generalizing their findings from the few cases suggested on the worksheet (STs High Level-3).
TONY: Pi over $n$.

TEACHER: Pi over $n$. That's right. That's correct. Pi over $n$. That's how long it takes to get one petal.

On the next question (uh) you (uh) had here ... let's see (uh). Now try it for cosine. And then it asks you "does your conclusion for Part hold true." If there was ever an ambiguous question it was that. What I wanted to say was for Part One does it hold true. Most of you said "yes" but I'm not sure you knew what you said "yes" to. But what I wanted to point out was the difference between graphing sine and cosine.

TEACHER: Did you notice that again sine was tilted up a little bit, it was more vertical and cosine tended to be horizontal, particularly on the four-leaf rose or three-leaf rose.

Next we went to the spiral: $R$ equals $n$ theta. We have a spiral. And I give you some coefficients here. Most of you (uh ... uh) answered a little bit of this but few of you did a complete answer on this. I asked you to (uh) tell what happens with $n$ when $n$ is the coefficient. Sara, what conclusions do you have here?
SARA: It gets bigger. (TEACHER: When what gets bigger?) When the number gets bigger.

TEACHER: Okay. Well, we had one, two, three. But what about the negative one, and negative two, and negative three. What does ... how would you describe that? (ASKS TO ANYONE. SOMEONE MUMBLES.) (QUIETLY) So, that's the end of it. Alright, what about the negative numbers? Someone had ... I know some people did that. Brad?

BRAD: It goes the opposite from 1,2, the opposite from what it did for the positive.

TEACHER: It almost comes back to what John said. When we have the negative it's ... ? (BRAD: Reflection.) The reflection. Okay, so I wanted you to observe that negative part. Then also you'll notice we have some small numbers. What happens when we have small numbers like point five and point one. How would you describe the spiral in that case? Someone ... Steph?

For the most part, the last segment transcribed was coded the same as the previous segment. The teacher is managing and task setting by asking all of the questions. Students are answering and are being given the role of explaining although the amount of explanation is minimal.
Transcription of Classroom A Lesson Segments (continued)

STEPH: It ... it gets narrower. More ...
compact.

TEACHER: More compact. Spiraling like a spring. It becomes very contracted. Whereas if we have a large number it becomes ... (DOES NOT FINISH SENTENCE. TEACHER IS OFF CAMERA.) Alright, any questions so far?
<table>
<thead>
<tr>
<th>OBSERVER SEGMENT</th>
<th>A</th>
<th>B</th>
<th>A</th>
<th>B</th>
<th>A</th>
<th>B</th>
</tr>
</thead>
<tbody>
<tr>
<td>TEACHING ACTIVITY</td>
<td>14</td>
<td>2</td>
<td>3</td>
<td>2</td>
<td>13</td>
<td>2</td>
</tr>
<tr>
<td>DEMAND on STs</td>
<td>12</td>
<td>12</td>
<td>2</td>
<td>12</td>
<td>12</td>
<td>2</td>
</tr>
<tr>
<td>#QUESTs by TCHR</td>
<td>3</td>
<td>5</td>
<td>4</td>
<td>5</td>
<td>7</td>
<td>12</td>
</tr>
<tr>
<td>#QUESTs by STs</td>
<td>1</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>HOMEWORK REVIEW</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>LESSON DEVELOP</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>GUIDED PRACTICE</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>GO OVER TEST</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ReVIEW PREV MAT</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>TECHNOLOGY</td>
<td>123</td>
<td>23</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>MANAGER</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>TASK SETTER</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>EXPLAINER</td>
<td>1</td>
<td>1</td>
<td>2</td>
<td>12</td>
<td>2</td>
<td>12</td>
</tr>
<tr>
<td>COUNSELOR</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>FELLOW INVEST</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>RESOURCE</td>
<td>3</td>
<td>3</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>STs PASSIVE</td>
<td>12</td>
<td>12</td>
<td>123</td>
<td>12</td>
<td>123</td>
<td>12</td>
</tr>
<tr>
<td>STs WRITING</td>
<td>125</td>
<td>1</td>
<td>15</td>
<td>5</td>
<td>15</td>
<td>5</td>
</tr>
<tr>
<td>STs TALKING</td>
<td>7</td>
<td>2</td>
<td>2357</td>
<td>27</td>
<td>2357</td>
<td>2</td>
</tr>
<tr>
<td>STs DIDACTIC</td>
<td>13</td>
<td>12</td>
<td>12</td>
<td>2</td>
<td>12</td>
<td>23</td>
</tr>
<tr>
<td>STs SYMBOLIZING</td>
<td>2</td>
<td>15</td>
<td>25</td>
<td>15</td>
<td></td>
<td></td>
</tr>
<tr>
<td>STs INVESTIGATING</td>
<td>3</td>
<td>2</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>STs PROB SOLVNG</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>STs HIGH LEVEL</td>
<td>3</td>
<td>3</td>
<td>23</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*a* The entries for all but "Quests by Tchr" and "Quests by Sts" represent labels for the behaviors observed during that lesson segment. For example "14" does not mean "fourteen" but rather means that Teaching Activities 1 and 4 were observed. Figure 5 lists the descriptors and their numeric code.

Figure 4. Observers' records for the transcribed Classroom A lesson segments.
Teaching Activities
(1) Exposition
(2) Exercise, consolidation, or practice
(3) Discussion
(4) Investigational work
(5) Applied mathematics
(6) Problem solving
(7) Working in Groups

Demand Placed on Students
(1) Recall a single fact or step.
(2) Recall and put together two or more facts or steps.
(3) Extend previous skills and understanding.

Lesson Segments
(1 if occurs) Homework
(1 if occurs) Lesson development
(1 if occurs) Guided practice
(1 if occurs) Reviewing a recently completed test
(1 if occurs) Reviewing previously learned material

Technology in Use
(1) Calculator(s)
(2) Microcomputer(s)
(3) Chalk board
(4) Overhead projector
(5) Manipulatives or models

Figure 5. List of SCAN descriptors and the numeric codes used in the present study.
Classroom Roles: Manager, Task Setter, Explainer, Consultant, Fellow

Investigator, Resource

(1) Teacher
(2) Students
(3) Hand-held graphing calculator
(4) Microcomputer
(5) Textbook

Student Behaviors

Passive - (1) watching, (2) listening, (3) reading, and (4) thinking

Writing - (1) note taking; (2) recording; (3) doing exercises;
symbolizing, using mathematical symbols, (4) with paper
and pencil, (5) with calculator, (6) with computer; (7)
explaining

Talking - (1) asking, (2) answering, (3) describing, (4) discussing, (5)
explaining, (6) hypothesizing, (7) asserting, (8) reading
aloud

Pupiling

Didactic - (1) absorbing, (2) recalling, and (3) imitative rule following

Symbolizing - using symbols: (1) on paper or chalk board, (2) on
calculator, or (3) on computer; translating from one symbol
or set of symbols to another as in manipulating algebraic
expressions: (1) on paper or chalk board, (2) on calculator,
or (3) on computer

Investigation - (1) guessing, (2) checking, (3) particularizing

Problem solving - (1) reading, (2) representing, (3) planning, (4)
implementing, (5) checking or verifying

Higher level skills - (1) image building, (2) analyzing, (3)
generalizing, (4) abstracting, (5) linking, (6)
proving, and (7) reflecting

Figure 5 (continued). List of SCAN descriptors and the numeric codes
used in the present study.
Figure 4 can be interpreted using the codes listed in Figure 5. Both observers coded the first segment of the transcribed portion of the lesson as Homework Review and the second and third segments as Review of Previously Learned Material. Observer A coded the Teaching Activity as Exposition (1) and Investigational Work (4) for the first five minutes with some Discussion (3) during the last ten minutes. Observer B labeled all segments as Practice (2). Both agreed that the Demand on Students was recall of single facts or steps (1) and recall and use of several facts or steps (2). Both observers noted that students took on the role of Explainer during the final two segments. Students exhibited the Passive behaviors of Watching (1) and Listening (2) during all three segments. They were also Talking during all three segments. They Answered (2), Explained (5), and Asserted (7). Their pupilizing activities involved Didactic behavior: Absorbing (1) and Recalling (2). They did some Symbolizing (Using the Calculator, 5) during the final two segments. Both observers agreed that the students were using higher level thinking skills during the final segment: Generalizing (3).

Table 2 displays the summary statistics for Classroom A. The means represent an average over the six lessons for that teacher's classroom. The means and standard deviations are reported for the entire lessons, for the segments of the lessons during which technology was not in use, and for the segments of the lessons during which technology was in use. The first two rows of Table 2 tabulate average number of teacher questions and average number of student questions per five minutes. The other means recorded in Table 2 represent the number of five-minute segments in which the role or activity was observed divided by the number of five-minute segments in the analysis (either the entire lessons, the part of the lessons during which technology was not in use, or the parts of the lessons during which technology was in use). These quotients then represent the percent of segments during which the particular role or activity was observed. This is the best estimate available of the percent of class time that was spent in the particular role or activity. The phrase "percent of class time" will be used interchangeably with "percent of observed segments" or "percent of five-minute segments."
<table>
<thead>
<tr>
<th>TABLE 2. CLASSROOM A</th>
<th>SUMMARY STATISTICS: TOTAL</th>
<th>SIX LESSONS WITH NO TECHNOLOGY</th>
<th>WITH TECHNOLOGY</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mean</td>
<td>St Dev</td>
<td>Mean</td>
</tr>
<tr>
<td>1 Teacher Questions (average per 5 min)</td>
<td>5.8</td>
<td>3.2</td>
<td>9.0</td>
</tr>
<tr>
<td>2 Student Questions (average per 5 min)</td>
<td>1.3</td>
<td>0.8</td>
<td>1.4</td>
</tr>
<tr>
<td><strong>Percent of 5 min Segments that Contain:</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3 Homework Review</td>
<td>16.5</td>
<td>27.9</td>
<td>11.1</td>
</tr>
<tr>
<td>4 Lesson Development</td>
<td>53.1</td>
<td>37.6</td>
<td>60.4</td>
</tr>
<tr>
<td>5 Guided Practice</td>
<td>20.5</td>
<td>17.8</td>
<td>16.7</td>
</tr>
<tr>
<td>6 Reviewing a Test</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>7 Reviewing Material</td>
<td>49.0</td>
<td>42.2</td>
<td>62.2</td>
</tr>
<tr>
<td>8 Using Calculators Only</td>
<td>34.0</td>
<td>22.2</td>
<td>0.0</td>
</tr>
<tr>
<td>9 Using Computers Only</td>
<td>27.2</td>
<td>28.5</td>
<td>0.0</td>
</tr>
<tr>
<td>10 Using Both Calculators and Computers</td>
<td>23.2</td>
<td>14.1</td>
<td>0.0</td>
</tr>
<tr>
<td>11 Student as Manager</td>
<td>4.2</td>
<td>16.3</td>
<td>0.0</td>
</tr>
<tr>
<td>12 Student as Task Setter</td>
<td>14.6</td>
<td>30.4</td>
<td>5.6</td>
</tr>
<tr>
<td>13 Student as Explainer</td>
<td>14.1</td>
<td>27.2</td>
<td>8.6</td>
</tr>
<tr>
<td>14 Student as Consultant</td>
<td>13.5</td>
<td>16.4</td>
<td>9.7</td>
</tr>
<tr>
<td>15 Student as Fellow Investigator</td>
<td>6.3</td>
<td>16.2</td>
<td>0.0</td>
</tr>
<tr>
<td>16 Student as Resource</td>
<td>2.1</td>
<td>8.2</td>
<td>0.0</td>
</tr>
<tr>
<td>17 Students Passive</td>
<td>94.8</td>
<td>16.0</td>
<td>100.0</td>
</tr>
<tr>
<td>18 Students Active: Writing</td>
<td>82.2</td>
<td>16.8</td>
<td>55.9</td>
</tr>
<tr>
<td>19 Students Active: Talking</td>
<td>95.8</td>
<td>10.2</td>
<td>100.0</td>
</tr>
<tr>
<td>20 Students Didactic</td>
<td>95.8</td>
<td>4.4</td>
<td>95.6</td>
</tr>
<tr>
<td>21 Students Symbolizing</td>
<td>71.7</td>
<td>23.4</td>
<td>22.2</td>
</tr>
<tr>
<td>22 Students Investigating</td>
<td>64.3</td>
<td>21.6</td>
<td>59.5</td>
</tr>
<tr>
<td>23 Students Problem Solving</td>
<td>8.6</td>
<td>19.5</td>
<td>0.0</td>
</tr>
<tr>
<td>24 Students In Higher Level Thinking</td>
<td>33.8</td>
<td>23.1</td>
<td>36.5</td>
</tr>
<tr>
<td>Percent of 5 min Segments that Contain:</td>
<td>TOTAL</td>
<td>WITH NO TECHNOLOGY</td>
<td>WITH TECHNOLOGY</td>
</tr>
<tr>
<td>----------------------------------------</td>
<td>-------</td>
<td>--------------------</td>
<td>-----------------</td>
</tr>
<tr>
<td></td>
<td>Mean</td>
<td>St Dev</td>
<td>Mean</td>
</tr>
<tr>
<td>25 Teacher as Manager</td>
<td>96.9</td>
<td>12.2</td>
<td>100.0</td>
</tr>
<tr>
<td>26 Teacher as Task Setter</td>
<td>82.3</td>
<td>25.7</td>
<td>88.4</td>
</tr>
<tr>
<td>27 Teacher as Explainer</td>
<td>82.3</td>
<td>29.5</td>
<td>91.1</td>
</tr>
<tr>
<td>28 Teacher as Consultant</td>
<td>26.0</td>
<td>15.7</td>
<td>8.6</td>
</tr>
<tr>
<td>29 Teacher as Fellow Investigator</td>
<td>3.1</td>
<td>3.0</td>
<td>0.0</td>
</tr>
<tr>
<td>30 Teacher as Resource</td>
<td>2.1</td>
<td>8.2</td>
<td>0.0</td>
</tr>
<tr>
<td>31 Exposition</td>
<td>62.5</td>
<td>33.1</td>
<td>65.9</td>
</tr>
<tr>
<td>32 Exercise, Consolidation, Practice</td>
<td>29.2</td>
<td>27.6</td>
<td>29.6</td>
</tr>
<tr>
<td>33 Discussion</td>
<td>2.1</td>
<td>4.1</td>
<td>4.4</td>
</tr>
<tr>
<td>34 Investigation</td>
<td>24.0</td>
<td>20.9</td>
<td>27.6</td>
</tr>
<tr>
<td>35 Applied Mathematics</td>
<td>1.0</td>
<td>2.0</td>
<td>4.4</td>
</tr>
<tr>
<td>36 Problem Solving</td>
<td>2.1</td>
<td>8.2</td>
<td>0.0</td>
</tr>
<tr>
<td>37 Working in Groups</td>
<td>14.6</td>
<td>31.2</td>
<td>0.0</td>
</tr>
<tr>
<td>38 Recall of a single fact or step</td>
<td>82.3</td>
<td>38.7</td>
<td>95.6</td>
</tr>
<tr>
<td>39 String together several facts or steps</td>
<td>41.7</td>
<td>14.8</td>
<td>57.0</td>
</tr>
<tr>
<td>40 Extend knowledge or skill</td>
<td>22.9</td>
<td>13.7</td>
<td>44.1</td>
</tr>
<tr>
<td>41 Number of 5 minute segments</td>
<td>48</td>
<td></td>
<td>9</td>
</tr>
</tbody>
</table>
The categories listed in rows three through ten provide some general information about the nature of the classroom activity. The percent of class time devoted to homework review, lesson development, and guided practice can be viewed in the light of reports in the mathematics education literature that too little time is spent on lesson development and too much time is spent on individual seatwork. In all six classrooms in the present study, very little time was left after lesson development and guided practice for students to work individually on homework assignments. Even allowing that teachers may have turned off the camera while students worked on individual seatwork, the duration of the tape viewed by the observers is always within two or three minutes of the length of the class period that teachers noted in their journals.

The next group of categories listed in Table 2 includes the roles that observers watched for students to assume. These are the roles observed by Fraser et al. (1987). The percent of time that students assumed these roles can be compared with the percent of time that teachers assumed these roles by comparing rows 11 through 16 with rows 25 through 30.

Page one of Table 2 also includes the student behaviors (Students Passive and Students Active, rows 17 through 19) and "pupiling" activities (rows 20 through 24) recorded by the observers. As was indicated earlier, students in traditional classrooms have been expected to watch, listen, think, absorb, recall, and follow rules. These behaviors fall under the categories labeled Students Passive and Didactic. If students' methods of pupiling have shifted away from the traditional experience and toward a more exploratory, dynamic interaction with the teacher and the content, then the percent of time indicated in the rows labeled Students Investigating, Students Problem Solving, and Students in Higher Level Thinking should be notably high.

Except for the data about the use of technology (Using Calculators Only, Using Computers Only, and Using Both Calculators and Computers, in rows 8 through 10), the categories are not mutually exclusive or necessarily exhaustive. During any five-minute observation segment, more than one category of behavior or classroom role could be exhibited by teacher or
students. Therefore, the percents should not be expected to sum to 100 for any of the groups of categories. The difference between the sum of the means of the three technology use categories and 100 percent represents the percentage of time that no technology was observed in use in the classroom.

The first column of means in Table 2 forms the basis for a description of the events in Classroom A over all segments of all six lessons viewed. Teacher A was observed for 48 five-minute segments. Technology was in use in this classroom during 84% of the observed segments.

The teacher moved freely from demonstrations on a classroom computer and large-screen monitor to directing students to use their handheld calculators or to move to the computer laboratory area. The computers were situated in the classroom. Throughout the year, the students investigated functions and graphs using the computer graphing utility and guided by carefully written worksheets.

Teacher A used a very active and direct teaching style. He lectured during 63% of the observed segments. Lesson development encompassed about 53% of class time. Guided practice, which entails teacher and students working together to complete exercises or solve problems that deal with material just learned, occurred during 21% of the observed segments.

Even during exposition Teacher A asked a large number of questions, averaging over one question per minute. During over 80% of the observed segments, the task or questions posed to students required them to recall a single fact or step. During 42% of class time, the demand placed on students was one of recalling and stringing together several facts or steps. It should not be surprising that at the end of the school year students were often required to recall previously learned material. Students were asked to make connections between what they were learning about polar graphs and what they already knew about other graphs. Also, students were often led to rehearse the previous day's learning in preparation for the new content. Almost 50% of the observed segments contained a review of previously learned material. During approximately 23% of the class segments the demand placed on students by the teacher's questions or the task at hand required them to extend their knowledge or skills.
Most of the time Teacher A acted as manager (97%), task setter (82%), and explainer (82%), but he also assumed the roles of consultant (26%), fellow investigator (3%), and resource (2%). (Note that the teacher may exhibit more than one role during a five-minute segment, so the percents do not sum to 100.) The students in Classroom A also exhibited all six roles: manager (4%), task setter (15%), explainer (14%), consultant (14%), fellow investigator (6%), and resource (2%). The roles of fellow investigator and resource were only assumed by the teacher or students when technology was in use. Students acted as manager only when technology was in use.

The students in this classroom were very involved in the lessons. Their pupil ing activities included writing (mostly note taking) and talking (mostly answering) during nearly every observed segment (82% and 96% respectively). They showed some didactic activities (absorbing, recalling, rule following) during nearly every observed segment (96%), but they were often using symbols (72%), investigating (64%), and using higher level thinking skills (34%). The problem solving activities were limited to times when technology was in use.

Some differences between classroom events when technology was in use and when it was not can be noted by comparing the second and third columns in Table 2. The evidence of teacher and students adopting new roles in the classroom has already been mentioned. Students acted as manager, fellow investigator, and resource persons only when technology (particularly, the computer graphing utility) was in use. Students became the task setters and explainers more often when technology was in use than when it was not. The teacher acted as a fellow investigator and resource only when technology was in use. He acted as a consultant more often when technology was in use than when it was not. His role as task setter and explainer decreased in frequency when technology was in use. The differences in pupil ing associated with the use of technology are that students were observed to be using mathematical symbols, analyzing, and generalizing more with technology than without.

Teacher A's actions looked so carefully planned that the lessons appeared choreographed. He managed instruction carefully and, as with all
activities in the classroom, the use of calculators and computers was planned and purposeful.

**Classroom B**

The use of technology in Classroom B was restricted to the computer in demonstration mode or calculators. When using the computer for demonstrations, Teacher B entered the instructions himself. Technology was observed in use in Classroom B during 44% of the observed segments. The students were not observed working in groups during any of the videotaped lessons.

The lessons taught during the six classes observed in Classroom B covered a wide range of topics. Since it was not possible to obtain the camera for consecutive days, the six lessons took place over a period of ten days. The first three consisted of a day on parametric equations, a day on polar equations, and a day on parabolic equations. Only the last lesson consisted solely of new material. During the first lesson some of the discussion included work with vectors and at the end of the lesson students were challenged to write their own conic graphers. The fourth lesson was shortened because students took a Calculus readiness test at the beginning of the period. The lesson consisted of a review of polar and parametric equations in preparation for a test. The last two lessons were taped after a break of three days. The topic was graphing parabolas and other conics.

A portion of one videotape recording made in Classroom B was transcribed and the transcription follows. An explanation of the record is given in the right-hand column. Figure 6 displays the observers' records. These lesson segments were chosen because they typify the events that were observed in Classroom B.
TEACHER: Okay, R.D.'s idea was a real good idea. Interchange the roles of the $x$ and $y$, which creates an inverse. And then find the function, find the values, and then turn it back around. Okay?

So, here's the first thing that I did. I wrote the little program, I just write ... (GIVING PROGRAM CODE) Clearscreen, and (uh) Label 1, kind of exactly like what we've been doing, Label 1. And (uh) the first thing that I did was (uh) since I knew what this looked like, I decided that I'd play around like I didn't know. And (uh) I was going to do something like kind of like the standard viewing rectangle, negative ten to ten, okay? Like for example, obviously you wouldn't use the grapher probably with, you probably would have some idea of where it was maybe, but you might have to kind of change your viewing rectangle a few times to see what it is. A good one to start with the program is like maybe to assign negative ten to, let me show you what I did first. (Um) I was going to interchange the roles of the $x$ and $y$, so just like he was saying so that would be $x$ square minus two $y$ plus four equals $y$. Okay? Now, that's the $x$. I've got a

At the beginning of class, the teacher asked a student, named "R.D.", whether he had been able to program his own method for graphing parabolas with horizontal axes. R.D. said that his calculator did not have enough memory. Now, later in the class, the teacher is about to derive R.D.'s method for graphing the parabola with equation $y^2 - 2y + 4 = x$.

The teacher is in an exposition mode (Teaching Activity-1) and is discussing (3) at great length one student's strategy for graphing parabolic relations. The teacher acts as a resource providing the program code.

The teacher is using the blackboard but telling how to program the calculators.

Some students are entering the program code (Writing-4) into their calculators.
typical function rule here now, $y = f(x)$. So I assign that to $x$. And then I have (um) $x$ squared, minus, excuse me two $x$, minus two $x$, plus four. Assign that to $y$. And then what I wanted to do was plot $y, x$. Because I want to change back. Now, this won't work, let me tell you why it won't work.

R.D.: Because you said negative ten and (CANT HEAR THE END OF THE SENTENCE.)

TEACHER: Okay, there's nothing wrong there. The reason it won't work is these $x$'s and $y$'s are used by the Grapher in the usual functional notation. (R.D.: Oh, just change them.) That's right, you've got to change your letters. You can't use $x$ and $y$. Change this to say $A$ or $T$ or something, but you can't use $x$ and $y$ it turns out. It wouldn't work the first time, I changed letters and it worked. And then this becomes $x$ squared minus two $A$ plus four is assigned to $B$. And then plot $B, A$. Okay? Um, A, well, Line. I want to connect the plotted points. By the way, on occasion you may want to take that line out and just plot points.

The teacher is recounting his own investigations and counseling students about the limitations of the method.
STUDENT: Does it matter whether you have B, A or A, B?

TEACHER: It does for what we're doing because what I'm thinking is (um) when I interchange the roles of the x and the y instead of writing x squared I'm writing A squared (um) minus two A plus four equals B. And the A is the input variable, and the B is the dependent variable. So ordinarily, we'd be plotting A, B if we were graphing that function.

(POINTS TO PARABOLA IN STANDARD POSITION ON BOARD.) Are you with me?

(STUDENT: Yeah.) But I'm interested in the inverse, which takes me back to this one. (POINTS TO PARABOLA WITH HORIZONTAL AXIS ON BOARD.) So, I plot B, A. Okay? (STUDENT: Okay.) Um ...

Using the zoom-in program, let me mention this, using the zoom-in program on systems of parametric eq-- ..., or systems of polar equations, I found that I was having difficulty, the graph wasn't looking right. It seemed to be kind of, not graphing like it should.

(R.D.: Well, that's because ...) (TEACHER CUTS OFF STUDENT.) That's because I didn't have enough points in there, I think.

Student R. D. tries to assert.

A student asks a question.

Students are analyzing the code (STs High Level-2).

The teacher explains the strategy to her again.
R.D.: Yeah, see when you zoom in it changes the range. So, on, in your calculator now you can get it smaller. But it doesn't on your program.

TEACHER: Okay. Know how I took care of that? I just simply went back and got the word Line and changed from T plus a tenth to T plus a hundredth and plotted more points. (R.D.: Yeah.) Okay? What R.D. is saying, say that again for everybody.

R.D.: Well, what the calculator does is when you zoom in it changes your range, and it changes what you go by and so the points plotted are smaller. So when you, so that you have more points when you zoom in. Because when you zoom in, you look on your range, you have like ... your (uh) what is it, x, it has (um) ...

(TEACHER: $x_{\text{min}}, x_{\text{max}},$ and scale.)

Yeah, the scale is changed. And that's how the points are plotting it.

Student R. D. is asserting (Talking-7) and counseling.

Students are for the most part watching and listening (Passive-1,2). They seem to be absorbing the information (Didactic-1), because some nod their heads, others are programming their calculators, and one or two ask questions.

Student R. D. explains (Talking-5).

(End of Segment 1.)

The teacher explained two ways that this problem could be avoided. He completed the program on the board. Two students asked questions about the
program commands 'Goto' and 'Label.' The teacher explained the commands. He ran the program on his calculator and showed the calculator screen to a few students sitting in the front of the classroom. He then showed a different, five line program that can be used on the more general case. He showed the algebraic manipulations that form the basis for the second program. Later in the class, the following exchange took place while the teacher was explaining some of the word problems in the textbook.

The teacher leads the process of solving this application problem. The teaching activity is Exposition (1).

TEACHER: On 738, problem number 25. It says, "A parabolic microphone is formed by revolving the portion of the parabola 10y equals x squared between x = -7 and x = 7 about its line of symmetry. Where should the sound receiver be placed for best reception?"

Um ... if that doesn't make sense to you, think of it as a satellite receiver. Where should the receiver be placed for best reception?

STUDENT: Would that be at the focus?

Student hypothesizing (Talking-6).
Transcription of Classroom B Lesson Segments (continued)

TEACHER: Sure, it's got to be at the focus. Why?

STUDENT: Because that's, ... when something comes in that straight line, it's ... it ... reflects right to the focus.

TEACHER: Okay, that's the reflective property of the parabola ... (BEGINS TO DRAW AXES AND PARABOLA ON BOARD) we have not talked about, but it's one of the more important physical properties of that kind of a surface. If you have a three-dimensional surface like this, if I place a receiver at the focal point, if I have electromagnetic wave coming in parallel to the axis of symmetry, ... if it hits this surface, it will reflect and go right through the focal point. That's exactly why satellite dishes are all built like parabolic reflectors. What they're saying here is they take this curve 10y equal x squared. Okay and so this is 10 times (um), oh how do I want to say it, this is 4 times 10 over 4, y equals x squared. Okay? And so my focal length is ten fourths units long or five halves. So where should the sound receiver be placed? Well, two and a half units from the ... center of this thing.
the ... vertex out here and the focal length is two and a half units out.

Now, you're probably saying but this is three-dimensional, how can that thing work, this is a plane. If they take this surface, if you take this thing and revolve it around in three dimensions, what's it going to create? It's going to create a parabolic, if I could draw this thing in three dimension, no matter how you slice it you've got the same parabola. No matter how you slice it, you're going to have the same parabola. So all light energy coming in and hitting this, or electromagnetic waves, or whatever, will hit it and come back through this point right here. Okay? Uh ...

Problem 27 is the same kind of thing. It says, "A parabolic headlight is formed by revolving a portion of the parabola between the lines y = -4 and y = 4 about its line of symmetry." Okay? So you've got ... (um) We'll use the same picture but it's a little different. When they talk about revolving it, they're talking about here, look, this portion of it right here. If you revolve that around the axis of symmetry, it's going to create a bowl. A parabolic bowl sitting in there, alright? Three dimensions.

Students are attentive, so the teacher is accomplishing image building (STs High Level-1).

More image building (STs High Level-1).
No matter how I cut it, if I cut it in such a way that I'm slicing it right through this axis down here, what I'll have is a parabola. The same parabola in every plane. So every energy source coming in and hitting that will reflect through this focal point. And the same is true for 27 as 25. In this case, the focal point is in a little different place. You have $y^2 = 12x$ so this'd be four times twelve fourths. So this is going to be three obviously. Okay? So there the focal length is three. So that's what they're referring to. It's a very useful property.

Next time you see (uh) ... Next time you take your flashlight apart, look at that little reflector ... the bulb is sitting in. All you have taken flashlights apart? What kind of a reflector is that? It's a parabolic, paraboloid is what it is. It's a three-dimensional ... parabola. It's been revolved around its axis of symmetry. Where's that little bulb sitting? Where's that filament in that little bulb sitting, hopefully? (STUDENT: At the focal point.) Right at the focal point. Because when the light is given off, it comes back, hits the reflector, and goes out in ... parallel ...
lines. So that you have a nice beam out there, a nice compact beam … coming out.

STUDENT: That's what they have in search lights too.

TEACHER: Yeah, they all work that way. It's a very useful property of that kind of curve. Okay? Now, you know, we'll talk about other curves. The ellipse has some very useful properties as well because it has a reflective property as well. We'll hit that a little later.

Student asserts (Talking-7) and introduces another application.

(End of Segment 2.)
<table>
<thead>
<tr>
<th>OBSERVER SEGMENT</th>
<th>A</th>
<th>B</th>
<th>A</th>
<th>B</th>
</tr>
</thead>
<tbody>
<tr>
<td>TEACHING ACTIVITY</td>
<td>13&lt;sup&gt;a&lt;/sup&gt;</td>
<td>12</td>
<td>125</td>
<td>12</td>
</tr>
<tr>
<td>DEMAND on STs</td>
<td>1</td>
<td>23</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>#QUESTs by TCHR</td>
<td>3</td>
<td>4</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>#QUESTs by STs</td>
<td>2</td>
<td>2</td>
<td>6</td>
<td></td>
</tr>
<tr>
<td>HOMEWORK REVIEW</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>LESSON DEVELOP</td>
<td>1</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>GUIDED PRACTICE</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>GO OVER TEST</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>REVIEW PREV MAT</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>TECHNOLOGY</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>13</td>
</tr>
<tr>
<td>MANAGER</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>TASK SETTER</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>EXPLAINER</td>
<td>12</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>COUNSELOR</td>
<td>12</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>FELLOW INVEST</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>RESOURCE</td>
<td>1</td>
<td>5</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>STs PASSIVE</td>
<td>12</td>
<td>12</td>
<td>123</td>
<td>12</td>
</tr>
<tr>
<td>STs WRITING</td>
<td>4</td>
<td>3</td>
<td>35</td>
<td></td>
</tr>
<tr>
<td>STs TALKING</td>
<td>157</td>
<td>127</td>
<td>26</td>
<td>127</td>
</tr>
<tr>
<td>STs DIDACTIC</td>
<td>1</td>
<td>12</td>
<td>1</td>
<td>123</td>
</tr>
<tr>
<td>STs SYMBOLIZING</td>
<td>5</td>
<td>2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>STs INVESTIGATING</td>
<td>3</td>
<td>23</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>STs PROB SOLVING</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>STs HIGH LEVEL</td>
<td>2</td>
<td>1</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<sup>a</sup>The entries for all but "Quests by Tchr" and "Quests by Sts" represent labels for the behaviors observed during that lesson segment. "13" does not mean "thirteen" but rather means that Teaching Activities 1 and 3 were observed. Figure 5 lists the descriptors and their numeric code.

**Figure 6.** Observers' records for the transcribed Classroom B lesson segments.
Both observers coded the Teaching Activity in the transcribed segments from Classroom B as Exposition (1). Observer A noted the first segment as also being Discussion (3) and Observer B labeled it as Exposition and Practice (2). Applied Mathematics (5) was noted by Observer A for the second segment. Both observers listed the Teacher (1) as Manager, Task Setter, and Explainer. Observer A also included the Student (2) as Explainer and Counselor during the first segment. Both observers coded the students' behavior as including some passive (Watching, 1, and Listening, 2) and some active behaviors (Talking: Asking, 1; Asserting, 7; and Answering, 2). They agreed that the students were Investigating by studying particular examples in detail (3).

Table 3 shows the summary statistics for the 47 five-minute segments recorded in Classroom B. Teacher B lectured to the class during nearly 70% of the observed segments. This figure stayed about the same regardless of whether technology was in use. A considerable amount of time was spent working word problems from the textbook. Sixty-one percent of observed segments contained exercise, consolidation, and practice. Students were never observed working on homework exercises. Lesson development occurred in only about 39% of class segments, while both reviewing material (48%) and guided practice (42%) occurred more often. Lesson development was more frequent during periods when technology was not in use (51%). Both reviewing material and guided practice were more likely to take place when technology was in use, occurring during 58% and 52% of the observed segments with technology in use.
## TABLE 3. CLASSROOM B

<table>
<thead>
<tr>
<th>Summary Statistics:</th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mean</td>
<td>St Dev</td>
<td>Mean</td>
</tr>
<tr>
<td>TOTAL</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Teacher Questions</td>
<td>2.9</td>
<td>1.3</td>
<td>4.3</td>
</tr>
<tr>
<td>(average per 5 min)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Student Questions</td>
<td>2.6</td>
<td>0.9</td>
<td>2.0</td>
</tr>
<tr>
<td>(average per 5 min)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Percent of 5 min Segments that Contain:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Homework Review</td>
<td>23.4</td>
<td>28.6</td>
<td>14.3</td>
</tr>
<tr>
<td>Lesson Development</td>
<td>39.0</td>
<td>44.4</td>
<td>50.9</td>
</tr>
<tr>
<td>Guided Practice</td>
<td>42.4</td>
<td>32.8</td>
<td>30.2</td>
</tr>
<tr>
<td>Reviewing a Test</td>
<td>2.1</td>
<td>6.8</td>
<td>7.3</td>
</tr>
<tr>
<td>Reviewing Material</td>
<td>47.6</td>
<td>42.0</td>
<td>39.8</td>
</tr>
<tr>
<td>Using Calculators Only</td>
<td>26.0</td>
<td>18.1</td>
<td>0.0</td>
</tr>
<tr>
<td>Using Computers Only</td>
<td>7.4</td>
<td>11.4</td>
<td>0.0</td>
</tr>
<tr>
<td>Using Both Calculators and Computers</td>
<td>10.3</td>
<td>12.6</td>
<td>0.0</td>
</tr>
<tr>
<td>Student as Manager</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Student as Task Setter</td>
<td>9.6</td>
<td>11.4</td>
<td>10.0</td>
</tr>
<tr>
<td>Student as Explainer</td>
<td>10.9</td>
<td>8.4</td>
<td>13.1</td>
</tr>
<tr>
<td>Student as Consultant</td>
<td>11.3</td>
<td>14.2</td>
<td>13.0</td>
</tr>
<tr>
<td>Student as Fellow Investigator</td>
<td>1.1</td>
<td>1.9</td>
<td>0.0</td>
</tr>
<tr>
<td>Student as Resource</td>
<td>1.6</td>
<td>2.7</td>
<td>3.6</td>
</tr>
<tr>
<td>Students Passive</td>
<td>100.0</td>
<td>0.0</td>
<td>100.0</td>
</tr>
<tr>
<td>Students Active: Writing</td>
<td>59.4</td>
<td>25.9</td>
<td>39.3</td>
</tr>
<tr>
<td>Students Active: Talking</td>
<td>97.2</td>
<td>3.5</td>
<td>97.5</td>
</tr>
<tr>
<td>Students Didactic</td>
<td>97.2</td>
<td>3.6</td>
<td>98.9</td>
</tr>
<tr>
<td>Students Symbolizing</td>
<td>59.6</td>
<td>22.0</td>
<td>45.6</td>
</tr>
<tr>
<td>Students Investigating</td>
<td>66.0</td>
<td>32.2</td>
<td>45.3</td>
</tr>
<tr>
<td>Students Problem Solving</td>
<td>3.2</td>
<td>5.0</td>
<td>1.6</td>
</tr>
<tr>
<td>Students In Higher Level Thinking</td>
<td>36.4</td>
<td>20.5</td>
<td>34.0</td>
</tr>
<tr>
<td>Percent of 5 min Segments that Contain:</td>
<td>SUMMARY STATISTICS:</td>
<td>SIX LESSONS WITH NO TECHNOLOGY</td>
<td>WITH TECHNOLOGY</td>
</tr>
<tr>
<td>---------------------------------------</td>
<td>-------------------</td>
<td>-------------------------------</td>
<td>----------------</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>Mean</strong></td>
<td><strong>St Dev</strong></td>
<td><strong>Mean</strong></td>
</tr>
<tr>
<td>Teacher as Manager</td>
<td>100.0</td>
<td>0.0</td>
<td>100.0</td>
</tr>
<tr>
<td>Teacher as Task Setter</td>
<td>71.3</td>
<td>23.4</td>
<td>81.8</td>
</tr>
<tr>
<td>Teacher as Explainer</td>
<td>91.8</td>
<td>4.4</td>
<td>88.6</td>
</tr>
<tr>
<td>Teacher as Consultant</td>
<td>21.7</td>
<td>15.2</td>
<td>17.9</td>
</tr>
<tr>
<td>Teacher as Fellow Investigator</td>
<td>10.6</td>
<td>13.1</td>
<td>14.1</td>
</tr>
<tr>
<td>Teacher as Resource</td>
<td>5.3</td>
<td>9.3</td>
<td>2.7</td>
</tr>
<tr>
<td>Exposition</td>
<td>69.1</td>
<td>36.2</td>
<td>71.4</td>
</tr>
<tr>
<td>Exercise, Consolidation, Practice</td>
<td>61.3</td>
<td>42.3</td>
<td>52.2</td>
</tr>
<tr>
<td>Discussion</td>
<td>7.4</td>
<td>6.0</td>
<td>10.6</td>
</tr>
<tr>
<td>Investigation</td>
<td>18.1</td>
<td>17.8</td>
<td>11.4</td>
</tr>
<tr>
<td>Applied Mathematics</td>
<td>6.4</td>
<td>9.1</td>
<td>4.5</td>
</tr>
<tr>
<td>Problem Solving</td>
<td>3.2</td>
<td>5.6</td>
<td>4.8</td>
</tr>
<tr>
<td>Working in Groups</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Recall of a single fact or step</td>
<td>71.7</td>
<td>15.0</td>
<td>80.9</td>
</tr>
<tr>
<td>String together several facts or steps</td>
<td>41.3</td>
<td>16.0</td>
<td>47.3</td>
</tr>
<tr>
<td>Extend knowledge or skill</td>
<td>15.1</td>
<td>7.7</td>
<td>25.2</td>
</tr>
</tbody>
</table>

Number of 5 minute segments

47
27.5 *
19.5 *

*The average of the number of segments noted by the observers.
Teacher B averaged about three questions per five minutes. Like Teacher A, Teacher B asked almost twice as many questions when technology was not in use as when it was. The students in Classroom B asked more questions when technology was in use than when it was not. The demand placed on students was usually recall of single facts or steps. In 15% of all observed segments, students were required to extend their knowledge or skills. This figure is higher when technology is not in use (25%).

During the six observed lessons in Classroom B, the students assumed at one time or another the roles of task setter (10%), explainer (11%), consultant (11%), fellow investigator (1%), and resource (2%). Overall, the number of segments during which they assume these roles represented about one-third of all class time. They never assumed the role of manager. They assumed the roles of explainer, consultant, and resource more often when technology was not in use than when it was not. Most of the time the teacher acted as manager (100%), task setter (71%), and explainer (93%), but also assumed the roles of consultant (22%), fellow investigator (11%), and resource (5%).

During nearly every observed segment, students were observed using didactic behaviors (97%), but they were also investigating (66%), more often when technology was in use; symbolizing (60%), usually with the calculators; and involved in some higher level thinking (36%), usually analyzing. Students were involved in higher level thinking just as often when technology was in use as when it was not.

In the observed segments, Teacher B showed a more traditional teaching style than any of the other teachers. He spent more time deriving equations. He discussed the history of some of the mathematics. He asked fewer questions during exposition and rarely waited for students to answer. Teacher B became very involved in solving the textbook problems and discussing solution strategies. He spent a great deal of class time performing algorithms by hand to show why certain programs worked as they did, or a graph looked as it did. It appeared that during class the students were not as involved as the teacher was in doing the mathematics, but it was clear that some of the students had attempted difficult homework problems. When the
students would suggest alternative solution strategies, the teacher would often try them and come back the next day ready to discuss them in class.

From discussions with this teacher, it was clear that he was enthused about solving problems using the technology, but perhaps not as enthused about the pedagogical changes that are said to take place when technology is incorporated into the curriculum. When asked about the use of the graphing utilities in precalculus mathematics classes, Teacher B stated that the use of the technology should not be expected to affect teaching styles. Rather, he saw the incorporation of technology in the classroom as simply the addition of one more problem solving tool.

**Classroom C**

During the six days of taping in Classroom C the students spent most of the time solving problems. The topic of Lesson 1 was vectors. The teacher led the students through the solution of problems requiring vector representations of velocity. All of the other lessons involved the students in problem solving using parametric equations. During Lesson 2 students worked in small groups using both calculators and computers. Parametric equations were used to model the flight of a ball. Lesson 3 began with whole class instruction. Teacher C led the students through exercises which required students to recognize curves defined parametrically. Then students worked exercises alone or in small groups using calculators or computers. Lessons 4 and 5 consisted of whole class instruction. The topic of Lesson 4 was graphing curves defined parametrically. During Lessons 5 and 6 students modeled problem situations with parametric equations. Lesson 6 was held in the computer laboratory, which was in a room adjoining the classroom.

The following is a transcription of three portions of Lesson 5. An explanation using the observers' categories is provided in the right-hand column. Figure 7 displays the observers' records for the transcribed sections of videotape.
Transcription of Classroom C Lesson Segments

TEACHER: Let's take a look at that view. Let's zoom in on some more because we're going to want to read some information so let's get even closer.

Now, our picture on the screen (WALL) would certainly model a situation that would exist in, in the real world. If you were actually doing this it would probably follow a path like this. We can feel reasonably good about that. Um, so let's try to answer some of the questions if we're able. So, uh, have we answered the first question? Have we got satisfactory equations? It seems by comparison to Example 1 that we, we feel pretty good about our parametric equations for this problem. Can we answer, um, the graph, have we got a complete graph of the problem situation? I think we do. I think we've answered five and six. What about seven? What portion of the graph represents the problem? And, uh, I think we're prepared to answer that question. Let's give a, um, well, go ahead and hit the space bar and let's get the graph zoomed in a little bit closer. What would you say it represents the, uh, values of, uh, the horizontal component?

Oh, by the way, I've discovered, uh, through somebody in the other class

The teacher is task setting.

The computer is used as a resource.

The students look at the graph, which represents the problem situation (Problem Solving: Representing-2).

The teacher has not waited for an answer to any of these questions.

The students look at their textbooks and their notes.

While the class waits for the student at the keyboard to redraw the
that when the graph is distorted like this one is, it has to do with, uh, speed. So you have to change the speed. Escape from there, and let's redraw the graph but first let's change speed. Uh, "I". Right now this thing is, uh, at what speed? This is currently at fifty. Let's, uh, and the lower the number the faster it is. Okay. And there's an inverse resolution between speed and uh, there's an inverse relationship. The faster it is the less, uh, the quality of the resolution of your graph. So this one's pretty fast. Okay, so let's, let's go to, um, a one hundred and then redraw. Redraw the graph under the current view. One ... and see if our, um, graph is, uh, a bit more like what we would hope. You'll notice that we've slowed it down and, uh, the peak of that thing is much more like a parabola now so I'm gonna suggest to you in the lab that when you're, uh, when you're graph doesn't look quite the way you're expecting, it's not curved when you thought it should have been, it could be that you're graph is just, uh, you're plotting at too fast a speed and you can slow it down a little bit. And the lower the number the faster is the plotting. Okay, well, uh, what would you suggest to answer that question, number seven I:

graph, the teacher offers advice about operating the software (Counseling).

Option "I" controls the speed.

The students look at the graph on the wall. They are passive (Watching-1, Listening-2). The teacher is managing the investigation.
Transcription of Classroom C Lesson Segments (continued)

think it is? Let me share this with you. (LOOKS IN STUDENT’S TEXTBOOK WITH HER.) Uh, what portion of the graph represents the problem? (THE TEACHER READS THE QUESTION FROM THE TEXT.) And that is to say, left to right, top to bottom, where--where's the problem as far as you're concerned? And your horizontal scale here is ten on this graph and so is your vertical scale. Ten. So, uh, what is your horizontal--what numbers do you believe represent a good left to right range for this problem? (WAITS 5 SECONDS.) What would you claim? Zero to what? From the screen. I think the evidence is there. Joe, what were you gonna say?

JOE: It'd be a hundred and ten.

TEACHER: Yeah, it looks to me I'd better say from zero to about a hundred and ten. And so certainly over a hundred, um, but I don't know what that is. A hundred and five? It looks like it might be mid-way through the interval, but certainly that the, um, horizontal component ranges between zero and a hundred and ten. What about vertically? The scale is still the same. Ten, um, is your scale vertically, so what would you

The same question has been asked in three different ways.

The students look at the graph.

Joe speaks softly.

The teacher stands and adjusts the overhead projector while he asks
say is, uh, a good, uh, vertical component here? Somewhere between zero and ... ?
What's your guess?

GUY: Two point two.

TEACHER: I didn't hear you Guy.

GUY: Two point two.

TEACHER: Two point two, but each, uh, each, uh, hash mark is worth, ten.

GUY: Oh. Well, twenty two.

TEACHER: Twenty two? Twenty five, something like that. It sure looks li--
it's over twenty. There's no doubt about that. Let's go to the next question. When
will the dart hit the ground? (THE TEACHER READS THE QUESTION FROM
THE TEXT.)

the question.

Guy speaks softly.

Twenty-five minutes of class
time have elapsed. The parametric
equations have been written and are
graphed in the proper viewing
rectangle.

(End of Segment 1.)

At the teacher's suggestion they
have zoomed in on a zero of the graph
to find the value of \( t \) when \( y(t) = 0 \). A
student suggested that they use option
"Last View" to save time. The teacher
thanks him for "getting me out of
trouble." They have estimated \( x(t) \) to
be 104 feet when the dart falls to the
ground.
A student suggested that they use the value $x(t) = 104$ feet and the velocity of 58 feet per second to find $t$. But the teacher asks whether they have to concern themselves with gravity.

A student, Char, suggested that they solve $y(t) = -16t^2 + (58 \sin 41^\circ)t$ for $y(t) = 0$. The teacher is at the board and has factored the expression.

(Beginning of Segment 2.)

TEACHER: Which means one of these two has to be zero, and this part is when we started so we're not too concerned with that, so you want this to be zero?

CHAR: Well ...

TEACHER: How're you gonna solve that? (PAUSE.) I agree with you.

CHAR: Take that whole thing and divide it by (?)..

TEACHER: (TEACHER TURNS ON THE LIGHT SWITCH.) We need some more light. So, uh, ...

CHAR: Take ...
Transcription of Classroom C Lesson Segments (continued)

TEACHER: ... what do you want me to do? (TALKS SIMULTANEOUSLY WITH THE STUDENT.) Fifty eight times the sine ...

CHAR: (TALKS SIMULTANEOUSLY WITH THE TEACHER.) Take that and divide it by (fifty eight?).

TEACHER: Go ahead. I didn't hear you.

CHAR: Fifty eight times forty one pi over one eighty.

TEACHER: You want to know when that's zero?

CHAR: Divided by, six-, wait a minute.

TEACHER: So you're gonna say $t$ is ...

CHAR: Equal to ...

TEACHER: ... a fraction and the fraction is ...?

CHAR: Fifty eight sine ...

TEACHER: Fifty eight times the sine of forty one pi over a hundred eighty.
CHAR: Divided by sixteen.

TEACHER: Divided by sixteen. I agree with that. Now, we can avoid this on the Casio because you can be in degrees. Right? Let's make it simpler and go on the Casio and let's just do this in degrees. How about fifty eight times the sine of forty one degrees divided by sixteen will be t? So what do you come up with?

CHAR: Two point three seven eight.

TEACHER: Two point three seven eight. So, uh, --

STUDENT: I did it - oh.

TEACHER: -- how about two point three eight, seconds? So, two point three eight seconds after this thing is projected it comes back down to the ground and it will be a hundred and four feet roughly from where you threw it from, and, uh, that's without getting too, uh, too very aw- we didn't zoom in a whole lot really, to tell you the truth. Because my scale, I don't even see it any more. I lost it when I was reading a point but I bet my scale was only by tens,

The teacher has been sharing task setting with Char. The students are answering (Talking-2).

The teacher is Manager.
right? And I should have gone perhaps maybe to the point oh one level - or I could have. And you can do that yourself individually when you go into the next set of problems.

Um, well we've answered some of it. Let's, let's finish it. (TEACHER READS FROM THE TEXTBOOK.) What's the maximum height of the dart and when will that be reached? I'm now looking at number nine.

CHAR: Didn't you read the point?

TEACHER: I've already answered number ten, haven't I? How far does the dart travel in a horizontal direction? I think I've answered that. What is the answer for number ten?

CHAR: (SIMULTANEOUSLY WITH STUDENT A.) A hundred and four.

STUDENT A: (SIMULTANEOUSLY WITH CHAR.) A hundred -- (SHAKES HER HEAD YES.)

TEACHER: About a hundred and four, right now. That's our rough estimate, at least from our graph that we have right now. But I want to know about number

Calculus students would use a standard algorithm for finding the maximum point on the graph of a function. For these pre-Calculus students, the same exercise is a problem requiring some investigation and analysis of graphs.
nine. What do you suggest --

CHAR: (MUMBLES.)

TEACHER: -- that, uh, Michelle do?

CHAR: Zoom in on the highest point.

TEACHER: Zoom in on the highest point on the curve? So let's try to do that. Maybe we can use a, uh, um, draw line feature perhaps.

(Middle of Segment 2.)

They will zoom in on the vertex of the parabola and read \((x(t_{\text{max}}), y(t_{\text{max}})) = (51.3, 22.48)\). Student B suggests that they use the value \(y(t_{\text{max}})\) in the function \(y(t)\) to find \(t_{\text{max}}\); that is, solve \(22.48 = -16t^2 + (58 \sin 41^\circ)t\) for \(t\). Before they go any further with that strategy, Char wonders aloud whether there is an easier way, since the graph is a parabola. She thinks that the time, \(t_{\text{max}}\), when the dart reaches its maximum height will be \(\frac{1}{2}t_z\), where \(t_z\) is the time when the dart hits the ground at the end of its flight, which was previously found to be 2.38 seconds. The teacher responds, "I don't know. Let's find out."

(Middle of Segment 3.)
Transcription of Classroom C Lesson Segments (continued)

TEACHER: Is it true that if it takes two and a half seconds to accomplish this thing leaving the ground and coming back to the ground, that halfway through that time interval is when it reaches its highest point? (WAITS TWO SECONDS.) I'm not so sure-- (CHAR: No, because--) because on the way up it's slowing down, isn't it?-- (CHAR: Yeah, because also--) And then on the way down it's speeding up again, isn't it?-- (CHAR: Because distance would have to be the same length.) Because you've got a gravity, uh, it's going to accelerate due to gravity, isn't it, as it falls? So, I'm not sure I want to say that, I--I'm not sure about that. (CHAR: Yeah.)

TEACHER (TO STUDENT AT COMPUTER WHO IS TRYING TO ZOOM IN TO READ THE COORDINATES AT THE MAXIMUM POINT OF \( f(x) = -16t^2 + (58 \sin 41^\circ) t \)): Did you come up with anything here yet?

MICHELLE: One point two eight.

TEACHER: One point two eight.

MICHELLE: I don't know if it's right.
Transcription of Classroom C Lesson Segments (continued)

TEACHER: Close. Well, look in the back. All the answers to this are in the back. See if we agree with them. Yeah, well, I don't know if I trust them anyway. I mean, in a preliminary edition sometimes the answers we get are for the wrong problem or something like that.

STUDENT: They have one point one nine.

TEACHER: Nine point six. We did problem, what, five, six, seven, eight--

CHAR: They did what I did.

TEACHER: Well, we got the graph right. We agree on the graph, I think. Do our equations agree on number five?

STUDENTS: Yeah. Yes. Yes.

TEACHER: We have the same ones they did, whoever did this solution. Six, we agree with?

TWO STUDENTS ARE DISCUSSING THE SOLUTION TO NUMBER NINE WHILE THE TEACHER LOOKS AT THE ANSWERS TO FIVE THROUGH EIGHT: They have one point, figure, two eight nine.
Transcription of Classroom C Lesson Segments (continued)

TEACHER: Six, our graphs sure agree. Seven? Eight? That was what we said. Two point three eight. I think we said something close to that. (CHAR: Yeah. Yup, it's right there.) Nine. Well Char, it looks like what you said is, is really the case. Now that means that we should with this quadratic, come up with two different values and one of them should be about one point one nine.

CHAR: Why doesn't the distance work? Why can't you just take--

TEACHER: Maximum height. Do we agree with that? Did we get that number?

JOE: What is it? What do they have?

TEACHER: Twenty-two point six two. We said twenty-two point four eight. Well, we're in the same league, and we didn't zoom in much. So, I suspect that we could agree with that. But they're uh, they uh, their answer agrees with Char's suggestion that we just take the total time and divide it in half. Because it's going to occur at the midpoint of the interval. And then the last one, a hundred and four point one. That's what we got exactly. We got one oh four point one, didn't we? Before, didn't we? I remember seeing that number.

(Beginning of Segment 4.)

The teacher does not hear her, but now Char may be suggesting a correct solution path.
CHAR: Mr. XXX-- (TEACHER: Yeah.)
Why can't you just take the distance and divide it by two, why doesn't that work?

TEACHER: The distance divided by two...

STUDENT A: You still get one point one nine.

TEACHER: We're getting one point two eight now. We're not getting what they have. So, maybe we don't trust them. So, whoever did the solution may be thinking like you did. But, uh, do we agree with this? I mean, are we doing the right thing doing this? (REFERRING TO FINDING THE MAXIMUM OF THE QUADRATIC FUNCTION.) I feel pretty good about doing this. Because we wanted to know when it reached twenty-two point four eight feet. And that's a function of t. y is a function of t. So, I just went back here and plugged into here. I feel pretty good about one point two eight. (PAUSES.) I feel better than I do about one point one nine. I mean, I just, I do. Yeah--(ACKNOWLEDGES STUDENT.)

STUDENT: I get one point oh nine when I um-- (TEACHER: On a calculator?) when I subtracted them.
Transcription of Classroom C Lesson Segments (continued)

TEACHER: You get one point oh nine, and which is yours for the plus? (TO STUDENT A.) Is that one point two eight? (STUDENT NODS.) Now, which one is it? And they're both in there. They're both positive numbers. Or is it that this height, we're not really at the maximum height yet? (CHAR: Yeah, that's true.) Maybe that's the problem too. Maybe we ought to zoom in a little more and get more accuracy. So, we'll let you do that on your own. Yeah-- (ACKNOWLEDGES STUDENT.)

JOE: Charlotte said that you can get the total distance and divide it by two. And when I just--

TEACHER (TO CHAR): Now, which were you saying? Which distance are you talking about? The vertical distance?

CHAR: That's what I was asking you. I was wondering, if you take, no... the horizontal distance-- (JOE: Horizontal distance.) (TEACHER: Horizontal distance - a hundred and four point one feet.) Why doesn't that work?

TEACHER: And what do you want to do? Go halfway through that interval?

This student is asserting (Talking-7). He redirects attention to Char's suggestion that they use the horizontal distance to find $t_{\text{max}}$. Neither Char nor Joe has completely explained a correct strategy. They could use the horizontal distance to find $t_{\text{max}}$ by dividing the distance between where the dart falls to the ground and where it was thrown by 2. This would yield the horizontal distance, $x(t_{\text{max}})$, travelled when the dart reaches its maximum height. Substituting this into the function for $x(t)$ would yield $t_{\text{max}}$. 
STUDENT A: We need the time it takes to get there. So, you figure half the time is the maximum height--

TEACHER: So you, the total time we figured was two point three eight seconds. Because we already did that work, right? (STUDENTS: Yeah. Yeah.) And we did that here. So, we wanted to know when it hit the ground. And then you took that number and took half of that, which is obviously what the person who did the example, I think they did that. (JOE TRIES TO INTERRUPT.) And I'm saying I don't know if I agree with--

JOE (INTERRUPTS): Is that true? Does an object come down as fast as it goes up?

TEACHER: I don't know. Do you agree?

CHAR: That's right, Joe. He said why wouldn't it make up for the--

JOE: Is it the same speed?

TEACHER: So you're saying the time we lose here (ON THE WAY UP) we're going to make up for here (ON THE WAY DOWN). (CHAR: Yes.) I don't know. Many of the students believe incorrectly that dividing \( t_z \) by 2 will yield \( t_{\text{max}} \). It is not necessarily the case although, unfortunately, in this problem \( t_{\text{max}} \) does equal \( \frac{t_z}{2} \).

The teacher and some of the students are struggling to confirm their suspicion that dividing \( t_z \) by 2 is not correct.
CHAR: It couldn't be any longer.

STUDENT B: If you average both their answers it gives you one point one nine.
(STUDENTS LAUGH.)

TEACHER (FACITIOUSLY): So you average their two answers, it's one point one nine.

I would want to investigate this further and zoom in on it, and try to get a more, maybe a more precise value. Because we're still at, look at my scale. My vertical scale on that graph is ten. And my horizontal scale is also ten.
(STUDENT: Zoom in--) So, we're not even at the nearest unit level. So, I'm not real confident of the numbers we're using to tell you the truth. So if I want to get more accuracy I think I'm going to (uh, uh) zoom in a little more.

I feel more comfortable using this to tell you the truth. Because we're borrowing a formula from physics, which I'm assuming is going to compensate for that problem of gravity, and it's ignoring--We're wrong anyhow, because we're, we're neglecting resistance, the wind resistance or the air--(CHAR: But they tell you to do that.) Which I'm not sure that we can do that, but we're just modeling the situation anyhow.
Transcription of Classroom C Lesson Segments (continued)

TEACHER (AS HE WALKS OVER TO THE OVERHEAD PROJECTOR AND ADJUSTS FOCUS): Now, she's zooming in on that. And let's see if we, if that changes our number. What was our number? Twenty-two point--(JOE: Wow, it comes to a point.) Okay, we've got to change our speed.

CHAR: Well, can't you just--(JOE: Well won't that separate the points?) Yeah.

TEACHER: But how accurate is the graph? Let's change the speed on that. (STUDENT A: But isn't that point the maximum point?) And we're at, where are we at right now, a hundred? Let's go to a hundred and fifty and see if that smooths that out a little bit. It's just too fast.

STUDENT A: But Mr. Jones, isn't that point the highest point?

TEACHER: I don't know. I don't know if I would agree.

Well, let's go to that vertex point and see what we can make out of that. Okay, read a point.
Transcription of Classroom C Lesson Segments (continued)

TEACHER: It's obvious where we are now. We want to do problems in nine point six. I think the example you'd better study pretty, pretty hard, is uh, uh not a routine problem at all in high school mathematics is Example Five. So, if I were you tonight, I'd spend a little time with Example Five.

CHAR: We've done those in Physics.

TEACHER: You did a problem like that? Related rates type thing? (LOOKS AT SCREEN. ADDRESSES STUDENT AT KEYBOARD.) Have you read that position? Where are you? Where's the arrow? Let's read that position and see. You did already? Fifty, twenty-two point six one seven. Now, that changes things. Now, it's twenty-two point six two.

CHAR: That's what they had in the back.

TEACHER: Okay. So, is that going to affect our answer? That's, that's a lot higher. (STUDENTS: Yeah. Twenty-two point four eight. It's higher.) That's higher than what we said. So, you might want to look at that and see what that does in that equation...and see if that makes any difference. But I'll let you handle that.

The teacher suggests a homework assignment.

Forty minutes of class time were spent investigating this group of problems.
<table>
<thead>
<tr>
<th>OBSERVER SEGMENT</th>
<th>A 1</th>
<th>B 2</th>
<th>A 3</th>
<th>B 4</th>
<th>A 5</th>
<th>B 6</th>
<th>A 7</th>
<th>B 8</th>
</tr>
</thead>
<tbody>
<tr>
<td>TEACHING ACTIV</td>
<td>46a</td>
<td>2</td>
<td>456</td>
<td>2</td>
<td>46</td>
<td>2</td>
<td>34</td>
<td>2</td>
</tr>
<tr>
<td>DEMAND on STs</td>
<td>12</td>
<td>12</td>
<td>12</td>
<td>12</td>
<td>12</td>
<td>12</td>
<td>3</td>
<td>12</td>
</tr>
<tr>
<td>#QUESTs by TCHR</td>
<td>5</td>
<td>11</td>
<td>8</td>
<td>20</td>
<td>5</td>
<td>17</td>
<td>2</td>
<td>10</td>
</tr>
<tr>
<td>#QUESTs by STs</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td>1</td>
<td></td>
<td></td>
<td>4</td>
</tr>
<tr>
<td>HMMK REVIEW</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>LESSON DEVELOP</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>GUIDED PRACTICE</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>GO OVER TEST</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>REVIEW PREV MAT</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>TECHNOLOGY</td>
<td>24</td>
<td>1234</td>
<td>3</td>
<td>234</td>
<td>13</td>
<td>13</td>
<td>2</td>
<td>234</td>
</tr>
<tr>
<td>MANAGER</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>TASK SETTER</td>
<td>1</td>
<td>12</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>12</td>
<td>1</td>
</tr>
<tr>
<td>EXPLAINER</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>COUNSELOR</td>
<td>1</td>
<td>2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>FELLOW INVEST</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>RESOURCE</td>
<td>45</td>
<td>345</td>
<td>4</td>
<td>5</td>
<td>35</td>
<td>4</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>STs PASSIVE</td>
<td>124</td>
<td>12</td>
<td>12</td>
<td>12</td>
<td>12</td>
<td>12</td>
<td>124</td>
<td>12</td>
</tr>
<tr>
<td>STs WRITING</td>
<td>6</td>
<td>256</td>
<td>234</td>
<td>26</td>
<td>5</td>
<td>5</td>
<td>6</td>
<td></td>
</tr>
<tr>
<td>STs TALKING</td>
<td>6</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>16</td>
<td>27</td>
<td>126</td>
<td>127</td>
</tr>
<tr>
<td>STs DIDACTIC</td>
<td>1</td>
<td>123</td>
<td>12</td>
<td>12</td>
<td>1</td>
<td>123</td>
<td>1</td>
<td>123</td>
</tr>
<tr>
<td>STs SYMBLZNG</td>
<td>3</td>
<td>23</td>
<td>1</td>
<td>3</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>STs INVESTIG</td>
<td>13</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>23</td>
<td>3</td>
<td>13</td>
<td>3</td>
</tr>
<tr>
<td>STs PR SOLVNG</td>
<td>2</td>
<td>5</td>
<td>5</td>
<td></td>
<td>5</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>STs HIGH LEVEL</td>
<td>2</td>
<td>2</td>
<td>12</td>
<td>27</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The entries for all but "Quests by Tchr" and "Quests by Sts" represent labels for the behaviors observed during that lesson segment. For example, "46" does not mean "forty six" but rather means that Teaching Activities 4 and 6 were observed. Figure 5 lists the descriptors and their numeric code.

Figure 7. Observers' records for the transcribed Classroom C lesson segments.
Figure 7 can be interpreted using the codes listed in Figure 5. All five minutes of Segment 1 were transcribed. The first half of Segment 2 was transcribed. The last portion of the transcription occurred during the final one and a half minutes of Segment 3 and the first minute of Segment 4. Observer A identified the Teaching Activity as Investigation (4) and Problem Solving (6), with some Applied Mathematics (5) and Discussion (3). Observer B identified the Teaching Activity as Exercise, Consolidation, or Practice (2). Both observers agreed that the teacher was guiding the students closely. The Demand on Students was recall of single facts or steps (1) and recall and use of several facts or steps (2). There is some disagreement about the number of questions that the teacher asked. The instructions to the observers were to not count repetitions of the same question. In order to be counted, a new question must redirect student thought or ask for a response different from the previous question. The transcriptions show that Teacher C forms many of his verbal communications (pedagogical moves) as interrogatives. Observer A felt that many were rewordings of the same question. Observer B felt that the questions were separate questions, redirecting student thought.

The computer graphing utility (Technology-2) was in use throughout the lesson. With a student operating the computer, the teacher moved freely from the black board (Technology-3) to the side of the room to lead the discussion. Some students used their calculators (Technology-1).

The teacher assumed the roles of Manager and Task Setter during all of the segments, but at times the students were sharing the role of Task Setter. Observer A noted that the teacher assumed the role of Fellow Investigator during most of the transcribed portion of the class. Students showed Passive and Active behaviors during the class. Although the teacher asked a large number of questions, only three or four students answered the questions. Only during the final segment of the transcription, were students actively involved in Asking (1), Answering (2), Hypothesizing (6), and Asserting (7). Both observers noted that students were investigating particular problems thoroughly (3) during the entire lesson. Observer A coded problem solving activities (Representing-2; Checking or Looking Back-5). Observer A also noted that students were analyzing (Higher Level Thinking-2) throughout the lesson.
Table 4 displays the summary statistics over all six lessons in Classroom C. The majority of class time was spent in guided practice (69%) with lesson development occupying about 13% of class time. Homework review was judged to be in progress during only 18% of observed segments, but it was difficult to tell without observing the lessons in sequence whether the problems being practiced had been assigned as homework on the previous day. As in the transcription, Teacher C most often "suggested" rather than "required" that students look at certain problems or problem types. The dedication of class time can be looked at another way by examining teaching activity. The teaching activity most often recorded was exercise, consolidation, or practice (66%); then working in groups (38%); then investigation (34%). Exposition was recorded for only 20% of the observed segments. Technology was in use during 85% of the observed segments. During 47% of the observed segments, both calculators and a computer or computers were in use.

Students were observed to be talking during all of the five-minute segments of all six classes (100%). An examination of the observers' records for Classroom C reveals that most of the talking is in the form of answering the teacher's questions. (See Tables 27 through 32 in Appendix B.) Note, however, that the students in Classroom C ask very few questions (0.8 per 5 minutes). Also, most of the answering is done by three or four students and not all questions are answered.
<table>
<thead>
<tr>
<th></th>
<th>SUMMARY STATISTICS:</th>
<th>SIX LESSONS WITH NO TECHNOLOGY</th>
<th>WITH TECHNOLOGY</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>TOTAL</td>
<td>WITH</td>
<td></td>
</tr>
<tr>
<td>Mean</td>
<td>St Dev</td>
<td>Mean</td>
<td>St Dev</td>
</tr>
<tr>
<td>Teacher Questions (average per 5 min)</td>
<td>6.0</td>
<td>3.8</td>
<td>9.9</td>
</tr>
<tr>
<td>Student Questions (average per 5 min)</td>
<td>0.8</td>
<td>0.4</td>
<td>0.2</td>
</tr>
<tr>
<td>Percent of 5 min Segments that Contain:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Homework Review</td>
<td>17.6</td>
<td>25.8</td>
<td>0.0</td>
</tr>
<tr>
<td>Lesson Development</td>
<td>12.8</td>
<td>21.2</td>
<td>24.1</td>
</tr>
<tr>
<td>Guided Practice</td>
<td>69.4</td>
<td>21.6</td>
<td>61.3</td>
</tr>
<tr>
<td>Reviewing a Test</td>
<td>1.9</td>
<td>4.5</td>
<td>0.0</td>
</tr>
<tr>
<td>Reviewing Material</td>
<td>6.5</td>
<td>7.6</td>
<td>12.5</td>
</tr>
<tr>
<td>Using Calculators Only</td>
<td>10.4</td>
<td>12.9</td>
<td>0.0</td>
</tr>
<tr>
<td>Using Computers Only</td>
<td>27.8</td>
<td>41.4</td>
<td>0.0</td>
</tr>
<tr>
<td>Using Both Calculators and Computers</td>
<td>47.2</td>
<td>44.4</td>
<td>0.0</td>
</tr>
<tr>
<td>Student as Manager</td>
<td>11.1</td>
<td>17.1</td>
<td>0.0</td>
</tr>
<tr>
<td>Student as Task Setter</td>
<td>44.7</td>
<td>31.4</td>
<td>34.8</td>
</tr>
<tr>
<td>Student as Explainer</td>
<td>15.7</td>
<td>20.3</td>
<td>25.0</td>
</tr>
<tr>
<td>Student as Consultant</td>
<td>33.3</td>
<td>26.4</td>
<td>25.0</td>
</tr>
<tr>
<td>Student as Fellow Investigator</td>
<td>23.1</td>
<td>31.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Student as Resource</td>
<td>6.5</td>
<td>8.8</td>
<td>18.8</td>
</tr>
<tr>
<td>Students Passive</td>
<td>80.6</td>
<td>23.6</td>
<td>100.0</td>
</tr>
<tr>
<td>Students Active: Writing</td>
<td>90.7</td>
<td>15.3</td>
<td>42.0</td>
</tr>
<tr>
<td>Students Active: Talking</td>
<td>100.0</td>
<td>0.0</td>
<td>100.0</td>
</tr>
<tr>
<td>Students Didactic</td>
<td>75.0</td>
<td>26.4</td>
<td>100.0</td>
</tr>
<tr>
<td>Students Symbolizing</td>
<td>92.5</td>
<td>13.2</td>
<td>48.2</td>
</tr>
<tr>
<td>Students Investigating</td>
<td>92.9</td>
<td>5.1</td>
<td>75.9</td>
</tr>
<tr>
<td>Students Problem Solving</td>
<td>31.5</td>
<td>21.4</td>
<td>6.3</td>
</tr>
<tr>
<td>Students In Higher Level Thinking</td>
<td>45.4</td>
<td>17.1</td>
<td>13.8</td>
</tr>
<tr>
<td>Percent of 5 min Segments that Contain:</td>
<td>TOTAL</td>
<td>Mean</td>
<td>St Dev</td>
</tr>
<tr>
<td>--------------------------------------</td>
<td>-------</td>
<td>------</td>
<td>--------</td>
</tr>
<tr>
<td>Teacher as Manager</td>
<td>91.7</td>
<td>20.4</td>
<td></td>
</tr>
<tr>
<td>Teacher as Task Setter</td>
<td>73.1</td>
<td>34.9</td>
<td></td>
</tr>
<tr>
<td>Teacher as Explaner</td>
<td>52.9</td>
<td>16.7</td>
<td></td>
</tr>
<tr>
<td>Teacher as Consultant</td>
<td>38.9</td>
<td>31.8</td>
<td></td>
</tr>
<tr>
<td>Teacher as Fellow Investigator</td>
<td>46.3</td>
<td>28.3</td>
<td></td>
</tr>
<tr>
<td>Teacher as Resource</td>
<td>0.9</td>
<td>2.0</td>
<td></td>
</tr>
<tr>
<td>Exposition</td>
<td>19.6</td>
<td>23.5</td>
<td></td>
</tr>
<tr>
<td>Exercise, Consolidation, Practice</td>
<td>65.7</td>
<td>30.5</td>
<td></td>
</tr>
<tr>
<td>Discussion</td>
<td>10.2</td>
<td>14.4</td>
<td></td>
</tr>
<tr>
<td>Investigation</td>
<td>34.3</td>
<td>20.3</td>
<td></td>
</tr>
<tr>
<td>Applied Mathematics</td>
<td>12.0</td>
<td>13.3</td>
<td></td>
</tr>
<tr>
<td>Problem Solving</td>
<td>8.3</td>
<td>17.8</td>
<td></td>
</tr>
<tr>
<td>Working in Groups</td>
<td>38.0</td>
<td>46.2</td>
<td></td>
</tr>
<tr>
<td>Recall of a single fact or step</td>
<td>74.1</td>
<td>21.4</td>
<td></td>
</tr>
<tr>
<td>String together several facts or steps</td>
<td>58.3</td>
<td>40.1</td>
<td></td>
</tr>
<tr>
<td>Extend knowledge or skill</td>
<td>26.9</td>
<td>18.6</td>
<td></td>
</tr>
</tbody>
</table>

Number of 5 minute segments  

<table>
<thead>
<tr>
<th></th>
<th>TOTAL</th>
<th>Mean</th>
<th>St Dev</th>
<th>SIX LESSONS</th>
<th>WITH NO TECHNOLOGY</th>
<th>Mean</th>
<th>St Dev</th>
<th>WITH TECHNOLOGY</th>
<th>Mean</th>
<th>St Dev</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>54</td>
<td>8</td>
<td>46</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Teacher C was observed for 54 segments and used technology during 46 of these segments. The following comparisons are made cautiously since the number of segments with no technology in use is so low. The teacher assumed the roles of consultant and resource only when technology was in use. The students exhibited the roles of manager and fellow investigator only when technology was in use. The students engaged in discussion and worked in groups only when technology was in use. Homework review was observed only while technology was in use. The students were observed in a didactic mode (absorbing, recalling, rule following) more often without technology than with it. They exhibited more symbolizing and higher level thinking when technology was in use than without it.

This teacher's ability to say "What do you think?," to coax, and then wait for the students to make suggestions, allows the students to assume roles that they might not otherwise assume. However, the observers all noted that in general the classroom was very quiet. Although there were many times when the teacher waited a long time for a student to respond, there were other times when the rewordings of the same question came in rapid fire fashion. There was some disagreement over whether the teacher was prepared to explain the solutions to problems during class, or whether he was seeing them for the first time. There are so many problems in every section of the text, that it would be very difficult to have solved all of them, but a substantial amount of class time could have been saved by skipping over steps that, at this point at the end of the year, should be routine for students.

**Classroom D**

The lessons taught during the six days of taping in Classroom D covered concepts in trigonometry: inverse trigonometric relations and functions, trigonometric equations and inequalities, and the Law of Sines. The schedule in this classroom was disrupted almost daily by end-of-year school functions, videotaping equipment malfunction, or building repair.
A transcription of the videotape recording made during one lesson in Classroom D follows. An explanation using the observers' categories is provided in the right-hand column. This lesson segment was chosen to illustrate some of the classroom interactions that took place in this classroom and how they were recorded by the observers. Figure 8 displays the observers' records for the transcribed sections of videotape. Figure 5 provides information necessary to interpret the observers' records.
Transcription of Classroom D Lesson Segments

TEACHER: Now, if you were to graph, and on the computer go ahead and type in arcsin $x$ just like you see it, that's what you get, just that one piece that we had cut off before. We don't get the whole thing now. We only get the part that's a function. And if you did it on the calculator, you would get the same thing, just that one little piece.

Okay? So, what you need to know now, is that's how the arcsine looks like. And it's really kind of easy--

(Middle of Segment 1.)

After a brief review of the concept of inverse trigonometric functions, the teacher now turns on the display computer to show the graph of $y = \arcsin x$ (Technology-2, 4).

The teacher is lecturing (Exposition-1) to the whole class.

THERON: Is this thing still graphing it? (TEACHER: No, no, it was already up here to start with.)

THERON: I think it's growin'.

(TEACHER LAUGHS.)

THERON: No, like it's branching off, like it's getting longer.

TEACHER: Okay, well, Theron, I don't really think it's growing, but... Alright, well we're saying the domain is negative one to one and it sure looks like it's negative one to one over here. And we said the range is from negative pi over two to pi over two, and pi over two as a decimal-- (THERESA: is one point five
seven)—is one point five seven. Up at the top, the top half looks pretty good. I'm not sure why it doesn't graph quite as long on the bottom half. Okay? Must just be something with the software.

Now, if you were to graph this thing by hand, you could use the old method, well and make yourself a table. What I would do, is write down where the domain and range are first because that makes it very easy. If you know that the domain is negative one to one, well you could do just pick numbers in here. The first thing you might pick is the zero. When you put zero in here, you get arcsine zero, you're asking what angle has a sine of zero.

STUDENT: Zero.

TEACHER: It'd be zero, okay. So we'll just put this right at the origin. (PLOTS POINT.) Let's say you put in a one. You're asking what angle has a sine of one.

JAY: Pi over two.

TEACHER: Pi over two, okay. Which we'll put… (PLOTS POINT)... up here. And if we put in negative one, we're

The teacher moves over to the chalkboard (Technology-3). The teacher is Manager and Task Setter.

The students in Classroom D are usually quite verbal, calling out comments and answers before the teacher has a chance to ask the questions (Talking: Answer-2, Assert-7).

The students are recalling values of trigonometric functions (Demand-1, Didactic-2).
asking what angle has a sine of negative one.

STUDENT A: Negative ninety degrees.

TEACHER: That's negative pi over two. Okay, so we put this down here. (PLOTS POINT.) Now that basically gives you enough to graph this thing. And from what we have up here, what, what does that look like the graph of that you already know?

JAY: Tangent.

TEACHER: Tangent... or...

JAY: ...or cosine.

STUDENT B: x cubed.

TEACHER: x cubed, okay, either one of those. And if you wanted to actually take another point you could pick something like a half and put that up here, and I'd have to ask you what angle has a sine of a half...

JAY: Pi over four.

STUDENT B: No, thirty.
Transcription of Classroom D Lesson Segments (continued)

TEACHER: Thir--oh, he is on a roll. He's got these things. Okay, and in radians, thirty is...

STUDENT B: Pi over... six.

TEACHER: Pi over six. Okay, so we'd come over to a half and pi over six would be one third of the way up, which is out here, and then I could do, and make the graph.

THERON: You said, what'd you say, for thirty and that, that was thirty over what, sine? Sine thirty? Pi over six?

(TEACHER: Yes.) Okay.

TEACHER: Alright, now just from what we've been doing all year long, if I throw a negative sign in front of that thing, what's that going to do to the graph?

THERESA: It flips it over.

TEACHER: Okay, it flips it over. So, we'll take a look at that. (ENTERS \( y = -\arcsin x \) IN THE COMPUTER.) Okay, it did exactly as you said, right, Theresa? Now, that does not change the domain and the range, does it?

The students are recalling the transformations that they have seen with graphs of other functions and generalizing to the graph of this function (STs High Level-3).
Alright, we've still got from negative one to one, and from negative pi over two to pi over two. If I throw two out front, what does that do to the graph?

STUDENT B: Shifts it.

THERESA: Stretches it.

TEACHER: Okay, what kind of a stretch?

THERESA: A vertical stretch.

TEACHER: Okay, it's just a vertical stretch. Which means, then, that my x's, or the domain, is not affected. So, my domain is still negative one to one. My range, however, is now going to be...

THERESA: Oh, ...

STUDENT C: (MUMBLES.)

STUDENT D: Negative pi to pi.

TEACHER: Right, negative pi to pi. This is what the range was, that two is going to stretch that range, and we get negative pi to pi.
STUDENT B: And that's one unit, that's (um) one unit circle, I mean-- (TEACHER: No) not one unit circle, but one (um) what do you call that?

TEACHER: What, one period? (STUDENT B: Yeah, one period.) Okay, yeah, because for, for the arc-functions, that's all you're concerned with, you just want one. Okay? Alright, so let me lay that on top here. (ENTERS y = 2 arcsin x INTO THE COMPUTER.)

It should go up just a little bit higher and down a little bit lower. Okay, so that looks pretty good. Again, it doesn't come down quite as far as it should on the bottom, but at least up at the top, how high is it going?

STUDENTS: Pi.

TEACHER: Yeah, on that it's going up to three, or just a little past it, so we know that's pi.

And, again, if you were going to graph that thing by hand. Basically, if you know that this is the domain, well, make your domain go from negative one to one. Now, for your range, instead of stopping at pi over two, stop at pi. And
you're still going to have the same shape. Okay?

Let's say, I put a two on the inside. (THREE STUDENTS ANSWER SIMULTANEOUSLY AND QUIETLY.)

TEACHER: Okay, so that's a horizontal what?

THERESA: Oh, shrink.

TEACHER: Right, that's a horizontal shrink. So, what does that do to the domain?

THERESA: One half.

TEACHER: Right, change this to a half (CHANGES -1 TO $\frac{1}{2}$) and a half (CHANGES 1 TO $\frac{1}{2}$). And the range will stay, negative pi over two to pi over two. Okay? Pretty easy so far?

STUDENT: Yeah.

TEACHER: Alright, let's say I throw a one half in there.

THERESA: Oh, stretch ... horizontal stretch.
TEACHER: Okay, right. Horizontal stretch by a factor of two, which turns this thing into...(POINTING AT RANGE)

THERESA AND OTHERS: Negative two.

TEACHER: Negative two to two. Okay, so really this, this should be one of the easier things that we've done because it's nothing new really. (WRITING RANGE ON BOARD.) Negative pi over two to pi over two.

Alright now, here let's start getting to the good ones. What is this thing going to do? (POINTS TO THE EQUATION \( f(x) = -3 \sin^{-1} \left( \frac{1}{4} x \right) \) WRITTEN ON THE BOARD.)

THERON: Now, that's going to be a shift, right?

STUDENT F: It's goin' to ... reflect, reflect.

THERESA: Show us.

TEACHER: Okay, it's going to be a reflection around the what?
Theron: $x$-axis.

Theresa: $y$-axis.

Teacher: Okay, around the $x$-axis.

Student G: It's gonna have a horizontal stretch of four. (Teacher: Horizontal stretch of four.) And a vertical stretch of three. (Teacher: And a vertical stretch of three.)

Teacher: Okay, so that means our range is goin--, I mean our domain is going to be...

Student G: Negative four to four.

Teacher: Negative four to four. Okay, the only ones you really have to keep in mind is the original, negative one to one, negative pi over two to pi over two. The range is now going to be...

Student G: Negative three pi over two -- (Teacher: Uh huh) ... to three pi over two.
TEACHER: (WRITING.) Three pi over two. Okay? So, again if you were going to graph this thing by hand, then this is how you would make your x-axis. This is the way you'd make your y-axis, and really the only x's you'd have to pick are these endpoints here, and zero. Okay? And again, that'll be kind of easy to do. I'm going to make kind of a cheap graph here. (SKETCHING GRAPH ON BOARD.)

At zero, we know we're going to have the origin still, aren't we? All of these things are going to pass through the origin, unless you have a horizontal or a vertical shift. Okay? We're still going to be at the origin. Normally, it would start over here at the four, and end up here at the three pi over two, and come like this..., but since we've got that reflection around the x-axis, we start up here... and just come around like that. Okay? Least I hope that's what it's going to be. (GOES TO ENTER IT INTO THE COMPUTER.) It better not make a liar out of me.

STUDENT: Hmmm.....

(End of Segment 2.)

Throughout the lesson, the teacher is the Explainer.

(AFTER 30 SECONDS THE GRAPH IS ON THE SCREEN.)
TEACHER: Okay, so again, that looks pretty good compared to what we had up there on the board. Now, the last one, and this is the same problem on page 634, Example #4 in your books. FIND THE DOMAIN, THE RANGE, AND DRAW A COMPLETE GRAPH OF

\[ f(x) = 3 \sin^{-1}\left(\frac{1}{4}(x + 8) - 5\right) \]

This one is going to do a little bit of everything. Okay? So again, if you were going to graph this by hand, you know, if you're going to graph it on the computer or the calculator, then you have no problem. You just type it in exactly as you see it. Only if you're going to do it on the computer, you'd have to type it in as arcsine. Okay, you'd have to type it out "A,R,C,S,I,N." Now, what kind of things are happening on this?

THERESA: Oooh...

STUDENT B: Horizontal shift.

THERON: Vertical shift?

STUDENT B: Horizontal shift of negative eight?
TEACHER: Alright now, you've got to be kind of careful of what order we do these things in. (STUDENTS MUMBLE ABOUT WHAT TO DO FIRST.) We always have to do--

THERON (LOUDLY): Let's graph the original graph first.

TEACHER: Okay, well, alright, and we know what the original graph looks like. (THERON: Yeah.) That's that. (POINTS TO THE GRAPH OF $y = \arcsin x$ ON THE SCREEN.) Okay? And since this has a positive coefficient on it, it's still going to look like that. It's not going to come back the other way. So, basically, we know the shape of this thing already. Now what we need to make sure we do is the horizontal (THERESA: four) stretch or shrink first before we do the shift.

THERESA: It's a stretch of four.

TEACHER: Okay. We have a stretch of four. So, what does that do to the domain?

THERESA: Um... negative four to four.
TEACHER: Okay. Now, horizontal stretch by four makes the domain negative four to four. Okay, now we've got something else happening in here. (POINTING TO "x + 8" IN THE EQUATION.)

THERESA AND OTHERS: Oh, um, horizontal shift of eight.

TEACHER: Okay, horizontal shift of eight, and in which direction?

THERESA: Left.

TEACHER: So, what will that do to our domain?

STUDENT: Negative twelve. (THERESA: Negative eight. Negative twelve.)

TEACHER: Alright, negative twelve to...

THERESA AND OTHERS: Four, three. Negative four.

TEACHER: Yeah. Negative four. Okay, good. Alright, now we can go ahead and work with this thing. (POINTS TO
THE COEFFICIENT "3." The three out front is going to be...

THERESA AND OTHERS: A vertical--

TEACHER: A vertical shift, or stretch rather ... by three. So, what does that do to the range?

THERESA: Three pi over two, to--

TEACHER: Okay, three pi over two to three pi over two. And then finally, we've got that negative five.

THERESA: A horizontal shift of five.

TEACHER: A vertical shift of negative five. So, here's a good question now. What's our new range?

JAY: Negative three pi over two minus five--

TEACHER: Right...and...three pi over two minus five. Okay? (STUDENT: Uh hmm.)

Now, what you might want to do, even if you are graphing this thing on the computer or the calculator, you might want to go ahead figure out this first so
then you won't have to fish around all day (STUDENT: Uh hmm) to get a right viewing rectangle with the grapher. If the domain is negative twelve to negative four, then you might want to make it just a little bit bigger than that. (WALKS OVER TO ENTER IT INTO COMPUTER.) And maybe go like from negative fourteen to negative two or something like that.

THERON (LOOKING ON HIS CALCULATOR): My graph ain't coming down. It looks like a hyperbola.

TEACHER: Okay, you mean you don't have the whole thing?

THERON: I don't know, I mean, I got my, I got my maximum x at point thirty five.

TEACHER: Okay, I'll take a look at it in a second. (Near the end of Segment 3.)
<table>
<thead>
<tr>
<th>OBSERVER SEGMENT</th>
<th>A</th>
<th>B</th>
<th>A</th>
<th>B</th>
<th>A</th>
<th>B</th>
</tr>
</thead>
<tbody>
<tr>
<td>TEACHNG ACTIV</td>
<td>1</td>
<td>15</td>
<td>14</td>
<td>15</td>
<td>14</td>
<td>15</td>
</tr>
<tr>
<td>DEMAND on STs</td>
<td>1</td>
<td>123</td>
<td>13</td>
<td>123</td>
<td>12</td>
<td>123</td>
</tr>
<tr>
<td>#QUESTs by TCHR</td>
<td>7</td>
<td>9</td>
<td>11</td>
<td>15</td>
<td>8</td>
<td>9</td>
</tr>
<tr>
<td>#QUESTs by STs</td>
<td>1</td>
<td>1</td>
<td>2</td>
<td>2</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>HMWK REVIEW</td>
<td>1</td>
<td></td>
<td>1</td>
<td></td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>LESSON DEVELOP</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>GUIDED PRACTICE</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>GO OVER TEST</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ReVIEW PREV MAT</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>TECHNOLOGY</td>
<td>234</td>
<td>34</td>
<td>234</td>
<td>34</td>
<td>1234</td>
<td>134</td>
</tr>
<tr>
<td>MANAGER</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>TASK SETTER</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>EXPLAINER</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>COUNSELOR</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>FELLOW INVEST</td>
<td></td>
<td></td>
<td>4</td>
<td>4</td>
<td>34</td>
<td>35</td>
</tr>
<tr>
<td>RESOURCE</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>STs PASSIVE</td>
<td>12</td>
<td>12</td>
<td>12</td>
<td>12</td>
<td>12</td>
<td>12</td>
</tr>
<tr>
<td>STs WRITING</td>
<td>1</td>
<td></td>
<td>1</td>
<td></td>
<td>15</td>
<td>5</td>
</tr>
<tr>
<td>STs TALKING</td>
<td>2</td>
<td>127</td>
<td>12</td>
<td>127</td>
<td>27</td>
<td>127</td>
</tr>
<tr>
<td>STs DIDACTIC</td>
<td>12</td>
<td>1</td>
<td>12</td>
<td>12</td>
<td>12</td>
<td>123</td>
</tr>
<tr>
<td>STs SYMBOLZNG</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>25</td>
<td>2</td>
</tr>
<tr>
<td>STs INVESTIG</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>STs PR SOLVING</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>STs HIGH LEVEL</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>3</td>
<td></td>
</tr>
</tbody>
</table>

The entries for all but "Quests by Tchr" and "Quests by Sts" represent labels for the behaviors observed during that lesson segment. For example, "15" does not mean "fifteen" but rather means that Teaching Activities 1 and 5 were observed. Figure 5 lists the descriptors and their numeric code.

Figure 8. Observers' records for the transcribed Classroom D lesson segments.
Figure 8 can be interpreted using the codes listed in Figure 5. The transcription represents the second half of Segment 1, all of Segment 2, and most of Segment 3. Both observers coded the Teaching Activity during all three segments as Exposition (1). Observer A included Investigation (4) and Observer B included Applied Mathematics (5) with Exposition. Both agreed that Segments 2 and 3 were Lesson Development. Observer A saw Segment 1 as a Review of Previously Learned Material and Segment 3 as including some Guided Practice. Observer A noticed the microcomputer (Technology-2) in use during all three segments, with the teacher also using the board (Technology-3) and an overhead projector (Technology-4). Both noted that the calculators (Technology-1) were in use during the third segment. When this teacher used the computer in demonstration mode, the computer was placed on his desk at the front corner of the room and connected to the overhead projector, which was placed out in front of the students about twelve feet from the computer. The computer was not in view of the camera. The teacher would walk to his desk to enter commands and then walk back out in front of the class to discuss the display.

Both observers agreed that the teacher exhibited the roles of Manager, Task Setter, and Explainer during all three transcribed segments. The students were not noted to be exhibiting any of the roles of Manager, Task Setter, Explainer, Consultant, Fellow Investigator, or Resource. They were Passive (Watching-1 and Listening-2). They did answer (Talking-2) and assert (Talking-7). Some asked questions (Talking-1). For the first two segments (ten minutes of class time), their pecturing behaviors were didactic (Absorbing-1 and Recalling-2). During the third segment they began using and translating symbols on their calculator (Symbolizing-2 and 5). They also began to investigate particular problems thoroughly (Investigating-3).

Table 5 displays the summary statistics for the 45 five-minute segments observed in Classroom D. Teacher D lectured to the class during 43% of the observed segments. This figure was a little higher when technology was not in use (57%) and a little lower when technology was in use (28%). It fluctuated greatly from day to day, ranging from 9% of one class period to 100% of another. A considerable amount of time was devoted to
exercise, consolidation, or practice (53%). This figure stayed about the same regardless of whether technology was in use. Students worked in groups during about one-third of all observed segments (34%), but they worked in groups during 61% of the segments with technology in use. Technology was in use in Classroom D during one-half of the observed segments (51%). The classroom was equipped with microcomputers on tables around the perimeter of the room.

Students were seen to be in the didactic mode (absorbing, recalling, rule following) during most of the segments (93% overall). They showed more symbolizing and investigating when technology was in use (92% and 90%, respectively) than when it was not (33% and 37%, respectively). Teacher D asked fewer questions when technology was in use than when it was not (4 per five minutes versus 9 per five minutes). During 56% of the segments when technology was in use, the demand on students was recall of a single fact or step. The corresponding figure for the segments when technology was not in use was 96%.

Observers noted the repeated occurrence of only one of the classroom roles (Fraser et al., 1987) for students. They recorded the students as task setter(s) for 27% of the segments; 11% when technology was not in use and 41% when it was. When technology was not in use, students were not recorded as exhibiting any of the other classroom roles. Students were talking during most of the observed segments (92%). All observers noted the nearly continuous verbal interactions of students with the teacher. The teacher asked a large number of questions (6 per five minutes). Students would often call out answers to questions that the teacher didn't ask. For example, the teacher would be working at the board and the students would call out what they wanted him to write, with no verbal or non-verbal cue from the teacher.
<table>
<thead>
<tr>
<th></th>
<th>SUMMARY STATISTICS:</th>
<th>SIX LESSONS WITH NO TECHNOLOGY</th>
<th>SIX LESSONS WITH TECHNOLOGY</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mean</td>
<td>St Dev</td>
<td>Mean</td>
</tr>
<tr>
<td>Teacher Questions</td>
<td>6.0</td>
<td>3.8</td>
<td>8.8</td>
</tr>
<tr>
<td>(average per 5 min)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Student Questions</td>
<td>1.8</td>
<td>1.1</td>
<td>1.6</td>
</tr>
<tr>
<td>(average per 5 min)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Percent of 5 min Segments that Contain:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Homework Review</td>
<td>24.4</td>
<td>33.3</td>
<td>38.6</td>
</tr>
<tr>
<td>Lesson Development</td>
<td>36.7</td>
<td>33.3</td>
<td>56.8</td>
</tr>
<tr>
<td>Guided Practice</td>
<td>45.6</td>
<td>27.7</td>
<td>15.0</td>
</tr>
<tr>
<td>Reviewing a Test</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Reviewing Material</td>
<td>16.7</td>
<td>23.4</td>
<td>29.3</td>
</tr>
<tr>
<td>Using Calculators Only</td>
<td>13.3</td>
<td>23.8</td>
<td>0.0</td>
</tr>
<tr>
<td>Using Computers Only</td>
<td>23.3</td>
<td>34.7</td>
<td>0.0</td>
</tr>
<tr>
<td>Using Both Calculators and Computers</td>
<td>14.4</td>
<td>20.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Student as Manager</td>
<td>3.3</td>
<td>15.3</td>
<td>0.0</td>
</tr>
<tr>
<td>Student as Task Setter</td>
<td>26.7</td>
<td>33.2</td>
<td>10.8</td>
</tr>
<tr>
<td>Student as Explaner</td>
<td>4.4</td>
<td>7.4</td>
<td>0.0</td>
</tr>
<tr>
<td>Student as Consultant</td>
<td>7.8</td>
<td>8.1</td>
<td>0.0</td>
</tr>
<tr>
<td>Student as Fellow Investigator</td>
<td>2.2</td>
<td>3.7</td>
<td>0.0</td>
</tr>
<tr>
<td>Student as Resource</td>
<td>1.1</td>
<td>1.9</td>
<td>0.0</td>
</tr>
<tr>
<td>Students Passive</td>
<td>91.1</td>
<td>17.6</td>
<td>100.0</td>
</tr>
<tr>
<td>Students Active: Writing</td>
<td>61.1</td>
<td>29.5</td>
<td>28.7</td>
</tr>
<tr>
<td>Students Active: Talking</td>
<td>92.2</td>
<td>10.9</td>
<td>98.3</td>
</tr>
<tr>
<td>Students Didactic</td>
<td>93.3</td>
<td>12.5</td>
<td>100.0</td>
</tr>
<tr>
<td>Students Symbolizing</td>
<td>64.4</td>
<td>24.9</td>
<td>32.5</td>
</tr>
<tr>
<td>Students Investigating</td>
<td>67.8</td>
<td>20.8</td>
<td>37.1</td>
</tr>
<tr>
<td>Students Problem Solving</td>
<td>15.6</td>
<td>16.8</td>
<td>2.3</td>
</tr>
<tr>
<td>Students in Higher Level Thinking</td>
<td>15.6</td>
<td>8.8</td>
<td>15.5</td>
</tr>
<tr>
<td>TABLE 5 (cont'd). CLASSROOM D</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>-----------------------------</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SUMMARY STATISTICS:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ENTIRE LESSON</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mean St Dev</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SIX LESSONS WITH NO TECHNOLOGY</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mean St Dev</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>WITH TECHNOLOGY</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mean St Dev</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Percent of 5 min Segments that contain:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Teacher as Manager</td>
<td>98.9  5.1</td>
<td>100.0  0.0</td>
<td>98.2  6.8</td>
</tr>
<tr>
<td>Teacher as Task Setter</td>
<td>66.7  30.0</td>
<td>80.6  20.8</td>
<td>56.3  39.9</td>
</tr>
<tr>
<td>Teacher as Explainer</td>
<td>87.8  18.8</td>
<td>100.0  0.0</td>
<td>77.0  37.7</td>
</tr>
<tr>
<td>Teacher as Consultant</td>
<td>52.2  32.6</td>
<td>25.5  23.7</td>
<td>75.5  32.5</td>
</tr>
<tr>
<td>Teacher as Fellow Investigator</td>
<td>1.1  2.6</td>
<td>0.0    0.0</td>
<td>2.2   5.1</td>
</tr>
<tr>
<td>Teacher as Resource</td>
<td>8.9   12.7</td>
<td>2.3    3.2</td>
<td>15.2  13.0</td>
</tr>
<tr>
<td>Exposition</td>
<td>43.3  41.8</td>
<td>56.8  43.6</td>
<td>27.5  38.1</td>
</tr>
<tr>
<td>Exercise, Consolidation, Practice</td>
<td>53.3  32.0</td>
<td>45.5  43.3</td>
<td>53.3  37.6</td>
</tr>
<tr>
<td>Discussion</td>
<td>0.0   0.0</td>
<td>0.0    0.0</td>
<td>0.0   0.0</td>
</tr>
<tr>
<td>Investigation</td>
<td>4.4   15.0</td>
<td>0.0    0.0</td>
<td>7.1   15.0</td>
</tr>
<tr>
<td>Applied Mathematics</td>
<td>8.9   20.6</td>
<td>6.8    44.0</td>
<td>7.6   20.9</td>
</tr>
<tr>
<td>Problem Solving</td>
<td>4.4   9.1</td>
<td>2.3    3.2</td>
<td>4.3   20.4</td>
</tr>
<tr>
<td>Working in Groups</td>
<td>34.4  39.7</td>
<td>6.3    13.7</td>
<td>60.9  46.1</td>
</tr>
<tr>
<td>Recall of a single fact or step</td>
<td>75.6  25.7</td>
<td>95.5  11.2</td>
<td>56.3  30.6</td>
</tr>
<tr>
<td>String together several facts or steps</td>
<td>61.1  17.4</td>
<td>87.0  9.5</td>
<td>42.8  30.4</td>
</tr>
<tr>
<td>Extend knowledge or skill</td>
<td>17.8  23.8</td>
<td>29.7   43.7</td>
<td>11.4  22.4</td>
</tr>
<tr>
<td>Number of 5 minute segments</td>
<td>45</td>
<td>22</td>
<td>23</td>
</tr>
</tbody>
</table>
The content of the lessons that were observed in Classroom D seemed to consist of basic, manipulative mathematics and very little of the applications and problem situations that are contained in the textbook. This may be due to the circumstances with which teacher and students had to cope at the end of the year (frequent absences, special schedules, building repair). Or it may be due to the mathematics preparation of the students. The students seemed very interested in the lessons and the teacher was willing to individualize the lessons in order to meet the students' needs. On more than one occasion during the observed lessons some students worked on make-up exams and others finished work at the computers while still others listened to the teacher deliver the lesson.

Classroom E

Some of the videotaping in Classroom E took place in mid-April and some took place in mid-May, after it was discovered that the last two tapes made in April were defective. The topic of Lessons 1 through 4 was conics. The topic of Lesson 5 was graphing and solving equations and inequalities involving logarithms. The topic of Lesson 6 was polar graphing.

Teacher E used a variety of teaching methods to involve students in the lessons. During Lesson 1, the teacher used a wood model of a cone to introduce conic sections. For several minutes toward the end of the period, five individual students read aloud from the text, with the teacher interrupting every minute or so to discuss and amplify what had been read. During Lessons 2 and 3, parabolas are introduced. Lesson 3 concluded with the solution of a problem involving maximizing the volume of a cone inscribed in a paraboloid and discussion of the possible applications. The teacher began Lesson 4 with a demonstration of the locus definition of ellipse. He used two thumb tacks to represent the foci; tied a piece of string between the tacks and pulled the string taut with his pen while drawing the ellipse around the tacks. The standard form for the equation of an ellipse was derived and analyzed. During Lesson 6, students learned how to translate coordinates from polar to rectangular form and vice versa by hand and using the calculator. During the lesson, several students went to the board
individually to plot a point with coordinates given in polar form. Throughout many of his lessons, Teacher E would stop his lecture to allow for a minute or two of individual seat work before returning to the teacher-led explanations.

The following is a transcription of two portions of a lesson in Classroom E. The comments in the right-hand column are provided to explain the observers' records, which appear in Figure 9.
Transcription of Classroom E Lesson Segments

TEACHER: What's the relationship between rho and x and y?
(WAITS FIVE SECONDS.)
STUDENT: Oh, um ... Pythagorean--

TEACHER (NODDING): Pythagorean Theorem, and therefore, we can say rho is equal to ...

STUDENT A: $x$ squared minus $y$ squared.
STUDENT B: Plus.

TEACHER: (WRITES $\rho = x^2 + y^2$ ON THE BOARD.) Does that look right?

STUDENTS Yes.

TEACHER: No. That's wrong. What's wrong with it?

(STUDENTS SPEAK SIMULTANEOUSLY.)
STUDENT'S A AND B: Square root. Need square root.
STUDENT C: Rho squared.

TEACHER (INSERTS SQUARE ROOT SIGN OVER $x^2 + y^2$): Okay? Now, what about theta? Theta is this angle right here ... (REFERS TO ANGLE BETWEEN VECTOR ($x$, $y$) AND POLAR AXIS) ...
counterclockwise from the polar axis. And what relationship do we have for theta then?

STUDENT: Hmm, sine? Cosine? Tangent?

TEACHER: Well, we wanna have it in terms of x and y only, or we wanna put x and y in terms of it. In other words, what I've done here is I've put rho in terms of x and y. Put theta in terms of x and y.

STUDENT (AFTER EIGHT SECONDS): y over x?

TEACHER: You're close. What'd you say, Jim?

JIM: Inverse sine of y over x.

TEACHER: Close. You're on the right track. You've just got the wrong function.

STUDENT D: Sine.

STUDENT E: Tangent. (THEN AFTER THREE SECONDS) Inverse tangent.

TEACHER (WRITING IT ON THE BOARD): Inverse tan of y over x. Inverse tangent
Transcription of Classroom E Lesson Segments (continued)

of $y$ over $x$.

Why? Well, let's take a step backwards. If you go back a step you have tangent of theta is equal to the opposite over the adjacent, $y$ over $x$. Therefore, theta would be the inverse tangent of $y$ over $x$.

Okay? Now, let's go the other route with it. 'Cuz, now we've got, we know what rho, how to find rho and theta if we know $x$ and $y$. In fact, let's go ahead and do an example of this. Let's take a Cartesian coordinate and change it to a polar coordinate. Let's take the point three, four. (WRITES (3,4) ON THE BOARD.) And this is an $x,y$-coordinate. And I want to change it so I have it in terms of rho and theta. And let's, let's deal with radians right now, okay? So, what's my rho value?

STUDENT (AFTER FIVE SECONDS): Um...

TEACHER: Square root of ...

STUDENT: Three squared plus four squared.

TEACHER: So, we get square root of nine plus sixteen. (STUDENT: Twenty-five.) Okay? Very good. Let's do theta.

(End of Segment 1.)

(Beginning of Segment 2.)

The students follow along, Answering (Talking-1), Watching and Listening (Passive-1, 2), Absorbing, Recalling, and Rule Following (Didactic-1, 2. 3).

The students answer and participate quite a bit. The teacher uses long wait times, expecting students to come up with answers.
It'd be the inverse tangent of ...
(STUDENT: Four thirds?) ... four thirds.
Okay, use your calculator to go ahead and
come up with that. Remember, make sure
you're in radians so that we get a radian
measure. (STUDENT: Oh, yeah.) Yeah,
I'd rather have a radian measure to go
with that four. I think it's Mode-Five for
radians.

STUDENTS (THREE IN UNISON): Point
nine two seven.

TEACHER: Point what?

STUDENTS: Point nine two seven.

TEACHER: Okay, now, I tell you what.
Since we know this is radians, let's just
do degrees for the heck of it. So, give me
a second answer in degrees. Do the same
thing.

STUDENT (AFTER SEVEN SECONDS):
Fifty-three point one.

TEACHER: Fifty-three point one ...
degrees. Well, does that make sense?
Let's see. Let's take a Cartesian
coordinate system. Find three comma
four. (DRAWING ON BOARD - EIGHT
SECONDS.) Okay, obviously they’re fi--, we know that this is a three-four-five triangle, so that makes, you know, there’s no problem with it. The fact that rho is five. But does this angle resemble a fifty-three degree angle ... with any accuracy?

(STUDENTS MUMBLING: Yeah.)

TEACHER: Yeah, I, I think that we’ve got a pretty good situation. Now, let me show you this, this little Casio computer does all of this for you. If you want to change from $x,y$-coordinates to rho, theta, it will do it for you. And let me show you how it does it. So get your calculator handy here.

Everybody, look on your calculator until you find your (um) plus sign, and see where it says "P,O,L" at the top of it? Does yours, does the 7500 have "P,O,L" there?

(STUDENTS: Yes.) Okay. Push, so push Shift-Plus and on your calculator will out come the "P,O,L" and a parenthesi-

(STUDENT: Should we be in radians?) Uh ... no, just stay in degrees for right now, and I’m going to show you what I mean here. Okay, now, what I want you to do is put three comma four in there, okay? And then put a close
'parentheses' and push Execute.

STUDENTS (ONE AFTER ANOTHER):
Wow! Wow. Wow. Wow!

TEACHER: Okay, so you all have what came up. Now, the point of it is, is (um) it will automatically give you the value of rho, but what it won't give you is theta ... until you do something else. Actually, the values of rho and theta, these two values are stored in the "I" and "J" variables. So, push, (um) Alpha-I-Execute and Alpha-J-Execute.

(CIRCULATES AND WATCHES. WAITS EIGHT SECONDS. STUDENTS SAYING "Ooh.") Yeah, right there they are for you.

So, in other words, what I'm telling ya' is with one, (um) with one step you can come up with the values of "I" and "J" and stuff like that. Now, this is going to be very important, because I am going to show you something really cool later on here. But for right now, it's important to note that you can get those two instantly, okay?

Let's go back over here for a second and look at this equation. I want to be able to go from a rho, theta to an x, y, and can you tell me an equation that
Transcription of Classroom E Lesson Segments (continued)

would involve \( x \) and rho and theta?
(WAITS TWO SECONDS.) Do you see any relationship in this drawing here that would allow me to find \( x \) in terms of rho and theta? (WAITS FOUR SECONDS.)
Give me a trig function that involves rho, theta, and \( x \).

STUDENT D (SIX SECONDS LATER):
Cosine.

TEACHER: Cosine of ... (STUDENT D: Theta) equals ... (STUDENT D: Uh, \( x \) over rho.) Okay, and therefore, \( x \) would equal ... (STUDENT D: rho cosine theta.) Okay.

Alright, now what, can you give me one in terms of \( y \)? (WAITS SIX SECONDS.) Can you say that again? (End of Segment 2.)

STUDENT E (TWO STUDENTS HAVE BEEN CONFERRING): Oh, yeah. Yeah. (PAUSE)
STUDENT F (ASKING STUDENT E): Sine theta?
STUDENT E: Yeah.
STUDENT F: Sine theta.

TEACHER: Sine theta is ...

STUDENT F: is equal to \( y \) over rho. These two students confer with each other before sharing their thoughts with the class. The teacher waits.
Transcription of Classroom E Lesson Segments (continued)

TEACHER: Therefore, y is ...

STUDENT E (WHISPERS TO STUDENT F):
Sine theta --

STUDENT F: Rho ...

STUDENT E: Sine theta times rho.

TEACHER: Rho sine theta would be the best way to write it.

Okay, let's take a situation and find our ... (WRITES $5, 30^\circ$ ON BOARD) ... go ahead and take your calculator and put in five cosine thirty and five sine thirty ... five cosine thirty and five sine thirty and we should have therefore our $x, y$ values. And I think you're going to get something like four point three three comma two point five for your two answers, right?

STUDENT: Yeah.

TEACHER: Okay, let's let the computer do the work for us now. Look down and on your minus sign you see "R,E,C" ... and "R,E,C" stands for rectangular conversion and see the little $r$, theta?
TEACHER: Okay, now there was a good point that was just brought up here. And that is, I can find the same point by putting in a different rho and theta ... because of this property of rho. rho is actually a directed distance. (PAUSE) If I put a negative number in ... if I put a negative number for rho, that means 'go the opposite direction of the direction angle.' In other words, if here's my polar axis, here's the direction of thirty degrees, right?

(STUDENTS: Right.) If I say negative five, what I mean is count out five units in the opposite direction of that direction angle. Go out this direction (DRAWING ON THE BOARD). So, this is the point negative five, thirty. Do you see how I got that? This is the point up here five, thirty ... in degrees. So if the number rho is negative, you go opposite the direction of the direction angle. Yes- (POINTS TO STUDENT.)

STUDENT: Won't that change theta to two ten?

TEACHER: Well, watch this, put this in your calculator using "R,E,C" and see if you don't come up with these values.

The third transcribed segment begins nine minutes after Segment 2. During those nine minutes, the teacher explains how to use calculator features to change rectangular coordinates to polar coordinates. During the course of the explanation, three different students ask questions: "How do you know which feature to use, 'Pol' or 'Rec'?" "Do we want to have it in degrees when we use these features?" "Does the calculator have an automatic degrees to radians conversion key?" After two of the three questions, the teacher says, "Good question."

A student notices that there is more than one way to name a point.
STUDENT G: You do.

STUDENT H AND OTHERS: You do.

TEACHER: You, too. You already tried it, huh? You're checking me out just to make sure I wasn't lying to you. (STUDENTS LAUGH.)

Well, how, what's, okay. That brings up a real good point, and that is this. You see in the Cartesian coordinate system you have a one-to-one relationship. If I give you three, if I say to you three comma four, how many different points can you plot when I say three, four? How many different ways can you say that same point? In other words, is there another way of saying three, four, the coordinates for three, four? (WAITS SIX SECONDS.)

Three, four is three, four, right? Unless you'd say six halves and eight, you know, twelve thirds or something, but other than that, you've got three, four as your coordinates. But, look at this, in a polar graph, this one point out here is five comma thirty. You can give me an infinite number of different rho, thetas that would name that same point. Give me a second one that would name five, thirty.
STUDENT: Five, three ninety.

TEACHER: Five, three ninety. In other words, go all the way around the circle and back up an extra thirty. Eddie?

EDDIE: Can you use negative five, uh, two ten?

TEACHER: Yes! Negative five, two ten does it. Give me one with a negative degrees. What is it going to mean when you have negative degrees? (STUDENTS MUMBLE.) Go ... (MOTIONS WITH HANDS. STUDENT: Yeah.) ... clockwise. So, negative three thirty would give you the same point thirty would, wouldn't it? Give me another one. (PAUSES.) How about five, negative five, with a negative one. This is a little tougher one.

STUDENT (AFTER FIVE SECONDS): One fifty?

TEACHER: Yes, yes. Negative one fifty. Now, is there any end to this? Is there, is there any end to the number of these? (STUDENT: No.) No, because every "k" three sixty, every three
hundred sixty degrees, you're right back to the same point again. Now, I tell you what, just for simplicity sake, since we know the answer to five, thirty, try, just try this one. Try putting in negative five, negative one fifty in, on your calculator and see if it still comes up with the same point. That ought to give you some kind of clue to the correctness of it.

STUDENT (AFTER TEN SECONDS): It becomes a positive.
STUDENTS (SIMULTANEOUSLY): It's positive.

TEACHER: Oh, that's good. Because it better be. Because five, thirty, is a positive, I mean, we have a coordinate out here that we know is four point three three, two point five, right? ... in the x,y-Cartesian coordinate system.

Now, how're you going to make polar graph paper? I want you to make your own polar graph paper. How would you do it? (WAITS FOUR SECONDS.) Because I want you to make, when we draw pictures, I want you to make accurate pictures for me. What would polar graph paper look like? (PAUSES. STUDENTS ANSWERING AND GUESSING

Students enter the values into their calculators.

The teacher is requiring students to build an image of polar graph paper (STs High Level-1).
Transcription of Classroom E Lesson Segments (continued)

QUIETLY.) Not Cartesian coordinate graph paper, but polar graph paper.
(STUDENT: Circles.) Actually the best thing that you could do, is if you could do this, is to go ahead and have a compass ... and a ruler. A ruler to get your units. And a compass to go around the pole and to draw units, to draw circles, of equal lengths. Of course I'll just do a representation here. (DRAWS ON BOARD.) If I said that this is the distance of one, two, three, four, and so forth. Then, drawing a circle around at the one, and then a two, and a three, and so forth. That would be a good example of polar graph paper. Then you could use a protractor, see, if you wanted to plot points, you could use a protractor to (um) get you your angle, and then use the circles to get you out the right distance.

For instance, if I wanted to find the point (um, uh) let's say, two point five comma thirty degrees, I'd go thirty degrees on my angle, draw an arrow out there, and then I'd go out two point five units in that direction. See what I mean? Go out two point five.

Okay, so Terrence, here's the chalk. Go to the board. I want you to locate the point, locate the point one...
point eight comma negative ninety degrees.

(TERRENCE TAKES THE CHALK AND GOES TO THE BOARD.)

TEACHER: One point eight, negative ninety degrees.

STUDENT: Why did you have to draw all those circles on there?

TEACHER: The circles are your units out from the center, aren't they? (STUDENT: Oh, yeah, alright.) Every point on there is exactly one unit, two units, three units... (STUDENT: Oh, I see.)

TEACHER (TO TERRENCE AT THE BOARD): One point eight, negative ninety degrees.

TERRENCE (AFTER NINE SECONDS, POINTING UP AND DOWN ALONG THE LINE $\theta = 90^\circ$): You have units this way, right?
TEACHER: You see the circles are always, they're always one unit from the pole. So if I say go out one point eight, negative ninety degrees, where would that be? (TERRENCE CONFIDENTLY DRAWS A RAY BEGINNING AT THE POLE AND ENDING AT THE POINT (-1.8, -90°).) Is the man awesome, or what?

(Near the end of Segment 3.)

Several more students in turn were called to the board to plot points on the polar coordinate graph. The teaching activity then becomes Exercise, Consolidation, and Practice (2).
<table>
<thead>
<tr>
<th>OBSERVER SEGMENT</th>
<th>A</th>
<th>B</th>
<th>A</th>
<th>B</th>
<th>A</th>
<th>B</th>
</tr>
</thead>
<tbody>
<tr>
<td>Teaching Activ</td>
<td>14a</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>Demand on STs</td>
<td>123</td>
<td>1</td>
<td>12</td>
<td>12</td>
<td>12</td>
<td>12</td>
</tr>
<tr>
<td>#Quests by Tchr</td>
<td>5</td>
<td>9</td>
<td>7</td>
<td>9</td>
<td>5</td>
<td>8</td>
</tr>
<tr>
<td>#Quests by STs</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>HWMK REVIEW</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lesson Develop</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Guided Practice</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Go Over Test</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Review Prev Mat</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Technology</td>
<td>13</td>
<td>13</td>
<td>13</td>
<td>13</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>Manager</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Task Setter</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Explainer</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>12</td>
<td></td>
</tr>
<tr>
<td>Counselor</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fellow Invest</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>Resource</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>STs Passive</td>
<td>123</td>
<td>12</td>
<td>12</td>
<td>12</td>
<td>12</td>
<td>12</td>
</tr>
<tr>
<td>STs Writing</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>STs Talking</td>
<td>2</td>
<td>12</td>
<td>12</td>
<td>124</td>
<td>2</td>
<td>125</td>
</tr>
<tr>
<td>STs Didactic</td>
<td>123</td>
<td>123</td>
<td>123</td>
<td></td>
<td>13</td>
<td>123</td>
</tr>
<tr>
<td>STs Symbolizing</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>1</td>
<td>14</td>
</tr>
<tr>
<td>STs Investig</td>
<td>3</td>
<td>3</td>
<td>123</td>
<td>123</td>
<td></td>
<td></td>
</tr>
<tr>
<td>STs Pr Solving</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>STs High Level</td>
<td>2</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The entries for all but "Quests by Tchr" and "Quests by STs" represent labels for the behaviors observed during that lesson segment. For example, "14" does not mean "fourteen" but rather means that Teaching Activities 1 and 4 were observed. Figure 5 lists the descriptors and their numeric code.

Figure 9. Observers' records for the transcribed Classroom E lesson segments.
Both observers noted the Teaching Activity in Segments 1 and 2 of the transcription as Exposition (1). Observer A also noted some Investigation (4) and Individual Seatwork (W1, which was coded as 7 numerically). The content of the transcribed segments was Lesson Development and Guided Practice. Teacher E was very adept at mixing lesson development and practice during all of the observed lessons. Although he usually acted as manager and task setter, his skilled use of questioning produced a large amount of student participation. During the portions of the lesson transcribed, the students were answering his questions and asking their own during nearly every segment. As in most lessons, Teacher E combined exposition with investigation.

The summary statistics over all six lessons observed in Classroom E appear in Table 6. Teacher E was observed using exposition during 70% of the 42 five-minute segments recorded in his class. The teaching activity was recorded as exercise, consolidation, or practice during 38% of the segments. Examining class time in terms of content, lesson development was accorded 70% of class time and guided practice was given 27%. These percentages remain about the same regardless of whether technology was in use. With technology in use, the percentage of time spent in guided practice and exercise, consolidation, or practice increased slightly (from 22% to 41% and 34% to 48%, respectively). The time spent in lesson development and exposition decreased slightly (from 75% to 62% and 73% to 66%, respectively). Investigation was used as a teaching activity during about 16% of class time and this figure remained the same with or without technology. Technology was in use in Classroom E in only 29% of the observed segments, and then only calculators were used.

Teacher E assumed the roles of manager (100%), explainer (93%), task setter (88%), and consultant (23%) during the observed segments. The proportion of time spent in each role was similar regardless of whether technology was in use, except that the role of consultant was used more often when technology was in use than when it was not (57% versus 10%, respectively). Students assumed the classroom roles rarely. They acted as task setters during 5% of the observed segments. This figure increased when
technology was in use. Students acted as task setters during 10% of the segments when technology was in use. They also acted as consultants during 10% of the segments when technology was in use.

Students worked in pairs or small groups during 20% of the segments in which technology was in use and never when it was not. They showed the passive pupiling behaviors (watching, reading, and listening) during almost every observed segment (99%), and also were observed talking (mostly answering) during almost every observed segment (92%). The students who were in the camera view (only three or four) were observed writing or symbolizing during about half of segments in which technology was not in use, but during nearly all of the segments in which technology was in use. This implies that students were observed taking notes about half of the time, but were involved in keying on their calculators whenever they were in use in the classroom.

The pupiling observed in Classroom E involved didactic activities (absorbing, recalling, rule following) during almost every segment (95%); and investigating (64%) and higher level thinking (image building, analyzing, and generalizing) (38%) during a substantial number of segments. When technology was in use the percentages remained nearly the same, with a slight decrease in didactic activities and a slight increase in investigating and higher level thinking.
<table>
<thead>
<tr>
<th>Activity</th>
<th>TOTAL Mean</th>
<th>TOTAL St Dev</th>
<th>NO TECHNOLOGY Mean</th>
<th>NO TECHNOLOGY St Dev</th>
<th>TECHNOLOGY Mean</th>
<th>TECHNOLOGY St Dev</th>
</tr>
</thead>
<tbody>
<tr>
<td>Teacher Questions (average per 5 min)</td>
<td>9.3</td>
<td>5.3</td>
<td>10.0</td>
<td>6.8</td>
<td>6.5</td>
<td>3.3</td>
</tr>
<tr>
<td>Student Questions (average per 5 min)</td>
<td>1.2</td>
<td>1.4</td>
<td>1.2</td>
<td>1.9</td>
<td>1.1</td>
<td>0.7</td>
</tr>
<tr>
<td>Homework Review</td>
<td>10.7</td>
<td>20.0</td>
<td>13.1</td>
<td>25.3</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Lesson Development</td>
<td>70.2</td>
<td>24.8</td>
<td>74.9</td>
<td>27.2</td>
<td>61.8</td>
<td>40.2</td>
</tr>
<tr>
<td>Guided Practice</td>
<td>27.4</td>
<td>21.2</td>
<td>21.9</td>
<td>23.8</td>
<td>41.0</td>
<td>38.4</td>
</tr>
<tr>
<td>Reviewing a Test</td>
<td>9.5</td>
<td>27.2</td>
<td>6.8</td>
<td>23.8</td>
<td>17.4</td>
<td>37.3</td>
</tr>
<tr>
<td>Reviewing Material</td>
<td>8.3</td>
<td>9.0</td>
<td>9.9</td>
<td>10.8</td>
<td>3.5</td>
<td>7.5</td>
</tr>
<tr>
<td>Using Calculators Only</td>
<td>28.6</td>
<td>20.4</td>
<td>0.0</td>
<td>0.0</td>
<td>100.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Using Computers Only</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Using Both Calculators and Computers</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Student as Manager</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Student as Task Setter</td>
<td>4.8</td>
<td>7.6</td>
<td>4.7</td>
<td>7.0</td>
<td>10.4</td>
<td>22.4</td>
</tr>
<tr>
<td>Student as Explainer</td>
<td>1.2</td>
<td>2.9</td>
<td>1.7</td>
<td>6.8</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Student as Consultant</td>
<td>1.2</td>
<td>2.6</td>
<td>0.0</td>
<td>0.0</td>
<td>10.4</td>
<td>22.4</td>
</tr>
<tr>
<td>Student as Fellow Investigator</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Student as Resource</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Students Passive</td>
<td>98.8</td>
<td>2.6</td>
<td>98.5</td>
<td>3.4</td>
<td>100.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Students Active: Writing</td>
<td>67.9</td>
<td>25.6</td>
<td>55.0</td>
<td>32.0</td>
<td>100.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Students Active: Talking</td>
<td>91.7</td>
<td>12.0</td>
<td>90.0</td>
<td>12.5</td>
<td>95.8</td>
<td>5.6</td>
</tr>
<tr>
<td>Students Didactic</td>
<td>95.2</td>
<td>8.6</td>
<td>96.8</td>
<td>7.0</td>
<td>91.7</td>
<td>11.2</td>
</tr>
<tr>
<td>Students Symbolizing</td>
<td>61.9</td>
<td>15.9</td>
<td>48.6</td>
<td>17.9</td>
<td>95.8</td>
<td>5.6</td>
</tr>
<tr>
<td>Students Investigating</td>
<td>64.3</td>
<td>12.3</td>
<td>57.9</td>
<td>22.1</td>
<td>79.9</td>
<td>21.7</td>
</tr>
<tr>
<td>Students Problem Solving</td>
<td>4.8</td>
<td>6.5</td>
<td>1.5</td>
<td>3.4</td>
<td>8.3</td>
<td>22.4</td>
</tr>
<tr>
<td>Students In Higher Level Thinking</td>
<td>38.1</td>
<td>21.1</td>
<td>39.6</td>
<td>22.7</td>
<td>45.8</td>
<td>35.8</td>
</tr>
<tr>
<td>Percent of 5 min Segments that Contain:</td>
<td>SUMMARY STATISTICS: TOTAL</td>
<td>SIX LESSONS NO TECHNOLOGY</td>
<td>TECHNOLOGY</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>--------------------------------------</td>
<td>---------------------------</td>
<td>---------------------------</td>
<td>-------------</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Mean</td>
<td>St Dev</td>
<td>Mean</td>
<td>St Dev</td>
<td>Mean</td>
<td>St Dev</td>
</tr>
<tr>
<td>Teacher as Manager</td>
<td>100.0</td>
<td>0.0</td>
<td>100.0</td>
<td>0.0</td>
<td>100.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Teacher as Task Setter</td>
<td>88.1</td>
<td>17.9</td>
<td>65.0</td>
<td>21.1</td>
<td>95.8</td>
<td>5.6</td>
</tr>
<tr>
<td>Teacher as Explainer</td>
<td>92.9</td>
<td>6.2</td>
<td>91.4</td>
<td>12.5</td>
<td>95.8</td>
<td>11.2</td>
</tr>
<tr>
<td>Teacher as Consultant</td>
<td>22.6</td>
<td>9.7</td>
<td>9.9</td>
<td>11.4</td>
<td>56.9</td>
<td>26.3</td>
</tr>
<tr>
<td>Teacher as Fellow Investigator</td>
<td>2.4</td>
<td>3.2</td>
<td>3.2</td>
<td>4.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Teacher as Resource</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Exposition</td>
<td>70.2</td>
<td>32.7</td>
<td>72.8</td>
<td>37.9</td>
<td>66.0</td>
<td>41.5</td>
</tr>
<tr>
<td>Exercise, Consolidation, Practice</td>
<td>38.1</td>
<td>31.1</td>
<td>33.9</td>
<td>33.9</td>
<td>47.6</td>
<td>34.4</td>
</tr>
<tr>
<td>Discussion</td>
<td>2.4</td>
<td>3.8</td>
<td>3.0</td>
<td>5.5</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Investigation</td>
<td>15.5</td>
<td>15.2</td>
<td>15.3</td>
<td>15.8</td>
<td>16.0</td>
<td>18.6</td>
</tr>
<tr>
<td>Applied Mathematics</td>
<td>7.1</td>
<td>7.9</td>
<td>9.9</td>
<td>10.2</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Problem Solving</td>
<td>2.4</td>
<td>5.1</td>
<td>1.5</td>
<td>3.4</td>
<td>5.2</td>
<td>11.2</td>
</tr>
<tr>
<td>Working in Groups</td>
<td>4.8</td>
<td>6.9</td>
<td>0.0</td>
<td>0.0</td>
<td>18.8</td>
<td>22.4</td>
</tr>
<tr>
<td>Recall of a single fact or step</td>
<td>83.3</td>
<td>21.8</td>
<td>83.3</td>
<td>23.3</td>
<td>84.0</td>
<td>20.5</td>
</tr>
<tr>
<td>String together several facts or steps</td>
<td>76.2</td>
<td>15.1</td>
<td>76.5</td>
<td>15.2</td>
<td>75.7</td>
<td>30.8</td>
</tr>
<tr>
<td>Extend knowledge or skill</td>
<td>38.1</td>
<td>7.7</td>
<td>35.7</td>
<td>4.6</td>
<td>44.1</td>
<td>26.1</td>
</tr>
</tbody>
</table>

| Number of Segments | 42 | 30 | 12 |
Classroom F

Parametric equations and conic sections were the topics of discussion during the lessons observed in Classroom F. During Lesson 1, the computer graphing utility was used for whole class demonstration of The Ferris Wheel Problem. The problem involves writing and graphing parametric equations in order to determine the flight of a ball thrown by a person standing on the ground and how close it will come to a person riding in a ferris wheel. During Lessons 2 and 3, the teacher led a review to prepare students for a chapter test covering parametric equations, vectors, and complex numbers. Most of the class time during these lessons was spent solving and discussing word problems. The teacher placed students in a test-taking situation by posing a problem or exercise to be solved and allowing four or five minutes of work time before discussing solution strategies. During Lesson 4, conic sections were introduced and concepts related to the parabola were discussed. Lesson 5 involved applications with parabolas. During Lesson 6 the standard equation of an ellipse was developed.

A transcription of a portion of a lesson in Classroom F follows. An explanation using the observers' categories appears in the right-hand column. Figure 10 displays the observers' records for the transcription.
Transcription of Classroom F Lesson Segments

TEACHER: (WRITES \( y = 8 - x^2 \) ON BOARD.) Which way does it open? ... Opens down. What is, uh, what's the maximum value it reaches? (STUDENT: Eight.) Eight, okay, so I should be able to sketch that right now. (SKETCHES THE GRAPH.) Now, let's suppose we have this parabola like this. And I'll stop it at the \( x \)-axis. I'll cut it off at the \( x \)-axis. Now, what I'm gonna do next, I'm gonna spin this parabola around. (MAKES HAND MOTIONS TO SHOW REVOLUTION AROUND A VERTICAL AXIS.) I'm gonna rotate it through 360 degrees and make a shell out of it, a paraboloid. So it's gonna end up looking (DRAWS) like this.

Follow what I'm saying? (WAITS TWO SECONDS.)

Alright, what I'm going to do next ... we'll do something different. I'm not gonna do the same problem as in the book. Let's do something a little different. I'm gonna put a cone, an inverted cone, inside the paraboloid ... Something like this. (DRAWS AN INVERTED CONE INScribed IN THE PARABOLOID.)

Now, are you following the picture? Maybe it would help ... if I did this. (DRAWS OVER SOME PARTS OF THE SKETCH USING COLORED CHALK AND)

(Middle of Segment 1.)

The teacher is directing (Manager-1) a review in preparation for an upcoming examination. The Teaching Activity is Exercise, Consolidation, and Practice (2).

The teacher is Task Setter (1). He chooses the problem and leads the solution process.
Okay, there's the cone that's inscribed in the paraboloid. Let's see uh (draws more with colored chalk.)

Okay, you understand the situation. Now, what's the question. There is a way to put a cone in there that we can get maximum volume from the cone. Now, think about it. I could make a short, fat cone like this, way out to the edge. Or I could make a tall, skinny cone, like that. But there is a cone that we can inscribe in the paraboloid that will have maximum volume. That's the question. And that's what we want to do. Alright, the first thing that I have to ask you people before we can do much of anything, what was the formula from eighth grade math class for the volume of a cone? (waits six seconds. Students chuckle. So does he.) Somebody said something good. (students mumbling.) No, we're getting ... somebody, I thought somebody said ... (student: one-third ...) Yes, it had something to do with one-third didn't it? The volume of a cone is one-third ... Now, let me ask you this, because this is a real good question to ask right now. It's one-third what the volume of a cylinder would be. What was the math

The teacher directs the problem solving process.

The students attempt to recall the formula (didactic-2). They answer the questions asked (talking-2). (end of segment 1.)
formula for the volume of a cylinder?

ONE STUDENT: Isn't it the area of the base times the height-- (TEACHER: Somebody's gonna say it.) OTHER STUDENTS: The area of a circle ... ANOTHER STUDENT SIMULTANEOUSLY: Pi--

TEACHER: Alright, pi r squared h. Pi times radius squared, that's the area of the top or the bottom of the cylinder, times the height. But, a cone, the only difference is (WRITES ON BOARD \[ V = \frac{1}{3} \pi r^2 h. \]) Okay, that's how we'll do a cone. It's one-third of a cylinder.

Alright, now, that's still, we have a ways to go. We had to know this. We had to know this. Now, back in this problem. Let's call the radius of the cone, let's call that \( x \). That would be distance \( x \). If we're at the origin here if the vertex of this cone is at the origin, then this distance right here ... (DRAWS RADIUS OUT FROM y-AXIS TO A POINT ON THE PARABOLOID) ... is \( x \). Now, I'm coming up with a point here. (WAITS TEN SECONDS.)

(SPEAKS WITH PAUSES. BEGINS TO WRITE COORDINATES OF THE POINT OF INTERSECTION OF THE INSCRIBED...)

The teacher sets the strategy for solving the problem (Task Setter-1).
TRANSCRIPTION OF CLASSROOM F LESSON SEGMENTS (CONTINUED)

CONE AND THE PARABOLOID). Okay, now if that's x ... (DRAWS DASHED LINE FROM THE POINT OF INTERSECTION DOWN TO THE x-AXIS. THINKING ABOUT THE y-COORDINATE) we'll call it -- no, we can't call it h though. That's the height, but what is it? We know. (STUDENTS MUMBLING.)

STUDENT A: Eight--

STUDENT B: Eight minus x squared.

(TEACHER APPROVES AND WRITES 8 - x^2 ON BOARD AS THE y-COORDINATE OF THE POINT OF INTERSECTION.)

TEACHER: Good, good. Because we're on the parabola, aren't we? So this height, if this is x from here to here, then this is f at x. Or, in this case, eight minus x squared. That's it, do you follow me, because if you follow that, you--we've got it made. We, we can go the rest--If you follow that. Why? Because if this distance here is x, well on this paraboloid really, a parabola if you cut it in half, this distance here would be eight minus x squared. That's the y value.

So, x eight minus x squared. Now, we're looking for maximum value. We're
looking for maximum value. So, let's go back here. Now, we're back to this one. (REFERRING TO THE FORMULA FOR THE VOLUME OF A CONE, \( V = \frac{1}{3} \pi r^2 h \).)

That's one-third times pi times, what? (STUDENTS: \( x \) squared) \( x \) squared, because \( x \) became the radius. \( x \) is the radius of the cone, times \( x \) squared, times ...

STUDENT: Eight minus \( x \) squared.

TEACHER: Eight minus \( x \) squared. Now, we have everything in terms of \( x \) and that's what we want. Because we can graph that. We can graph that on the calculator. If we have everything in terms of \( x \) then we can graph—Now, we have plenty of time. I want to try this and I don't want to rush it. Before you jump into this, let's, let's think of a good viewing rectangle, so we don't waste ten minutes just trying to find a good viewing rectangle. What values of \( x \) are going to make sense? What do you think? (WAITS A FEW SECONDS.)

STUDENT: Hmm ... from zero ...
Transcription of Classroom F Lesson Segments (continued)

TEACHER: From zero ... to ...
(STUDENT MUMBLES) probably not eight, but you're close.

ANOTHER STUDENT: Square root of eight.

TEACHER: Yeah, square root of eight. Right. From zero to the square root of eight. So, let's, let's go. We don't have to be that exact. I want to do something--I want to show you the picture first. Let's go from negative five to positive five. I know that, I know that those values don't make sense, but we can cut those out very easily. I want to get a complete view of the graph, what it looks like. Let's go negative five positive five. We'd better be careful here on our y values ... on our viewing rectangle. Um ... because you can get quite a bit of volume there. I think maybe just to get things started, we'd better go up to about forty or fifty. So, let's maybe negative five and then up to forty. Okay, now I'll be quiet for a minute and let you guys get that in and we'll take a look at it. (TEACHER SILENT FOR TEN SECONDS. WALKS BETWEEN ROWS.)

Students are entering the equation into their calculators (Writing-5).
Transcription of Classroom F Lesson Segments (continued)

TEACHER: (QUIETLY) I'm, I'm just guessing on that viewing rectangle. That might be terrible. You may have to adjust it. I was just guessing.

(STUDENT C MOTIONS FOR THE TEACHER TO COME AND SHOWS THE TEACHER HIS CALCULATOR SCREEN.)

TEACHER: That's right. You're right. That's what it should look like. Because we're dealing with a fourth degree equation here if you think about it.
(STUDENT C: I know.) So that's what you should expect to see.

STUDENT D: Two answers?

TEACHER: No. We can't have--

STUDENT E TO STUDENT D: One's negative.

TEACHER: We can't have negative x values. So, that's why I told you to go negative five. I want to get a complete look at the graph. And then we'll zoom in on the problem situation itself.

The teacher becomes Consultant (1). He circulates about the room and students check their graphs and their ideas with him.

They are representing the problem situation graphically (Problem Solving: Representing-2).
Transcription of Classroom F Lesson Segments (continued)

(STUDENT D MOTIONS WITH HIS HAND TO DRAW THE GRAPH OF A FOURTH-DEGREE POLYNOMIAL IN THE AIR.)

TEACHER: Yes, that's what you should be seeing, something like that right now.

Now, let's, let's, after you have, you see a complete graph, I hope everybody does ... (WALKS TO BACK OF ROOM AND AROUND TO TWO ROWS LOOKING AT CALCULATOR SCREENS.)

Yeah, everybody I see ... Good, good, good, good, good. Okay, everybody over here alright? Everybody I can see from here has a good picture. Alright, now let's zoom in on the problem situation and we know what you should be seeing. I didn't get to check every single person in the room, but just, just about everybody I see is looking at something like that--(DRAWS A QUICK SKETCH OF THE GRAPH ON THE BOARD.)

Alright, now where's the problem situation?

(A STUDENT ANSWERS AND MOTIONS THAT IT'S TO THE RIGHT BUT SPEAKS TOO QUIETLY TO HEAR WHAT HE SAYS.)

(End of Segment 2.)
Transcription of Classroom F Lesson Segments (continued)

TEACHER: Right here isn't it? Yeah, it's from here (ZERO) to here (THE POSITIVE x-INTERCEPT OF THE FUNCTION). So, let's zoom in on that. Let's cut out everything else. Let's zoom in on the problem situation itself.

(WAITS 17 SECONDS.)

I want a fairly accurate answer. So, once you have changed your Range, come in on the problem situation. Let's run a Tracer to the vertex. I would like to see how I'm supposed to build this thing to get that maximum volume in that cone. (WAITS FIVE SECONDS.)

So, run Tracer to the vertex and then you can, you don't have to put it in your zoom program. We can go Shift-Times and blow it up a couple times to get a fairly accurate answer.

STUDENT: Just go to the vertex.

TEACHER: Yea, let's go to the vertex, and get the x, because that's, that's going to be my maximum volume. Where I've got the vertex in quadrant one, in quadrant one, right there's going to be the x value to get the maximum volume out of this thing. (WAITS TWO SECONDS.) And blow it up a couple, just Shift-Times a couple times, blow it up a

The teacher circulates while students work at their desks with calculators.

The teacher sets the task. The students are following the steps set out by the teacher (Didactic: Rule Following-3).

The graphing calculator has an automatic zoom-in feature (Shift-\[X\]).

Student asserts (Talking-7).

The teacher is directing the solution process (Manager-1).
couple times so we're fairly accurate. And let's see if everybody in the room can agree. (WAITS TEN SECONDS. STUDENTS ARE WORKING ON THEIR CALCULATORS.)

We're looking, we're, did you blow it up a couple times, did you run your Tracer to the vertex and blow it up a couple times? Well, I want the value of $x$ that gives me maximum volume for that cone that's inscribed in that paraboloid. That's what I'm looking for. Two? (STUDENTS ANSWER QUIETLY:) Real close to two? (STUDENT: Two.) Good, alright. Now, people are saying you want an $x$ value of two here. Let's do this next. What is the maximum volume of the cone? Where is that at? What is that? (WAITS TWO SECONDS.) What is it, if it happens at two, if it happens at $x$ equals two, that that's where you're going to get maximum volume, what's the fast way to figure out the maximum volume?

STUDENT F (SIMULTANEOUSLY WITH STUDENT G): Substitute it.

STUDENT G (SIMULTANEOUSLY WITH STUDENT F): $y$. (REFERRING TO READING THE $y$ VALUE FOR THE VERTEX.)
Transcription of Classroom F Lesson Segments (continued)

TEACHER (WHISPERING): There's a faster way. (TALKING) What are we graphing?

STUDENT F REPEATS: \( y \).

OTHER STUDENTS ANSWER: Volume.

STUDENT F SAYS: Shift-y ...

TEACHER: Shift-y. We're graphing the volume. You can, don't get me wrong, you can put it back in if you want to. But I think I would just hit Shift-y on your calculator, and you're gonna switch over to volume. And what is the best I can do? What's the volume of the cone?

(STUDENTS ANSWER SIMULTANEOUSLY.)

STUDENT: Sixteen point seven.

STUDENT: Sixteen point seven five.

TEACHER (WHILE WRITING IT ON THE BOARD): Sixteen ... sixteen point seven five cubic whatever.

Okay, now you're going to do one like that tonight. And that would be a dandy on the quiz. Wouldn't that? Wouldn't that be a good way to just kind of wrap up the quiz? (STUDENTS: Oh, yeah.) I thought so.

The teacher does not hear Student F's correct response.

The students are engaging in problem solving (Implementing-3), but it is teacher directed.

(Middle of Segment 3.)
<table>
<thead>
<tr>
<th>OBSERVER SEGMENT</th>
<th>A</th>
<th>B</th>
<th>A</th>
<th>B</th>
<th>A</th>
<th>B</th>
</tr>
</thead>
<tbody>
<tr>
<td>TEACHNG ACTIV</td>
<td>246&lt;sup&gt;a&lt;/sup&gt;</td>
<td>2</td>
<td>26</td>
<td>2</td>
<td>26</td>
<td>2</td>
</tr>
<tr>
<td>DEMAND on STs</td>
<td>12</td>
<td>12</td>
<td>12</td>
<td>12</td>
<td>12</td>
<td>12</td>
</tr>
<tr>
<td>#QUESTs by TCHR</td>
<td>4</td>
<td>8</td>
<td>6</td>
<td>6</td>
<td>4</td>
<td>6</td>
</tr>
<tr>
<td>#QUESTs by STs</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>2</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>HMWK REVIEW</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>LESSON DEVELOP</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>GUIDED PRACTICE</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>GO OVER TEST</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>REVIEW PREV MAT</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>TECHNOLOGY</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>MANAGER</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>TASK SETTER</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>EXPLAINER</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>COUNSELOR</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>FELLOW INVEST</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>RESOURCE</td>
<td>5</td>
<td>3</td>
<td>5</td>
<td>3</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>STs PASSIVE</td>
<td>12</td>
<td>12</td>
<td>12</td>
<td>12</td>
<td>12</td>
<td>12</td>
</tr>
<tr>
<td>STs WRITING</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>STs TALKING</td>
<td>2</td>
<td>2</td>
<td>27</td>
<td>12</td>
<td>2</td>
<td>12</td>
</tr>
<tr>
<td>STs DIDACTIC</td>
<td>12</td>
<td>12</td>
<td>123</td>
<td>123</td>
<td>123</td>
<td>123</td>
</tr>
<tr>
<td>STs SYMB. ZNG</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>STs INVESTIG</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>STs PR SOLVING</td>
<td>23</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>STs HIGH LEVEL</td>
<td>12</td>
<td>2</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<sup>a</sup> The entries for all but "Quests by Tchr" and "Quests by Sts" represent labels for the behaviors observed during that lesson segment. For example, "246" does not mean "two hundred forty-six" but rather means that Teaching Activities 2, 4, and 6 were observed. Figure 5 lists the descriptors and their numeric code.

Figure 10. Observers' records for the transcribed Classroom F lesson segments.
Both observers labeled the Teaching Activity in the transcribed segments of the lesson as Exercise, Consolidation, or Practice (2). Observer A also noted Investigation (4) and Problem Solving (6) for parts of the lesson. Teacher F was extremely thorough in demonstrating and leading the solution of problems in this lesson. A great deal of class time was devoted to individual problems. Students were reviewing previously learned material and practicing solution processes under close guidance. The class was very attentive and worked on the problems as a group. Both observers recorded the teacher as Manager and Task Setter during all three transcribed segments. At times, the teacher was also observed Explaining and Counseling. Students were Watching and Listening (Passive-1,2) and Asking, Answering, and Asserting (Talking-1,2,7). Their pupiling activities included Didactic behaviors (Absorbing-1, Recalling-2, and Rule Following-3) during every segment with some Investigating (Particularizing-3), Problem Solving (Representing-2 and Implementing-3), and Higher Level Thinking (Image Building-1 and Analyzing-2).

Table 7 displays the summary statistics for the six lessons observed in Classroom F. The most common lesson objective in Classroom F was Review of Previously Learned Material (66%). Lesson Development took place during only 18% of the observed segments. Guided Practice was observed during 38% of the segments. Teacher F lectured to his class during only 33% of the observed segments (Exposition-33%). He used Exercise, Consolidation, or Practice as a Teaching Activity during 85% of the observed segments. Technology was used during 30% of the observed segments. When technology was in use, it was most often used in the form of graphing calculators (88%).

The teacher exhibited all six roles (Manager, Task Setter, Explainer, Consultant, Fellow Investigator, and Resource). He assumed the role of Task Setter more often when technology was in use than when it was not (98% versus 73%). During the 47 segments observed, the students operated as Task Setters (9%), Explainers (4%), and Consultants (12%). They assumed these roles more often when technology was in use than when it was not. They used Passive and Active behaviors during almost all of the observed segments (98% for each), regardless of whether technology was in use. Their pupiling
activities included Didactic behaviors (97%), Higher Level Thinking (30%), Investigating (77%), Symbolizing (68%), and Problem Solving (9%). The latter three (Investigating, Symbolizing, and Problem Solving) were observed more when technology was in use than when it was not. The demand place on students was more likely to be recall of a single fact or step (89%) or recall of a string of facts or steps (70%) than extension of knowledge or skill (14%).
<table>
<thead>
<tr>
<th>TABLE 7. CLASSROOM F</th>
<th>SUMMARY STATISTICS: TOTAL</th>
<th>SIX LESSONS</th>
<th>TECHNOLOGY</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mean</td>
<td>St Dev</td>
<td>Mean</td>
</tr>
<tr>
<td>Teacher Questions</td>
<td>5.6</td>
<td>2.8</td>
<td>7.0</td>
</tr>
<tr>
<td>Student Questions</td>
<td>1.1</td>
<td>0.4</td>
<td>0.9</td>
</tr>
<tr>
<td>Percent of 5 min Segments that Contain:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Homework Review</td>
<td>12.8</td>
<td>23.3</td>
<td>19.3</td>
</tr>
<tr>
<td>Lesson Development</td>
<td>18.1</td>
<td>40.5</td>
<td>22.8</td>
</tr>
<tr>
<td>Guided Practice</td>
<td>38.3</td>
<td>31.8</td>
<td>28.3</td>
</tr>
<tr>
<td>Reviewing a Test</td>
<td>4.3</td>
<td>11.7</td>
<td>7.0</td>
</tr>
<tr>
<td>Reviewing Material</td>
<td>66.0</td>
<td>43.4</td>
<td>61.4</td>
</tr>
<tr>
<td>Using Calculators Only</td>
<td>24.5</td>
<td>20.7</td>
<td>0.0</td>
</tr>
<tr>
<td>Using Computers Only</td>
<td>2.1</td>
<td>4.5</td>
<td>0.0</td>
</tr>
<tr>
<td>Using Both Calculators and Computers</td>
<td>3.2</td>
<td>6.8</td>
<td>0.0</td>
</tr>
<tr>
<td>Student as Manager</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Student as Task Setter</td>
<td>8.5</td>
<td>8.8</td>
<td>8.6</td>
</tr>
<tr>
<td>Student as Explainer</td>
<td>4.3</td>
<td>5.0</td>
<td>3.1</td>
</tr>
<tr>
<td>Student as Consultant</td>
<td>11.7</td>
<td>8.0</td>
<td>7.9</td>
</tr>
<tr>
<td>Student as Fellow Investigator</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Student as Resource</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Students Passive</td>
<td>97.9</td>
<td>3.1</td>
<td>98.5</td>
</tr>
<tr>
<td>Students Active: Writing</td>
<td>64.2</td>
<td>18.8</td>
<td>48.0</td>
</tr>
<tr>
<td>Students Active: Talking</td>
<td>97.9</td>
<td>3.8</td>
<td>98.2</td>
</tr>
<tr>
<td>Students Didactic</td>
<td>96.8</td>
<td>4.6</td>
<td>96.9</td>
</tr>
<tr>
<td>Students Symbolizing</td>
<td>68.1</td>
<td>18.4</td>
<td>52.1</td>
</tr>
<tr>
<td>Students Investigating</td>
<td>77.7</td>
<td>17.2</td>
<td>61.2</td>
</tr>
<tr>
<td>Students Problem Solving</td>
<td>8.5</td>
<td>10.2</td>
<td>3.5</td>
</tr>
<tr>
<td>Students in Higher Level Thinking</td>
<td>30.1</td>
<td>15.3</td>
<td>24.7</td>
</tr>
<tr>
<td>Percent of 5 min Segments that Contain:</td>
<td>SUMMARY STATISTICS:</td>
<td>SIX LESSONS</td>
<td>TECHNOLOGY</td>
</tr>
<tr>
<td>----------------------------------------</td>
<td>---------------------</td>
<td>-------------</td>
<td>------------</td>
</tr>
<tr>
<td></td>
<td>TOTAL</td>
<td>NO TECHNOLOGY</td>
<td>TECHNOLOGY</td>
</tr>
<tr>
<td></td>
<td>Mean</td>
<td>St Dev</td>
<td>Mean</td>
</tr>
<tr>
<td>Teacher as Manager</td>
<td>100.0</td>
<td>0.0</td>
<td>100.0</td>
</tr>
<tr>
<td>Teacher as Task Setter</td>
<td>84.0</td>
<td>17.0</td>
<td>73.0</td>
</tr>
<tr>
<td>Teacher as Explainer</td>
<td>90.4</td>
<td>7.5</td>
<td>93.6</td>
</tr>
<tr>
<td>Teacher as Consultant</td>
<td>36.2</td>
<td>19.7</td>
<td>31.2</td>
</tr>
<tr>
<td>Teacher as Fellow Investigator</td>
<td>3.2</td>
<td>4.7</td>
<td>0.0</td>
</tr>
<tr>
<td>Teacher as Resource</td>
<td>5.3</td>
<td>17.0</td>
<td>7.0</td>
</tr>
<tr>
<td>Exposition</td>
<td>33.0</td>
<td>34.3</td>
<td>41.2</td>
</tr>
<tr>
<td>Exercise, Consolidation, Practice</td>
<td>85.1</td>
<td>32.8</td>
<td>79.2</td>
</tr>
<tr>
<td>Discussion</td>
<td>3.2</td>
<td>5.2</td>
<td>5.3</td>
</tr>
<tr>
<td>Investigation</td>
<td>27.7</td>
<td>17.6</td>
<td>24.9</td>
</tr>
<tr>
<td>Applied Mathematics</td>
<td>2.1</td>
<td>3.8</td>
<td>1.8</td>
</tr>
<tr>
<td>Problem Solving</td>
<td>3.2</td>
<td>7.7</td>
<td>1.8</td>
</tr>
<tr>
<td>Working in Groups</td>
<td>7.4</td>
<td>6.9</td>
<td>3.1</td>
</tr>
<tr>
<td>Recall of a single fact or step</td>
<td>89.4</td>
<td>17.1</td>
<td>92.1</td>
</tr>
<tr>
<td>String together several facts or steps</td>
<td>70.2</td>
<td>16.7</td>
<td>78.4</td>
</tr>
<tr>
<td>Extend knowledge or skill</td>
<td>13.8</td>
<td>12.7</td>
<td>18.8</td>
</tr>
</tbody>
</table>

Number of segments: 47

Number of segments: 26.5 *

Number of segments: 18.5 *

*The average of the number of segments noted by the observers.
CHAPTER V

DISCUSSION: SUMMARY OF SIX CLASSROOMS

Each of the teachers had his own teaching style. All were experienced teachers, but their prior experience with calculators and computers in the classroom varied greatly. Each implemented the technology in his classroom in a way that worked best with the equipment and facilities available in his school.

The purpose of this chapter is to answer the research questions:

What teaching and pupilning *roles* do teachers and students exhibit in precalculus classes where a hand-held calculator graphing utility or a microcomputer graphing utility is used?

What teaching and pupilning *behaviors* do teachers and students exhibit in precalculus classes where a hand-held calculator graphing utility or a microcomputer graphing utility is used?

Are the roles and behaviors exhibited by teachers and students in these classrooms when technology is in use different from when it is not?

Does the SCAN instrument, developed for use in classrooms where technology *supplements* the curriculum, adequately capture the roles and behaviors exhibited by teachers and students in classrooms where technology is an *integral part* of the curriculum?

In response to the first three questions, teaching and pupilning activities observed in the six project classrooms are summarized. Then, the robustness of the SCAN instrument for recording events in classrooms where technology is an integral part of the curriculum is discussed.
Teaching and Pupiling in the Six Project Classrooms

Table 8 contains a summary of the data collected in the six classrooms. The overall means and standard deviations are reported for the 36 lessons observed, for the portions of the lessons in which technology was not in use, and for the portions of the lessons in which technology was in use. The total number of five minute segments observed was 283. During 158 (56%) of the segments, calculators or computers were in use. During the remaining 125 (44%) of the segments, no calculators or computers were in use. When technology was in use, 43% of the time it was calculators alone; 27% of the time it was computers alone; and in 30% of the segments in which technology was in use, both calculators and computers were used.

There is evidence that the roles students exhibited when technology was in use differed from the roles they exhibited when technology was not in use. Students exhibited a wider variety of roles when technology was in use. They acted as Task Setters during 27% of the segments with technology. They acted as Consultants during 20% of the segments with technology. They were also observed assuming the roles of Explainer (11%), Fellow Investigator (11%), and Manager (6%) when technology was in use. When technology was not in use, students exhibited the roles of Task Setter (10%), Consultant (7%), and Explainer (6%). However, they exhibited these roles less often without technology than with it, and there was a large variance in the mean percentage when technology was not in use.

There is evidence that the teacher's role shifted with the use of technology. Although the teacher remained the Manager during virtually all of the observed segments (98%), with or without technology in use (96% and 100%, respectively), the use of other roles shifted. With technology in use, the teachers exhibited the roles of Task Setter and Explainer less often (82% versus 75%, and 91% versus 75%, respectively) and the role of Consultant more often (19% versus 43%) than when technology was not in use. This shift in classroom role exhibited by the teacher is similar to the shift seen by Fraser et al. (1987). Although it is not as strong as would be necessary to claim that the teacher's role has shifted completely from information authority and conclusion giver to facilitator of learning (Kellogg & Leonard, 1987), it is in the direction expected for such a claim.
<table>
<thead>
<tr>
<th>TABLE 8. SUMMARY STATISTICS: ALL CLASSROOMS</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
</tr>
<tr>
<td>Mean</td>
</tr>
<tr>
<td>------</td>
</tr>
<tr>
<td>Teacher Questions (average per 5 min)</td>
</tr>
<tr>
<td>Student Questions (average per 5 min)</td>
</tr>
<tr>
<td>Percent of 5 min Segments that Contain:</td>
</tr>
<tr>
<td>Homework Review</td>
</tr>
<tr>
<td>Lesson Development</td>
</tr>
<tr>
<td>Guided Practice</td>
</tr>
<tr>
<td>Reviewing a Test</td>
</tr>
<tr>
<td>Reviewing Material</td>
</tr>
<tr>
<td>Using Calculators Only</td>
</tr>
<tr>
<td>Using Computers Only</td>
</tr>
<tr>
<td>Using Both Calculators and Computers</td>
</tr>
<tr>
<td>Student as Manager</td>
</tr>
<tr>
<td>Student as Task Setter</td>
</tr>
<tr>
<td>Student as Explainer</td>
</tr>
<tr>
<td>Student as Consultant</td>
</tr>
<tr>
<td>Student as Fellow Investigator</td>
</tr>
<tr>
<td>Student as Resource</td>
</tr>
<tr>
<td>Students Passive</td>
</tr>
<tr>
<td>Students Active: Writing</td>
</tr>
<tr>
<td>Students Active: Talking</td>
</tr>
<tr>
<td>Students Didactic</td>
</tr>
<tr>
<td>Students Symbolizing</td>
</tr>
<tr>
<td>Students Investigating</td>
</tr>
<tr>
<td>Students Problem Solving</td>
</tr>
<tr>
<td>Students in Higher Level Thinking</td>
</tr>
<tr>
<td>Percent of 5 min Segments that Contain:</td>
</tr>
<tr>
<td>----------------------------------------</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>Teacher as Manager</td>
</tr>
<tr>
<td>Teacher as Task Setter</td>
</tr>
<tr>
<td>Teacher as Explainer</td>
</tr>
<tr>
<td>Teacher as Consultant</td>
</tr>
<tr>
<td>Teacher as Fellow Investigator</td>
</tr>
<tr>
<td>Teacher as Resource</td>
</tr>
<tr>
<td>Exposition</td>
</tr>
<tr>
<td>Exercise, Consolidation, Practice</td>
</tr>
<tr>
<td>Discussion</td>
</tr>
<tr>
<td>Investigation</td>
</tr>
<tr>
<td>Applied Mathematics</td>
</tr>
<tr>
<td>Problem Solving</td>
</tr>
<tr>
<td>Working in Groups</td>
</tr>
<tr>
<td>Recall of a single fact or step</td>
</tr>
<tr>
<td>String together several facts or steps</td>
</tr>
<tr>
<td>Extend knowledge or skill</td>
</tr>
</tbody>
</table>

283 125 153
The mean percent of segments in which the teacher acted as Fellow Investigator or Resource also increased with the use of technology; however there was a large variance in the mean percentage for these roles.

Students' pupiling activities shifted with the use of technology. Students were less didactic, although they still used a great deal of the didactic behaviors coded—absorbing, recalling, and rule following (98% of the time without technology and 87% of the time with technology). Students did more symbolizing with technology than without (91% versus 44%). They investigated more with technology than without (87% versus 54%). They were observed in a problem solving mode more often with technology than without (20% versus 2%).

Other differences were observed in students' behavior when technology was in use. When technology was not in use, students were observed writing (taking notes, recording, doing exercises, using symbols) only 44% of the time. With calculators or computers, students were observed writing (or entering information into the computer or calculator) 93% of the time. The amount of time students spent using passive behaviors decreased from 99% (without technology) to 89% (with technology). The number of segments in which students talked (asked questions, answered, discussed, explained, asserted) remained constant regardless of whether or not technology was in use (96%). A shortcoming of the instrument may be in measuring students' verbal activity. The instrument used a sign system for recording students' talk. So, whether students spoke one time or several times during a single five minute period, if that type of verbal activity had already occurred during the interval, it was not tallied again. Ten instances of students asserting would look the same as one instance. Students in all of the classrooms spoke to the teacher at least once in almost every five minute interval. The number of questions asked by students was tallied. On the average, students asked one to two questions per five minute segment, regardless of whether or not technology was in use.

Exposition was the most prevalent teaching activity for segments in which no technology was in use (59%), followed by exercise, consolidation, practice (53%) and investigation (16%). When technology was in use, the most commonly recorded teaching activity was exercise, consolidation, practice (56%), followed by exposition (41%), and investigation (25%).
Students worked in groups during 29% of the segments in which technology was in use and during only 2% of the segments in which technology was not in use. Teachers spent an average of 37% of the observed segments in lesson development and 42% in guided practice, but the variance between teachers is large. The amount of class time spent on lesson development ranged from 13% to 70%. The amount of class time spent on guided practice ranged from 21% to 69%.

The teaching and pupiling activities observed in the project classrooms can also be compared to other published predictions about the potential and goals of education with technology. Burkhardt (1985) predicted that calculators and microcomputers would help teachers and students achieve the classroom learning activities of discussion, non-routine problem solving, and open investigation. The National Council of Teachers of Mathematics (1989) sees "the emergence of a new classroom dynamic in which teachers and students become natural partners in developing mathematical ideas and solving mathematical problems" as the most fundamental consequence of changes in response to technology-rich classroom environments. Were discussion, non-routine problem solving, open investigation, and a partnership between teachers and students a part of the teaching and pupiling observed in the project classrooms?

No one classroom was the site of all of these behaviors every day. However, impressive events did occur in all of the classrooms. Although these technology-rich classrooms do not seem different from traditional classrooms with regard to the amount of time spent using discussion as a teaching activity, some sophisticated discussion about mathematics did take place. Non-routine problem solving was observed. The textbook contains many difficult real-world problems and students and teachers spent entire class periods engrossed in solving them. There was open investigation and there was guided investigation. The investigating in Classroom A was carefully guided by the teacher. Open investigation was observed in Classroom C, when the teacher would often follow students' lead through a difficult solution process, and immediately follow up on students' suggestions. It was obvious that the teacher and some of the students in Classroom B carried out extensive investigations into alternative solution strategies, but these seemed to take place outside of class. During class, the results of these
investigations would be shared. Teacher and students in both of these classrooms were at times partners in developing solution strategies and solving mathematical problems.

Demana and Waits (1988) state that the technology-rich curriculum in use in the project classrooms requires students to be active partners in the learning process, and allows students to investigate and study many more examples and problems than is possible with traditional methods. Wiske et al. (1988) and Lampert (1988) state that when using the technology-rich curriculum developed around the *Geometric Supposer*, students began forming their own hypotheses, actively testing things out, and making generalizations. They shared ideas, talked about mathematics, and interacted in group problem solving in a way that differed from traditional classroom interactions. Teachers and students behaved as mathematicians, asking questions, exploring, really doing mathematics. Were these behaviors characteristic of the classrooms under observation in the present study?

Students were observed to be active partners in the learning process. Teachers E and F used long wait times while students entered information into their calculators and came up with answers to their questions. Both of these teachers looked like coaches readying their classes (teams) to perform at their best. The students responded with a high degree of participation. Students in Classroom D followed along verbally, responding and commenting as the teacher spoke. Teacher A organized worksheets to guide students' discovery of important ideas. Students worked diligently to complete them. During the observed lessons, the teachers and students in Classrooms B, C, and F thoroughly investigated several of the rich problem situations in the textbook. The investigation into polar graphs completed by students in Classroom A required generalizations about the effects of the coefficients and trigonometric functions in the equations on the graphs of the polar relations. Students in Classroom D applied what they had previously learned about shifts, stretches, and reflections of graphs of polynomial functions to the graphs of expressions involving the inverse trigonometric functions.

Heid (1988) saw students develop greater independence and interact more with each other when they studied an Algebra I curriculum that integrated technology with the mathematics. The students using the
technology-integrated PreCalculus curriculum in the present study worked together more often when technology was in use than when it was not. Students assumed the role of Consultant more often when technology was in use. Sometimes the working together and consulting was planned, as when students shared limited resources in a computer lab. Other times the consulting was spontaneous, as when students leaned over to see the display on a peer's calculator screen and discuss how it was attained; or when one student would help another to program the calculator; or when a student would help the teacher by sharing some new knowledge about how to operate the computer or calculator.

Each teacher's behavior with technology differed from his behavior without it. This may be stating the obvious, since we would expect new behaviors with new tools. Yet each teacher did not do the same thing with the new tool. Each teacher maintained his own individual style. The technology did provide a vehicle for incorporating some new behaviors and roles, including some recommended by the Standards (NCTM, 1989).

The Robustness of the Instrument

An instrument developed for use in classrooms where technology supplements the curriculum was modified for use in the present study. In the present study, technology was integrated into the curriculum. The textbook was designed for use with graphing utilities. Students had access to graphing calculators at all times. They had frequent access to computers.

The question of whether the instrument is appropriate for recording activities in classrooms where technology is integrated with the curriculum needs to be addressed. Can an observer using the instrument adequately capture and record all of the relevant classroom teaching and pupilizing activities? Two questions are discussed: Are there behaviors present in the classroom that are not included in the categories on the instrument? Are the categories that are present appropriate?

All of the teachers involved in the present study attended a week-long summer in-service after their first year of teaching with the materials. They were joined by other teachers involved in the long-term curriculum development project designed to incorporate technology into the school mathematics curriculum. These teachers discussed the changes in student
behaviors that they had observed in their own classrooms during the first year of using the technology-rich curriculum. They mentioned several pupiling activities that are not explicitly mentioned on the instrument. These teachers said that in addition to abstracting, reflecting, analyzing, and generalizing, their students began "networking, challenging, directing, and venturing." If the students in the technology-oriented curriculum are using these types of pupiling activities and the observers are not able to capture these activities using the instrument, then the instrument would not be adequate for characterizing important changes in pupiling.

The suggestion that students were "networking" implies a complex of behaviors and activities including: students working together on a common problem; students communicating with each other about the problem; students consulting with persons who have particular strengths necessary for solving the problem. It would be difficult to read this activity from the SCAN record. An observer using SCAN would be able to record students working in groups, discussing mathematics, and problem solving. However, the subtleties implied by the term "networking" may not come across on the SCAN record.

The project teachers noted that at times students began "challenging" each other or the teacher in these classrooms. Students would want to have the most unique graph, or a better solution method, or the best program. An observer using SCAN would have a difficult time recording this behavior on the instrument. The student could be noted as explaining, consulting, or asserting, but none of these seems to capture the entire meaning of "challenging."

The instrument can be used to record instances where students are "directing" the activity in the classroom. The students can be recorded as assuming the roles of Task Setter and Manager. This implies that they are making decisions regarding what task to perform, how to perform it, and who will perform it. These are essentially the tasks of the director.

The project teachers agreed that their students at times showed an activity they labeled as "venturing." Venturing would include the following behaviors. The students took risks. They attempted to solve problems that students in precalculus classes usually would not attempt. They tried to solve problems when they knew that they were not sure what solution strategy to
use. They spent time on a problem and then abandoned a strategy in favor of others. Using the methods of the present study (the videotaping procedure and the instrument) this activity could not be recorded. Because the teachers were instructed to videotape "classroom" activities, there are very few segments in which one or two students are followed closely as they attempt to solve a problem. So, in order to be captured on the videotape, the whole class would have to be involved. In that case, the best that the observer could do is to record the teaching and pupiling activities as Investigation or Problem Solving. The record is simply not complete enough to read back the particulars of a solution process. In order to capture a record of this type of activity, it would be necessary to conduct a thorough study of two or three students solving problems, in a manner similar to the work done by Schoenfeld (1981).

So the instrument and the procedures may not be up to the task of capturing all of the subtleties in pupiling behavior observed by the teachers. What about the behaviors and activities that are present on the instrument? Are the categories that are present appropriate? Two issues arise: the use of a sign system (Dunkin & Biddle, 1974) and the use of high inference categories (Cooney, 1980).

The unit of observation used in the present study was time: five minute segments of class time. In all but two cases, the categories were coded using a sign system, in which only the first instance of a given event during the time segment is tallied. The sign system may make the instrument less sensitive to classroom differences. For example, the data in Table 4 suggest that the students were very talkative in Classroom C. However, during follow-up interviews the observers characterized the students in Classroom C as quiet. The instrument did include a category for counting the number of student questions. The number of student questions shown in Table 4 for Classroom C is low, indicating that this category may be a more sensitive indicator of students' verbal participation than the category Students Talking. In all of the classrooms in the present study, students were noted to be talking in nearly every time segment.

The content of students' talk may be more important for characterizing classroom interaction than a measure of the amount of student talk. A record of who initiates the verbal interaction (Friedman &
Stomper, 1988), or the structure of the explanations that students and teachers use (Leinhardt, 1989) may provide more complete information about classroom participation.

The second important issue related to the robustness of the instrument is the degree to which observers were required to make inferences when categorizing behavior. In order to avoid a situation in which the behaviors categorized were too trivial or too mechanical to capture the complexity of classroom interaction, it was necessary that the categories involve some inference on the part of the observers. It was assumed that because the observers had experience teaching secondary mathematics, the inferences and subjective decisions they made would be valid. Although their decisions may have been valid, the reliability of observer categorizations needs to be examined. The definitions of categories can be improved and throughout the viewing and coding process, periodic checks should be made to insure consistency in the use of the categories.
CHAPTER VI
CONCLUSIONS AND RECOMMENDATIONS

The teaching and pupil ing behaviors and activities observed in the six project classrooms differed from teaching and pupil ing in traditional mathematics classrooms in some significant ways. The lessons observed did not follow the homework-lecture-new homework prevailing pattern of instruction. There was no evidence that the teachers and students had fallen into the routine noted by Fey (1979) and the Research Advisory Committee of NCTM (1988) that describes activities in most classrooms today. That routine consists of listing answers for the previous day's assignment, working the more difficult problems at the chalkboard, giving a brief explanation or none at all of the new material, assigning problems for the next day, and spending the remainder of the class period working on the new assignment with the teacher walking around answering questions. Although homework was assigned and homework review did occur during whole class instruction, the problems in the textbook were rich enough to allow for extensive discussion and development to be woven into the solution process. Sometimes an entire class period was spent solving a group of problems all relating to the same problem situation. Some class periods were devoted entirely to laboratory work. Other times the teacher would spend an entire class period explaining new content, interspersing lecture with guided practice and perhaps an explanation of how to operate some new features of the technology.

Students did more than answer questions, sit, and listen. Teachers C and F had students running the demonstration computer. Students in Classroom C presented the solutions to particular homework problems to the class and often guided the solution process for problems presented by the teacher during whole class instruction. During one period in Classroom D, students were involved in one of four different activities happening
simultaneously: exploring the computer graphing utility, taking make-up exams, listening to a short lecture, or working in pairs on a homework assignment. Individuals in Classrooms B and E were asked to the board to demonstrate skills to the class. Students in Classroom A worked in pairs at the computers and, guided by a worksheet, discovered the characteristics of polar graphs. The teacher stayed in the background and students discussed their experimentation with each other. In all six classrooms students were often observed entering commands into their calculators while the teacher lectured or led a discussion. Students in Classroom B came to the teacher with alternative solution strategies that they had tried at home. Students in Classroom C and F assisted the teacher in operating the computer graphing utility by using commands they had discovered on their own.

In traditional classrooms, seatwork consumes up to 50% of the time in class. In the project classrooms, guided practice was noted for 42% of the segments and exercise, consolidation, or practice was noted for 56% of the segments. However, in all but one classroom, this practice was teacher-directed. Students were rarely observed working at their seats on homework exercises at the end of the class period. Even if teachers were turning off the camera when students began seatwork, on the average it could not consume more than 10 minutes of class time, because the 36 lessons that were taped lasted an average of 40 minutes. Class periods were 50 minutes or less.

Little time is spent in small groups or on independent activities such as projects or investigations in traditional classrooms (Research Advisory Committee, 1988). In the C²PC classrooms, students worked in small groups during 17% of the observed segments and during 29% of the segments in which technology was in use.

In traditional classrooms, "the text is followed fairly closely, but students are likely to read at most one or two pages out of five pages of textual materials other than problems" (Conference Board of Mathematical Sciences, 1975, cited in Romberg & Carpenter, 1986). Students normally use the text as little more than a source of problem lists. In Classroom C, students were seen using the laboratory manuals to learn to use the parametric grapher. Teacher C often asked students to find the textbook example that modeled the solution strategy appropriate for the problem at hand. Students in Classroom E took turns reading aloud from the text. Teacher E would interrupt them to
ask for rephrasing or to explain the difficult passages. Teacher D read
definitions aloud from the text and asked students to paraphrase them.
It may be that even with the C²PC text, which is intended to require more
reading than the average high school textbook, students and teachers use it
the way they have always used the textbook. This issue needs more study to
see just how much of the textbook is read by students and how much use they
make of the laboratory manuals and documentation for the utilities.

Romberg and Carpenter (1986) lamented that students see mathematics
as a static discipline and that "such essential characteristics as abstracting,
inventing, proving, and applying are often lost." These higher level
thinking skills were observed in the project classrooms. Further study of
students' attitudes toward mathematics and beliefs about the discipline is
needed.

In some ways the descriptions of teaching and pupiling with
technology look the same as the descriptions of teaching and pupiling in
traditional classrooms. The teacher talks \( \frac{2}{3} \) of the time and the predominant
pattern in traditional classrooms is extensive teacher-directed explanation
and questioning (Suydam & Osborne, 1977). In the project classrooms, the
teacher acted as explainer during more than 80% of the observed segments
and lectured during nearly half of the segments. Because the present
research used a sign system for recording activities, a direct comparison
between the findings here and the real-clock measures made in prior
research cannot be made. It can be said that the teachers did continue to
exhibit some of the characteristics of direct, teacher-led instruction during
most of the observed segments.

The role of the teacher in traditional classrooms is managerial
(Romberg, 1985, cited in Romberg & Carpenter, 1986, p. 851). In the project
classrooms, the teacher acted as manager and task setter during 98% and 77%
of observed segments, respectively. Other roles can be exhibited
concurrently, but the evidence suggests that teachers are holding on to the
managerial roles.

In traditional classrooms, over 50% of the questions are at the
knowledge level (Suydam & Osborne, 1977). The demand on students in the
C²PC classrooms was recorded as recall of a single fact or step and recall of
several facts or steps during 79% and 58% of the observed segments, respectively. Again, a direct comparison is not possible since the units of measure are different. In prior research, the demand level of each question was categorized. In the present research, the incidence of a particular type of demand during a five-minute interval was noted. It can be said that teachers continue to use knowledge level questions and tasks. In the project classrooms, more than one type of demand level could have been noted during a single interval. In either case, it may be that teachers have found it effective to use knowledge level questions even when teaching new concepts and skills. The increments forward from previously-learned knowledge to new knowledge may be purposefully kept small in order to help students build new knowledge into the old structure.

Implications

These results have implications for teacher educators, researchers into classroom behavior, teachers and supervisors interested in implementing the standards, and developers of technology-based curricula. Such a detailed look at teaching and pupiling activities in classrooms would be a valuable experience for a preservice teacher. The work is time consuming, but could be used as a project for preservice teachers who would benefit from a thorough examination of the activities of skillful teachers and discussing their observations with each other and a field supervisor. The SCAN instrument could be used for recording observations of student teachers and for later discussions with the student teacher.

For those interested in implementing the Standards (NCTM, 1989), the instrument and procedures used in the present study could be used to develop records of classroom behaviors for analysis and discussion. The desired classroom behaviors would need to be defined clearly and the instrument could be modified to include target behaviors. Videotapes could be used to provide teachers with examples of the target behaviors.

Curriculum developers can use the results of this study as evidence that teachers can adapt a new curriculum to meet their needs and their own individual teaching style. Utilities are valuable to teachers and students if they allow the user to keep control over lesson objectives and problem
solution strategies. Students using computer and calculator utilities are provided access to powerful tools but must direct the tool themselves.

Recommendations

The present research concentrates on the processes occurring in the C²PC classrooms. There is research being conducted by others involved in the C²PC project investigating student achievement and student attitudes. At a future stage, the products of learning in the C²PC classrooms should also be investigated. Measures of teaching and learning behaviors of interest to the curriculum developers and to mathematics educators interested in effective teaching should be correlated with student outcome measures. Other studies planned for the future should include comparative studies of teaching and learning activities in traditional precalculus classrooms and the C²PC classrooms and incorporate a longitudinal analysis of teaching and learning activities in the C²PC classrooms. The present study used observations of teaching made at the end of the first year of using the curriculum materials. A future study should include observations made throughout the first year and into the second year of using the materials.

A true ethnographic study would provide valuable insights into the mechanisms of change in classrooms adopting a technology-based curriculum. In such a study two or three classrooms should be studied in great detail. The observer should be present in the classroom every day for several weeks. From that vantage point, the observer should note the behaviors of students and teacher. The observations should not be limited to a predetermined set of behaviors. The findings from the present study would assist the observer by providing a starting place, but the subtle behaviors described by teachers that were not included as separate descriptors on the SCAN instrument (venturing, challenging, directing, networking) could also be investigated.

The present study provided evidence that teachers and students who want to bring to classrooms a different type of teaching and pupil may be able to do so. Although dramatic differences were not seen in the project classrooms, there were some significant differences between interactions in these classrooms and what is reported in the literature for traditional classrooms. There is support for Hawkins and Sheingold’s (1986) claim:
When examined in the long term, the nature of learning interactions in classrooms may change dramatically. The technology may support much more collaborative work on the part of students. Because of the increasing opportunities for paired and small group activities, changes in curriculum, and the capacity of the technology to support students' learning of academic content, teachers may need to become less the providers of content-specific knowledge and more the facilitators of students' acquisition of knowledge. Instruction might shift away from emphasis on information-giving to emphasis on helping students to find relevant information, learn how to solve problems, ask questions, think critically, and communicate ideas. (p. 50)
APPENDIX A

SUMMARY STATISTICS FOR EACH LESSON
<table>
<thead>
<tr>
<th></th>
<th>Lesson 1</th>
<th></th>
<th>Lesson 2</th>
<th></th>
<th>Lesson 3</th>
<th></th>
<th>Lesson 4</th>
<th></th>
<th>Lesson 5</th>
<th></th>
<th>Lesson 6</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>M</td>
<td>SD</td>
<td>M</td>
<td>SD</td>
<td>M</td>
<td>SD</td>
<td>M</td>
<td>SD</td>
<td>M</td>
<td>SD</td>
<td>M</td>
<td>SD</td>
</tr>
<tr>
<td>Tchr Quests (ave/5 mln)</td>
<td>6.1</td>
<td>0.1</td>
<td>9.6</td>
<td>0.9</td>
<td>5.6</td>
<td>0.7</td>
<td>0.0</td>
<td>0.0</td>
<td>4.2</td>
<td>0.2</td>
<td>7.1</td>
<td>1.6</td>
</tr>
<tr>
<td>Stl Quests (ave/5 mln)</td>
<td>1.5</td>
<td>0.4</td>
<td>0.6</td>
<td>0.2</td>
<td>1.6</td>
<td>0.2</td>
<td>2.0</td>
<td>0.1</td>
<td>0.4</td>
<td>0.1</td>
<td>2.1</td>
<td>0.6</td>
</tr>
<tr>
<td>% of Segments With:</td>
<td></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>Homework Review</td>
<td>0.0</td>
<td>0.0</td>
<td>11.1</td>
<td>0.0</td>
<td>71.4</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>21.4</td>
<td>30.3</td>
</tr>
<tr>
<td>Lesson Development</td>
<td>93.8</td>
<td>8.8</td>
<td>83.3</td>
<td>23.6</td>
<td>14.3</td>
<td>20.2</td>
<td>60.0</td>
<td>56.6</td>
<td>65.0</td>
<td>7.1</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Guided Practice</td>
<td>6.3</td>
<td>8.8</td>
<td>27.8</td>
<td>23.6</td>
<td>14.3</td>
<td>20.2</td>
<td>40.0</td>
<td>56.6</td>
<td>0.0</td>
<td>0.0</td>
<td>42.9</td>
<td>60.6</td>
</tr>
<tr>
<td>Reviewing a Test</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Reviewing Material</td>
<td>0.0</td>
<td>0.0</td>
<td>44.4</td>
<td>0.0</td>
<td>28.6</td>
<td>40.4</td>
<td>0.0</td>
<td>0.0</td>
<td>85.0</td>
<td>7.1</td>
<td>100.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Using Calculators Only</td>
<td>43.8</td>
<td>26.5</td>
<td>55.6</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>20.0</td>
<td>14.1</td>
<td>53.6</td>
<td>5.1</td>
</tr>
<tr>
<td>Using Computers Only</td>
<td>6.3</td>
<td>8.8</td>
<td>22.2</td>
<td>0.0</td>
<td>64.3</td>
<td>10.1</td>
<td>70.0</td>
<td>14.1</td>
<td>20.0</td>
<td>14.1</td>
<td>6.3</td>
<td>8.8</td>
</tr>
<tr>
<td>Both Calcs and Comps</td>
<td>37.5</td>
<td>17.7</td>
<td>5.6</td>
<td>7.9</td>
<td>21.4</td>
<td>10.1</td>
<td>10.0</td>
<td>14.1</td>
<td>20.0</td>
<td>14.1</td>
<td>40.2</td>
<td>3.8</td>
</tr>
<tr>
<td></td>
<td></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>Student as Manager</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>40.0</td>
<td>56.6</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Student as Task Setter</td>
<td>6.3</td>
<td>8.8</td>
<td>16.7</td>
<td>23.6</td>
<td>14.3</td>
<td>20.2</td>
<td>80.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Student as Explainer</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>70.0</td>
<td>14.1</td>
<td>20.0</td>
<td>0.0</td>
<td>14.3</td>
<td>20.2</td>
</tr>
<tr>
<td>Student as Consultant</td>
<td>6.3</td>
<td>8.8</td>
<td>27.8</td>
<td>7.9</td>
<td>21.4</td>
<td>30.3</td>
<td>40.0</td>
<td>56.6</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>St Fallow Investigator</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>14.3</td>
<td>20.2</td>
<td>40.0</td>
<td>56.6</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Student as Resource</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>20.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Students Passive</td>
<td>100.0</td>
<td>0.0</td>
<td>100.0</td>
<td>0.0</td>
<td>92.9</td>
<td>10.1</td>
<td>60.0</td>
<td>56.6</td>
<td>100.0</td>
<td>0.0</td>
<td>100.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Students Active: Writing</td>
<td>93.8</td>
<td>8.8</td>
<td>61.1</td>
<td>7.9</td>
<td>92.9</td>
<td>10.1</td>
<td>100.0</td>
<td>0.0</td>
<td>65.0</td>
<td>21.2</td>
<td>93.6</td>
<td>8.8</td>
</tr>
<tr>
<td>Students Active: Talking</td>
<td>75.0</td>
<td>0.0</td>
<td>100.0</td>
<td>0.0</td>
<td>100.0</td>
<td>0.0</td>
<td>100.0</td>
<td>0.0</td>
<td>100.0</td>
<td>0.0</td>
<td>100.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Students Didactic</td>
<td>93.8</td>
<td>8.8</td>
<td>100.0</td>
<td>0.0</td>
<td>92.9</td>
<td>10.1</td>
<td>100.0</td>
<td>0.0</td>
<td>90.0</td>
<td>14.1</td>
<td>100.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Students Symbolizing</td>
<td>81.3</td>
<td>8.8</td>
<td>72.2</td>
<td>23.6</td>
<td>64.3</td>
<td>30.3</td>
<td>100.0</td>
<td>0.0</td>
<td>35.0</td>
<td>35.4</td>
<td>93.8</td>
<td>8.8</td>
</tr>
<tr>
<td>Students Investigating</td>
<td>25.0</td>
<td>17.7</td>
<td>66.7</td>
<td>31.4</td>
<td>64.3</td>
<td>50.5</td>
<td>80.0</td>
<td>0.0</td>
<td>65.0</td>
<td>7.1</td>
<td>87.5</td>
<td>17.7</td>
</tr>
<tr>
<td>Students Problem Solving</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>14.3</td>
<td>20.2</td>
<td>50.0</td>
<td>70.7</td>
<td>0.0</td>
<td>0.0</td>
<td>7.1</td>
<td>10.1</td>
</tr>
<tr>
<td>Sts Higher Level Thinking</td>
<td>0.0</td>
<td>0.0</td>
<td>27.8</td>
<td>7.9</td>
<td>21.4</td>
<td>30.3</td>
<td>40.0</td>
<td>56.6</td>
<td>70.0</td>
<td>0.0</td>
<td>35.7</td>
<td>50.5</td>
</tr>
<tr>
<td>% of Segments With:</td>
<td>LESSON 1</td>
<td>SUMMARY STATISTICS (TOTAL)</td>
<td>LESSON 2</td>
<td>LESSON 3</td>
<td>LESSON 4</td>
<td>LESSON 5</td>
<td>LESSON 6</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>----------------------------------------</td>
<td>----------</td>
<td>---------------------------</td>
<td>----------</td>
<td>----------</td>
<td>----------</td>
<td>----------</td>
<td>----------</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>M</td>
<td>SD</td>
<td>M</td>
<td>SD</td>
<td>M</td>
<td>SD</td>
<td>M</td>
<td>SD</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Teacher as Manager</td>
<td>100.0</td>
<td>0.0</td>
<td>100.0</td>
<td>0.0</td>
<td>100.0</td>
<td>0.0</td>
<td>70.0</td>
<td>42.4</td>
<td>100.0</td>
<td>0.0</td>
<td>100.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Teacher as Task Setter</td>
<td>100.0</td>
<td>0.0</td>
<td>94.4</td>
<td>7.9</td>
<td>92.9</td>
<td>10.1</td>
<td>30.0</td>
<td>14.1</td>
<td>75.0</td>
<td>35.4</td>
<td>83.3</td>
<td>23.6</td>
</tr>
<tr>
<td>Teacher as Explainer</td>
<td>93.8</td>
<td>8.8</td>
<td>83.3</td>
<td>23.6</td>
<td>92.9</td>
<td>10.1</td>
<td>20.0</td>
<td>0.0</td>
<td>80.0</td>
<td>28.3</td>
<td>100.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Teacher as Consultant</td>
<td>37.5</td>
<td>0.0</td>
<td>27.8</td>
<td>7.9</td>
<td>35.7</td>
<td>30.3</td>
<td>50.0</td>
<td>42.4</td>
<td>10.0</td>
<td>14.1</td>
<td>11.1</td>
<td>15.7</td>
</tr>
<tr>
<td>Tchr Fellow Investigator</td>
<td>0.0</td>
<td>0.0</td>
<td>5.6</td>
<td>7.9</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>5.0</td>
<td>7.1</td>
<td>5.6</td>
<td>7.8</td>
</tr>
<tr>
<td>Teacher as Resource</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Exposition</td>
<td>100.0</td>
<td>0.0</td>
<td>83.3</td>
<td>23.6</td>
<td>42.9</td>
<td>60.6</td>
<td>20.0</td>
<td>0.0</td>
<td>80.0</td>
<td>14.1</td>
<td>27.8</td>
<td>39.3</td>
</tr>
<tr>
<td>Exerc., Consolidat., Pract</td>
<td>0.0</td>
<td>0.0</td>
<td>27.8</td>
<td>39.3</td>
<td>42.9</td>
<td>60.6</td>
<td>0.0</td>
<td>0.0</td>
<td>20.0</td>
<td>28.3</td>
<td>72.2</td>
<td>39.3</td>
</tr>
<tr>
<td>Discussion</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>10.0</td>
<td>14.1</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Investigation</td>
<td>0.0</td>
<td>0.0</td>
<td>33.3</td>
<td>15.7</td>
<td>21.4</td>
<td>30.3</td>
<td>40.0</td>
<td>56.6</td>
<td>50.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Applied Mathematics</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>5.0</td>
<td>7.1</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Problem Solving</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>20.0</td>
<td>28.3</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Working in Groups</td>
<td>6.3</td>
<td>8.8</td>
<td>5.6</td>
<td>7.9</td>
<td>28.6</td>
<td>0.0</td>
<td>80.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Single fact or step</td>
<td>100.0</td>
<td>0.0</td>
<td>88.9</td>
<td>15.7</td>
<td>71.4</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>95.0</td>
<td>7.1</td>
<td>100.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Several facts or steps</td>
<td>31.3</td>
<td>8.8</td>
<td>33.3</td>
<td>15.7</td>
<td>50.0</td>
<td>30.3</td>
<td>20.0</td>
<td>28.3</td>
<td>45.0</td>
<td>21.2</td>
<td>61.1</td>
<td>7.9</td>
</tr>
<tr>
<td>Extend knowledge or skill</td>
<td>6.3</td>
<td>8.8</td>
<td>11.1</td>
<td>15.7</td>
<td>21.4</td>
<td>30.3</td>
<td>30.0</td>
<td>42.4</td>
<td>25.0</td>
<td>7.1</td>
<td>44.4</td>
<td>47.1</td>
</tr>
</tbody>
</table>

Number of Segments 8 9 7 5 10 9
### Table 9 (cont'd): Classroom A: Summary (No Technology)

<table>
<thead>
<tr>
<th>Lesson</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tchr Quests (ave/5 min)</td>
<td>8.5</td>
<td>14.3</td>
<td>15.0</td>
<td>3.5</td>
<td>14.8</td>
<td>7.4</td>
</tr>
<tr>
<td>Stt Quests (ave/5 min)</td>
<td>1.5</td>
<td>0.7</td>
<td>0.7</td>
<td>0.7</td>
<td>0.7</td>
<td>0.7</td>
</tr>
<tr>
<td>% of Segments With:</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Homework Review</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Lesson Development</td>
<td>100.0</td>
<td>100.0</td>
<td>0.0</td>
<td>73.3</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Guided Practice</td>
<td>0.0</td>
<td>0.0</td>
<td>50.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Reviewing a Test</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Reviewing Material</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>50.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Using Calculators Only</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Using Computers Only</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Both Calc and Comps</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Student as Manager</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Student as Task Setter</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Student as Explainer</td>
<td>0.0</td>
<td>0.0</td>
<td>25.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Student as Consultant</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>St Fellow Investigator</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Student as Resource</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Students Passive</td>
<td>100.0</td>
<td>100.0</td>
<td>100.0</td>
<td>100.0</td>
<td>100.0</td>
<td>100.0</td>
</tr>
<tr>
<td>Students Active: Writing</td>
<td>50.0</td>
<td>50.0</td>
<td>50.0</td>
<td>63.3</td>
<td>100.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Students Active: Talking</td>
<td>100.0</td>
<td>100.0</td>
<td>100.0</td>
<td>100.0</td>
<td>100.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Students Didactic</td>
<td>100.0</td>
<td>100.0</td>
<td>100.0</td>
<td>90.0</td>
<td>100.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Students Symbolizing</td>
<td>0.0</td>
<td>50.0</td>
<td>50.0</td>
<td>0.0</td>
<td>50.0</td>
<td>70.7</td>
</tr>
<tr>
<td>Students Investigating</td>
<td>50.0</td>
<td>70.7</td>
<td>75.0</td>
<td>50.0</td>
<td>100.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Students Problem Solving</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Sts Higher Level Thinking</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>63.3</td>
<td>50.0</td>
</tr>
</tbody>
</table>

*Note: The table represents the percentage of segments with specific classroom behaviors across six lessons.*
### TABLE 9 (cont’d). CLASSROOM A: SUMMARY (NO TECHNOLOGY)

<table>
<thead>
<tr>
<th>Lesson</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
</tr>
</thead>
<tbody>
<tr>
<td>M</td>
<td>SD</td>
<td>M</td>
<td>SD</td>
<td>M</td>
<td>SD</td>
<td>M</td>
</tr>
<tr>
<td>% of Segments With:</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Teacher as Manager</td>
<td>100.0</td>
<td>0.0</td>
<td>100.0</td>
<td>0.0</td>
<td>100.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Teacher as Task Setter</td>
<td>100.0</td>
<td>0.0</td>
<td>75.0</td>
<td>35.4</td>
<td>100.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Teacher as Explainer</td>
<td>100.0</td>
<td>0.0</td>
<td>100.0</td>
<td>0.0</td>
<td>100.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Teacher as Consultant</td>
<td>0.0</td>
<td>0.0</td>
<td>25.0</td>
<td>35.4</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Tchr Fellow Investigator</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Teacher as Resource</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Exposition</td>
<td>100.0</td>
<td>0.0</td>
<td>100.0</td>
<td>0.0</td>
<td>50.0</td>
<td>70.7</td>
</tr>
<tr>
<td>Exerc, Consolidat, Pract</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>50.0</td>
<td>70.7</td>
</tr>
<tr>
<td>Discussion</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Investigation</td>
<td>0.0</td>
<td>0.0</td>
<td>50.0</td>
<td>70.7</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Applied Mathematics</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Problem Solving</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Working In Groups</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Single fact or step</td>
<td>100.0</td>
<td>0.0</td>
<td>100.0</td>
<td>0.0</td>
<td>100.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Several facts or steps</td>
<td>50.0</td>
<td>70.7</td>
<td>0.0</td>
<td>0.0</td>
<td>100.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Extend knowledge or skill</td>
<td>50.0</td>
<td>70.7</td>
<td>0.0</td>
<td>0.0</td>
<td>50.0</td>
<td>70.7</td>
</tr>
</tbody>
</table>

Number of Segments: 1, 1.5, 1, 0, 4, 1.5
<table>
<thead>
<tr>
<th></th>
<th>CLASSROOM A:</th>
<th>SUMMARY (WITH TECHNOLOGY)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>LESSON 1</td>
<td>M</td>
</tr>
<tr>
<td>Tchr Quests (ave/5 min)</td>
<td>5.7</td>
<td>0.2</td>
</tr>
<tr>
<td>St Quests (ave/5 min)</td>
<td>1.5</td>
<td>0.3</td>
</tr>
<tr>
<td>% of Segments With:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Homework Review</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Lesson Development</td>
<td>92.9</td>
<td>10.1</td>
</tr>
<tr>
<td>Guided Practice</td>
<td>7.1</td>
<td>10.1</td>
</tr>
<tr>
<td>Reviewing a Test</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Reviewing Material</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Using Calculators Only</td>
<td>50.0</td>
<td>30.3</td>
</tr>
<tr>
<td>Using Computers Only</td>
<td>7.1</td>
<td>10.1</td>
</tr>
<tr>
<td>Both Calcs and Comps</td>
<td>42.9</td>
<td>20.2</td>
</tr>
<tr>
<td>Student as Manager</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Student as Task Setter</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Student as Explainer</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Student as Consultant</td>
<td>7.1</td>
<td>10.1</td>
</tr>
<tr>
<td>St Fellow Investigator</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Student as Resource</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Students Passive</td>
<td>100.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Students Active: Writing</td>
<td>100.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Students Active: Talking</td>
<td>71.4</td>
<td>0.0</td>
</tr>
<tr>
<td>Students Didactic</td>
<td>92.9</td>
<td>10.1</td>
</tr>
<tr>
<td>Students Symbolizing</td>
<td>92.9</td>
<td>10.1</td>
</tr>
<tr>
<td>Students Investigating</td>
<td>21.4</td>
<td>10.1</td>
</tr>
<tr>
<td>Students Problem Solving</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Sts Higher Level Thinking</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>% of Segments With:</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>-------------------------------------------</td>
<td>----</td>
<td>----</td>
</tr>
<tr>
<td>Teacher as Manager</td>
<td>100.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Teacher as Task Setter</td>
<td>100.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Teacher as Explainer</td>
<td>92.9</td>
<td>10.1</td>
</tr>
<tr>
<td>Teacher as Consultant</td>
<td>42.9</td>
<td>0.0</td>
</tr>
<tr>
<td>Tchr Fellow Investigator</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Teacher as Resource</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Exposition</td>
<td>100.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Exerc, Consolidat, Pract</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Discussion</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Investigation</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Applied Mathematics</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Problem Solving</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Working in Groups</td>
<td>7.1</td>
<td>10.1</td>
</tr>
<tr>
<td>Single fact or step</td>
<td>100.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Several facts or steps</td>
<td>28.6</td>
<td>0.0</td>
</tr>
<tr>
<td>Extend knowledge or skill</td>
<td>0.0</td>
<td>0.0</td>
</tr>
</tbody>
</table>

Number of Segments 7 7.5 6 5 6 7.5
<table>
<thead>
<tr>
<th></th>
<th>LESSON</th>
<th>SUMMARY STATISTICS (TOTAL)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>M</td>
<td>SD</td>
</tr>
<tr>
<td>Tchr Questions (ave/5 min)</td>
<td>2.2</td>
<td>0.8</td>
</tr>
<tr>
<td>St Questions (ave/5 min)</td>
<td>1.8</td>
<td>0.4</td>
</tr>
<tr>
<td>% of Segments With:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Homework Review</td>
<td>63.6</td>
<td>12.9</td>
</tr>
<tr>
<td>Lesson Development</td>
<td>31.8</td>
<td>6.4</td>
</tr>
<tr>
<td>Guided Practice</td>
<td>22.7</td>
<td>32.1</td>
</tr>
<tr>
<td>Reviewing a Test</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Reviewing Material</td>
<td>81.8</td>
<td>12.9</td>
</tr>
<tr>
<td>Using Calculators Only</td>
<td>9.1</td>
<td>12.9</td>
</tr>
<tr>
<td>Using Computers Only</td>
<td>18.2</td>
<td>12.9</td>
</tr>
<tr>
<td>Both Cals and Comps</td>
<td>9.1</td>
<td>12.9</td>
</tr>
<tr>
<td>Student as Manager</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Student as Task Setter</td>
<td>27.3</td>
<td>38.6</td>
</tr>
<tr>
<td>Student as Explainer</td>
<td>13.6</td>
<td>19.3</td>
</tr>
<tr>
<td>Student as Consultant</td>
<td>9.1</td>
<td>0.0</td>
</tr>
<tr>
<td>St Fellow Investigator</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Student as Resource</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Students Passive</td>
<td>100.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Students Active: Writing</td>
<td>54.5</td>
<td>0.0</td>
</tr>
<tr>
<td>Students Active: Talking</td>
<td>100.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Students Didactic</td>
<td>100.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Students Symbolizing</td>
<td>59.1</td>
<td>32.1</td>
</tr>
<tr>
<td>Students Investigating</td>
<td>81.8</td>
<td>12.9</td>
</tr>
<tr>
<td>Students Problem Solving</td>
<td>4.5</td>
<td>6.4</td>
</tr>
<tr>
<td>Sts Higher Level Thinking</td>
<td>63.6</td>
<td>12.9</td>
</tr>
<tr>
<td>% of Segments With:</td>
<td>LESSON 1</td>
<td></td>
</tr>
<tr>
<td>-----------------------------------------</td>
<td>----------</td>
<td>---</td>
</tr>
<tr>
<td>Teacher as Manager</td>
<td>100.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Teacher as Task Setter</td>
<td>40.9</td>
<td>19.3</td>
</tr>
<tr>
<td>Teacher as Explaner</td>
<td>90.9</td>
<td>12.9</td>
</tr>
<tr>
<td>Teacher as Consultant</td>
<td>22.7</td>
<td>32.1</td>
</tr>
<tr>
<td>Tchr Fellow Investigator</td>
<td>31.8</td>
<td>8.4</td>
</tr>
<tr>
<td>Teacher as Resource</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Exposition</td>
<td>54.5</td>
<td>12.9</td>
</tr>
<tr>
<td>Exerc, Consolidat, Pract</td>
<td>63.6</td>
<td>12.9</td>
</tr>
<tr>
<td>Discussion</td>
<td>9.1</td>
<td>12.9</td>
</tr>
<tr>
<td>Investigation</td>
<td>36.4</td>
<td>38.6</td>
</tr>
<tr>
<td>Applied Mathematics</td>
<td>22.7</td>
<td>32.1</td>
</tr>
<tr>
<td>Problem Solving</td>
<td>13.6</td>
<td>19.3</td>
</tr>
<tr>
<td>Working in Groups</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Single fact or step</td>
<td>81.8</td>
<td>0.0</td>
</tr>
<tr>
<td>Several facts or steps</td>
<td>22.7</td>
<td>19.3</td>
</tr>
<tr>
<td>Extend knowledge or skill</td>
<td>13.6</td>
<td>6.4</td>
</tr>
<tr>
<td>Number of Segments</td>
<td>11</td>
<td>9</td>
</tr>
<tr>
<td></td>
<td>M</td>
<td>SD</td>
</tr>
<tr>
<td>------------------</td>
<td>------</td>
<td>------</td>
</tr>
<tr>
<td>Tchr Quests (ave/5 min)</td>
<td>2.6</td>
<td>1.4</td>
</tr>
<tr>
<td>St Quests (ave/5 min)</td>
<td>1.8</td>
<td>0.3</td>
</tr>
<tr>
<td>% of Segments With:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Homework Review</td>
<td>56.3</td>
<td>8.8</td>
</tr>
<tr>
<td>Lesson Development</td>
<td>37.5</td>
<td>17.7</td>
</tr>
<tr>
<td>Guided Practice</td>
<td>25.0</td>
<td>35.4</td>
</tr>
<tr>
<td>Reviewing a Test</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Reviewing Material</td>
<td>68.8</td>
<td>26.5</td>
</tr>
<tr>
<td>Using Calculators Only</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Using Computers Only</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Both Calcs and Comp</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Student as Manager</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Student as Task Setter</td>
<td>25.0</td>
<td>35.4</td>
</tr>
<tr>
<td>Student as Explainer</td>
<td>8.3</td>
<td>11.8</td>
</tr>
<tr>
<td>Student as Consultant</td>
<td>14.6</td>
<td>2.9</td>
</tr>
<tr>
<td>St Fellow Investigator</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Student as Resource</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Students Passive</td>
<td>100.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Students Active: Writing</td>
<td>33.3</td>
<td>23.6</td>
</tr>
<tr>
<td>Students Active: Talking</td>
<td>100.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Students Didactic</td>
<td>100.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Students Symbolizing</td>
<td>58.3</td>
<td>11.8</td>
</tr>
<tr>
<td>Students Investigating</td>
<td>72.9</td>
<td>14.7</td>
</tr>
<tr>
<td>Students Problem Solving</td>
<td>6.3</td>
<td>8.8</td>
</tr>
<tr>
<td>Sts Higher Level Thinking</td>
<td>62.5</td>
<td>17.7</td>
</tr>
<tr>
<td>LESSON</td>
<td>SUMMARY (NO TECHNOLOGY)</td>
<td></td>
</tr>
<tr>
<td>--------</td>
<td>-------------------------</td>
<td></td>
</tr>
<tr>
<td></td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>% of Segments With:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Teacher as Manager</td>
<td>100.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Teacher as Task Setter</td>
<td>50.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Teacher as Explain</td>
<td>87.5</td>
<td>17.7</td>
</tr>
<tr>
<td>Teacher as Consultant</td>
<td>25.0</td>
<td>35.4</td>
</tr>
<tr>
<td>Tchr Fellow Investigator</td>
<td>50.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Teacher as Resource</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Exposition</td>
<td>50.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Exerc, Consolidat, Pract</td>
<td>68.8</td>
<td>26.5</td>
</tr>
<tr>
<td>Discussion</td>
<td>16.7</td>
<td>23.6</td>
</tr>
<tr>
<td>Investigation</td>
<td>25.0</td>
<td>35.4</td>
</tr>
<tr>
<td>Applied Mathematics</td>
<td>12.5</td>
<td>17.7</td>
</tr>
<tr>
<td>Problem Solving</td>
<td>18.8</td>
<td>26.5</td>
</tr>
<tr>
<td>Working in Groups</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Single fact or step</td>
<td>79.2</td>
<td>5.9</td>
</tr>
<tr>
<td>Several facts or steps</td>
<td>16.7</td>
<td>23.6</td>
</tr>
<tr>
<td>Extend knowledge or skill</td>
<td>20.8</td>
<td>5.9</td>
</tr>
</tbody>
</table>

Number of Segments: 7, 1.5, 6, 4, 3, 6
<table>
<thead>
<tr>
<th></th>
<th>LESSON 1</th>
<th></th>
<th>LESSON 2</th>
<th></th>
<th>LESSON 3</th>
<th></th>
<th>LESSON 4</th>
<th></th>
<th>LESSON 5</th>
<th></th>
<th>LESSON 6</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Tchr Quests (ave/5 min)</strong></td>
<td>1.6 0.0</td>
<td>1.3 0.1</td>
<td>1.8 0.4</td>
<td>5.5 2.1</td>
<td>1.0 0.9</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>St Quests (ave/5 min)</strong></td>
<td>1.6 0.8</td>
<td>3.9 0.6</td>
<td>1.9 0.5</td>
<td>2.5 0.7</td>
<td>4.3 0.9</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>% of Segments With:</strong></td>
<td></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>Homework Review</td>
<td>66.7 47.1</td>
<td>50.0 70.7</td>
<td>0.0 0.0</td>
<td>0.0 0.0</td>
<td>0.0 0.0</td>
<td>0.0 0.0</td>
<td>0.0 0.0</td>
<td>0.0 0.0</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lesson Development</td>
<td>33.3 47.1</td>
<td>7.1 10.1</td>
<td>0.0 0.0</td>
<td>100.0 0.0</td>
<td>50.0 70.7</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Guided Practice</td>
<td>20.0 28.3</td>
<td>78.6 30.3</td>
<td>50.0 70.7</td>
<td>0.0 0.0</td>
<td>50.0 70.7</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Reviewing a Test</td>
<td>0.0 0.0</td>
<td>0.0 0.0</td>
<td>0.0 0.0</td>
<td>0.0 0.0</td>
<td>0.0 0.0</td>
<td>0.0 0.0</td>
<td>0.0 0.0</td>
<td>0.0 0.0</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Reviewing Material</td>
<td>100.0 0.0</td>
<td>71.4 40.4</td>
<td>100.0 0.0</td>
<td>0.0 0.0</td>
<td>0.0 0.0</td>
<td>0.0 0.0</td>
<td>0.0 0.0</td>
<td>0.0 0.0</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Using Calculators Only</td>
<td>20.0 28.3</td>
<td>59.8 3.8</td>
<td>37.5 17.7</td>
<td>100.0 0.0</td>
<td>100.0 0.0</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Using Computers Only</td>
<td>60.0 56.6</td>
<td>0.0 0.0</td>
<td>37.5 17.7</td>
<td>0.0 0.0</td>
<td>0.0 0.0</td>
<td>0.0 0.0</td>
<td>0.0 0.0</td>
<td>0.0 0.0</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Both Calcs and Comps</td>
<td>20.0 28.3</td>
<td>40.2 3.8</td>
<td>25.0 35.4</td>
<td>0.0 0.0</td>
<td>0.0 0.0</td>
<td>0.0 0.0</td>
<td>0.0 0.0</td>
<td>0.0 0.0</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Student as Manager</td>
<td>0.0 0.0</td>
<td>0.0 0.0</td>
<td>0.0 0.0</td>
<td>0.0 0.0</td>
<td>0.0 0.0</td>
<td>0.0 0.0</td>
<td>0.0 0.0</td>
<td>0.0 0.0</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Student as Task Setter</td>
<td>30.0 42.4</td>
<td>6.3 8.8</td>
<td>12.5 17.7</td>
<td>0.0 0.0</td>
<td>0.0 0.0</td>
<td>0.0 0.0</td>
<td>0.0 0.0</td>
<td>0.0 0.0</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Student as Explainer</td>
<td>20.0 28.3</td>
<td>0.0 0.0</td>
<td>0.0 0.0</td>
<td>50.0 70.7</td>
<td>0.0 0.0</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Student as Consultant</td>
<td>0.0 0.0</td>
<td>0.0 0.0</td>
<td>0.0 0.0</td>
<td>0.0 0.0</td>
<td>33.3 47.1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>St Fellow Investigator</td>
<td>0.0 0.0</td>
<td>0.0 0.0</td>
<td>0.0 0.0</td>
<td>0.0 0.0</td>
<td>16.7 23.6</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Student as Resource</td>
<td>0.0 0.0</td>
<td>0.0 0.0</td>
<td>0.0 0.0</td>
<td>0.0 0.0</td>
<td>0.0 0.0</td>
<td>0.0 0.0</td>
<td>0.0 0.0</td>
<td>0.0 0.0</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Students Passive</td>
<td>100.0 0.0</td>
<td>100.0 0.0</td>
<td>100.0 0.0</td>
<td>100.0 0.0</td>
<td>100.0 0.0</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Students Active: Writing</td>
<td>83.3 23.6</td>
<td>93.8 8.8</td>
<td>62.5 53.0</td>
<td>50.0 70.7</td>
<td>100.0 0.0</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Students Active: Talking</td>
<td>100.0 0.0</td>
<td>100.0 0.0</td>
<td>87.5 17.7</td>
<td>100.0 0.0</td>
<td>100.0 0.0</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Students Didactic</td>
<td>100.0 0.0</td>
<td>93.8 8.8</td>
<td>87.5 17.7</td>
<td>100.0 0.0</td>
<td>100.0 0.0</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Students Symbolizing</td>
<td>50.0 70.7</td>
<td>93.8 8.8</td>
<td>62.5 53.0</td>
<td>50.0 70.7</td>
<td>100.0 0.0</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Students Investigating</td>
<td>100.0 0.0</td>
<td>100.0 0.0</td>
<td>75.0 35.4</td>
<td>50.0 70.7</td>
<td>100.0 0.0</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Students Problem Solving</td>
<td>0.0 0.0</td>
<td>6.3 8.8</td>
<td>0.0 0.0</td>
<td>50.0 70.7</td>
<td>0.0 0.0</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sts Higher Level Thinking</td>
<td>50.0 70.7</td>
<td>18.8 26.5</td>
<td>50.0 35.4</td>
<td>50.0 70.7</td>
<td>50.0 70.7</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>% of Segments With:</td>
<td>LESSON 1</td>
<td></td>
<td>LESSON 2</td>
<td></td>
<td>LESSON 3</td>
<td></td>
<td>LESSON 4</td>
<td></td>
<td>LESSON 5</td>
<td></td>
<td>LESSON 6</td>
<td></td>
</tr>
<tr>
<td>----------------------------------------</td>
<td>----------</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>Teacher as Manager</td>
<td>100.0</td>
<td>0.0</td>
<td>100.0</td>
<td>0.0</td>
<td>100.0</td>
<td>0.0</td>
<td>100.0</td>
<td>0.0</td>
<td>100.0</td>
<td>0.0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Teacher as Task Setter</td>
<td>33.3</td>
<td>47.1</td>
<td>62.5</td>
<td>53.0</td>
<td>37.5</td>
<td>53.0</td>
<td>100.0</td>
<td>0.0</td>
<td>100.0</td>
<td>0.0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Teacher as Explainer</td>
<td>100.0</td>
<td>0.0</td>
<td>93.8</td>
<td>8.8</td>
<td>100.0</td>
<td>0.0</td>
<td>100.0</td>
<td>0.0</td>
<td>83.3</td>
<td>23.6</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Teacher as Consultant</td>
<td>16.7</td>
<td>23.6</td>
<td>26.8</td>
<td>2.5</td>
<td>50.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>16.7</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tchr Fellow Investigator</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>33.3</td>
<td>47.1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Teacher as Resource</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>50.0</td>
<td>70.7</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Exposition</td>
<td>70.0</td>
<td>42.4</td>
<td>56.3</td>
<td>61.9</td>
<td>12.5</td>
<td>17.7</td>
<td>100.0</td>
<td>0.0</td>
<td>100.0</td>
<td>0.0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Exerc, Consolat, Pract</td>
<td>46.7</td>
<td>18.9</td>
<td>93.8</td>
<td>8.8</td>
<td>100.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>50.0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Discussion</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>50.0</td>
<td>70.7</td>
<td>16.7</td>
<td>23.6</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Investigation</td>
<td>56.7</td>
<td>33.0</td>
<td>0.0</td>
<td>0.0</td>
<td>50.0</td>
<td>70.7</td>
<td>50.0</td>
<td>70.7</td>
<td>33.3</td>
<td>47.1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Applied Mathematics</td>
<td>50.0</td>
<td>70.7</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Problem Solving</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Working in Groups</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Single fact or step</td>
<td>90.0</td>
<td>14.1</td>
<td>53.6</td>
<td>5.1</td>
<td>75.0</td>
<td>35.4</td>
<td>100.0</td>
<td>0.0</td>
<td>0.0</td>
<td>29.2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Several facts or steps</td>
<td>36.7</td>
<td>4.7</td>
<td>25.9</td>
<td>16.4</td>
<td>50.0</td>
<td>35.4</td>
<td>100.0</td>
<td>0.0</td>
<td>0.0</td>
<td>18.8</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Extend knowledge or skill</td>
<td>0.0</td>
<td>0.0</td>
<td>7.1</td>
<td>10.1</td>
<td>0.0</td>
<td>0.0</td>
<td>50.0</td>
<td>70.7</td>
<td>12.5</td>
<td>17.7</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Number of Segments: 4, 7.5, 0, 2, 1, 5
<table>
<thead>
<tr>
<th>TABLE 11. CLASSROOM C: SUMMARY STATISTICS (TOTAL)</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>LESSON</strong></td>
<td><strong>M</strong></td>
<td><strong>SD</strong></td>
<td><strong>M</strong></td>
<td><strong>SD</strong></td>
<td><strong>M</strong></td>
<td><strong>SD</strong></td>
</tr>
<tr>
<td>Tchr Quests (ave/5 min)</td>
<td>10.5</td>
<td>5.7</td>
<td>2.4</td>
<td>1.4</td>
<td>4.7</td>
<td>0.5</td>
</tr>
<tr>
<td>Stt Quests (ave/5 min)</td>
<td>0.2</td>
<td>0.2</td>
<td>1.4</td>
<td>1.9</td>
<td>1.1</td>
<td>0.4</td>
</tr>
<tr>
<td><strong>% of Segments With:</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Homework Review</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>50.0</td>
<td>70.7</td>
</tr>
<tr>
<td>Lesson Development</td>
<td>37.9</td>
<td>40.7</td>
<td>43.8</td>
<td>61.9</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Guided Practice</td>
<td>83.3</td>
<td>23.6</td>
<td>50.0</td>
<td>70.7</td>
<td>50.0</td>
<td>70.7</td>
</tr>
<tr>
<td>Reviewing a Test</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Reviewing Material</td>
<td>11.1</td>
<td>15.7</td>
<td>12.5</td>
<td>17.7</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Using Calculators Only</td>
<td>34.8</td>
<td>2.1</td>
<td>10.0</td>
<td>0.0</td>
<td>5.6</td>
<td>7.9</td>
</tr>
<tr>
<td>Using Computers Only</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>11.1</td>
<td>15.7</td>
</tr>
<tr>
<td>Both Calcs and Comps</td>
<td>0.0</td>
<td>0.0</td>
<td>87.5</td>
<td>0.0</td>
<td>90.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Student as Manager</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>25.0</td>
<td>35.4</td>
</tr>
<tr>
<td>Student as Task Setter</td>
<td>34.8</td>
<td>2.1</td>
<td>43.8</td>
<td>61.9</td>
<td>60.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Student as Explainer</td>
<td>27.8</td>
<td>39.3</td>
<td>0.0</td>
<td>0.0</td>
<td>15.0</td>
<td>21.2</td>
</tr>
<tr>
<td>Student as Consultant</td>
<td>22.2</td>
<td>31.4</td>
<td>18.8</td>
<td>26.5</td>
<td>40.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Stt Fellow Investigator</td>
<td>0.0</td>
<td>0.0</td>
<td>43.8</td>
<td>61.9</td>
<td>10.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Student as Resource</td>
<td>22.2</td>
<td>31.4</td>
<td>0.0</td>
<td>0.0</td>
<td>10.0</td>
<td>14.1</td>
</tr>
<tr>
<td>Students Passive</td>
<td>100.0</td>
<td>0.0</td>
<td>62.5</td>
<td>53.0</td>
<td>75.0</td>
<td>35.4</td>
</tr>
<tr>
<td>Students Active: Writing</td>
<td>60.6</td>
<td>8.6</td>
<td>93.8</td>
<td>8.8</td>
<td>100.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Students Active: Talking</td>
<td>100.0</td>
<td>0.0</td>
<td>100.0</td>
<td>0.0</td>
<td>100.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Students Didactic</td>
<td>100.0</td>
<td>0.0</td>
<td>56.3</td>
<td>61.9</td>
<td>70.0</td>
<td>28.3</td>
</tr>
<tr>
<td>Students Symbolizing</td>
<td>66.2</td>
<td>16.4</td>
<td>93.8</td>
<td>8.8</td>
<td>100.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Students Investigating</td>
<td>85.4</td>
<td>5.0</td>
<td>93.8</td>
<td>8.8</td>
<td>100.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Students Problem Solving</td>
<td>0.0</td>
<td>0.0</td>
<td>37.5</td>
<td>53.0</td>
<td>30.0</td>
<td>14.1</td>
</tr>
<tr>
<td>Sts Higher Level Thinking</td>
<td>22.2</td>
<td>31.4</td>
<td>37.5</td>
<td>53.0</td>
<td>55.0</td>
<td>35.4</td>
</tr>
<tr>
<td>% of Segments With:</td>
<td>CLASSROOM C:</td>
<td>SUMMARY STATISTICS (TOTAL)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>---------------------</td>
<td>--------------</td>
<td>-----------------------------</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>LESSON 1</td>
<td>M</td>
<td>SD</td>
<td>LESSON 2</td>
<td>M</td>
<td>SD</td>
</tr>
<tr>
<td>Teacher as Manager</td>
<td>100.0</td>
<td>0.0</td>
<td></td>
<td>100.0</td>
<td>0.0</td>
<td></td>
</tr>
<tr>
<td>Teacher as Task Setter</td>
<td>100.0</td>
<td>0.0</td>
<td></td>
<td>87.5</td>
<td>17.7</td>
<td></td>
</tr>
<tr>
<td>Teacher as Explainer</td>
<td>45.5</td>
<td>64.3</td>
<td></td>
<td>56.3</td>
<td>26.5</td>
<td></td>
</tr>
<tr>
<td>Teacher as Consultant</td>
<td>0.0</td>
<td>0.0</td>
<td></td>
<td>87.5</td>
<td>0.0</td>
<td></td>
</tr>
<tr>
<td>Tchr Fellow Investigator</td>
<td>50.0</td>
<td>70.7</td>
<td></td>
<td>0.0</td>
<td>0.0</td>
<td></td>
</tr>
<tr>
<td>Teacher as Resource</td>
<td>0.0</td>
<td>0.0</td>
<td></td>
<td>0.0</td>
<td>0.0</td>
<td></td>
</tr>
<tr>
<td>Exposition</td>
<td>45.5</td>
<td>64.3</td>
<td></td>
<td>0.0</td>
<td>0.0</td>
<td></td>
</tr>
<tr>
<td>Exerc, Consolidat, Pract</td>
<td>83.3</td>
<td>23.6</td>
<td></td>
<td>25.0</td>
<td>0.0</td>
<td></td>
</tr>
<tr>
<td>Discussion</td>
<td>0.0</td>
<td>0.0</td>
<td></td>
<td>37.5</td>
<td>53.0</td>
<td></td>
</tr>
<tr>
<td>Investigation</td>
<td>50.0</td>
<td>70.7</td>
<td></td>
<td>43.8</td>
<td>61.9</td>
<td></td>
</tr>
<tr>
<td>Applied Mathematics</td>
<td>0.0</td>
<td>0.0</td>
<td></td>
<td>0.0</td>
<td>0.0</td>
<td></td>
</tr>
<tr>
<td>Problem Solving</td>
<td>0.0</td>
<td>0.0</td>
<td></td>
<td>0.0</td>
<td>0.0</td>
<td></td>
</tr>
<tr>
<td>Working In Groups</td>
<td>0.0</td>
<td>0.0</td>
<td></td>
<td>87.5</td>
<td>0.0</td>
<td></td>
</tr>
<tr>
<td>Single fact or step</td>
<td>94.4</td>
<td>7.9</td>
<td></td>
<td>50.0</td>
<td>53.0</td>
<td></td>
</tr>
<tr>
<td>Several facts or steps</td>
<td>94.4</td>
<td>7.9</td>
<td></td>
<td>12.5</td>
<td>0.0</td>
<td></td>
</tr>
<tr>
<td>Extend knowledge or skill</td>
<td>50.0</td>
<td>70.7</td>
<td></td>
<td>37.5</td>
<td>35.4</td>
<td></td>
</tr>
</tbody>
</table>

Number of Segments: 9, 8, 10, 9, 9, 9
<table>
<thead>
<tr>
<th></th>
<th>LESSON 1</th>
<th></th>
<th>LESSON 2</th>
<th></th>
<th>LESSON 3</th>
<th></th>
<th>LESSON 4</th>
<th></th>
<th>LESSON 5</th>
<th></th>
<th>LESSON 6</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>M</td>
<td>SD</td>
<td>M</td>
<td>SD</td>
<td>M</td>
<td>SD</td>
<td>M</td>
<td>SD</td>
<td>M</td>
<td>SD</td>
<td>M</td>
<td>SD</td>
</tr>
<tr>
<td>Tchr Quests (ave/5 min)</td>
<td>9.6</td>
<td>5.6</td>
<td>9.5</td>
<td>2.1</td>
<td></td>
<td></td>
<td>11.5</td>
<td>4.9</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>St Quests (ave/5 min)</td>
<td>0.3</td>
<td>0.4</td>
<td>0.0</td>
<td>0.0</td>
<td></td>
<td></td>
<td>0.0</td>
<td>0.0</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>% of Segments With:</td>
<td></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>Homework Review</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td></td>
<td></td>
<td>0.0</td>
<td>0.0</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lesson Development</td>
<td>32.1</td>
<td>25.3</td>
<td>0.0</td>
<td>0.0</td>
<td></td>
<td></td>
<td>0.0</td>
<td>0.0</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Guided Practice</td>
<td>83.3</td>
<td>23.6</td>
<td>50.0</td>
<td>70.7</td>
<td></td>
<td></td>
<td>100.0</td>
<td>0.0</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Reviewing a Test</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td></td>
<td></td>
<td>0.0</td>
<td>0.0</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Reviewing Material</td>
<td>8.3</td>
<td>11.8</td>
<td>50.0</td>
<td>70.7</td>
<td></td>
<td></td>
<td>0.0</td>
<td>0.0</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Using Calculators Only</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td></td>
<td></td>
<td>0.0</td>
<td>0.0</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Using Computers Only</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td></td>
<td></td>
<td>0.0</td>
<td>0.0</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Both Calcs and Comps</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td></td>
<td></td>
<td>0.0</td>
<td>0.0</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Student as Manager</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td></td>
<td></td>
<td>0.0</td>
<td>0.0</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Student as Task Setter</td>
<td>38.1</td>
<td>6.7</td>
<td>0.0</td>
<td>0.0</td>
<td></td>
<td></td>
<td>50.0</td>
<td>70.7</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Student as Explainer</td>
<td>33.3</td>
<td>47.1</td>
<td>0.0</td>
<td>0.0</td>
<td></td>
<td></td>
<td>0.0</td>
<td>0.0</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Student as Consultant</td>
<td>25.0</td>
<td>35.4</td>
<td>0.0</td>
<td>0.0</td>
<td></td>
<td></td>
<td>50.0</td>
<td>70.7</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>St Fellow Investigator</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td></td>
<td></td>
<td>0.0</td>
<td>0.0</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Student as Resource</td>
<td>25.0</td>
<td>35.4</td>
<td>0.0</td>
<td>0.0</td>
<td></td>
<td></td>
<td>0.0</td>
<td>0.0</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Students Passive</td>
<td>100.0</td>
<td>0.0</td>
<td>100.0</td>
<td>0.0</td>
<td></td>
<td></td>
<td>100.0</td>
<td>0.0</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Students Active: Writing</td>
<td>39.3</td>
<td>15.2</td>
<td>50.0</td>
<td>70.7</td>
<td></td>
<td></td>
<td>50.0</td>
<td>70.7</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Students Active: Talking</td>
<td>100.0</td>
<td>0.0</td>
<td>100.0</td>
<td>0.0</td>
<td></td>
<td></td>
<td>100.0</td>
<td>0.0</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Students Didactic</td>
<td>100.0</td>
<td>0.0</td>
<td>100.0</td>
<td>0.0</td>
<td></td>
<td></td>
<td>100.0</td>
<td>0.0</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Students Symbolizing</td>
<td>47.6</td>
<td>26.9</td>
<td>50.0</td>
<td>70.7</td>
<td></td>
<td></td>
<td>50.0</td>
<td>70.7</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Students Investigating</td>
<td>84.5</td>
<td>1.7</td>
<td>50.0</td>
<td>70.7</td>
<td></td>
<td></td>
<td>50.0</td>
<td>70.7</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Students Problem Solving</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td></td>
<td></td>
<td>50.0</td>
<td>70.7</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sts Higher Level Thinking</td>
<td>16.7</td>
<td>23.6</td>
<td>0.0</td>
<td>0.0</td>
<td></td>
<td></td>
<td>50.0</td>
<td>70.7</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>% of Segments With:</td>
<td>LESSON 1</td>
<td></td>
<td>LESSON 2</td>
<td></td>
<td>LESSON 3</td>
<td></td>
<td>LESSON 4</td>
<td></td>
<td>LESSON 5</td>
<td></td>
<td>LESSON 6</td>
<td></td>
</tr>
<tr>
<td>-----------------------------------------</td>
<td>----------</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>Teacher as Manager</td>
<td>100.0</td>
<td>0.0</td>
<td>100.0</td>
<td>0.0</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>100.0</td>
<td>0.0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Teacher as Task Setter</td>
<td>100.0</td>
<td>0.0</td>
<td>100.0</td>
<td>0.0</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>100.0</td>
<td>0.0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Teacher as Explainer</td>
<td>42.9</td>
<td>60.6</td>
<td>100.0</td>
<td>0.0</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>100.0</td>
<td>0.0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Teacher as Consultant</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>0.0</td>
<td>0.0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tchr Fellow Investigator</td>
<td>50.0</td>
<td>70.7</td>
<td>0.0</td>
<td>0.0</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>0.0</td>
<td>0.0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Teacher as Resource</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>0.0</td>
<td>0.0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Exposition</td>
<td>42.9</td>
<td>60.6</td>
<td>0.0</td>
<td>0.0</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>0.0</td>
<td>0.0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Exerc, Consolidat, Pract</td>
<td>83.3</td>
<td>23.6</td>
<td>100.0</td>
<td>0.0</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>50.0</td>
<td>70.7</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Discussion</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>0.0</td>
<td>0.0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Investigation</td>
<td>50.0</td>
<td>70.7</td>
<td>0.0</td>
<td>0.0</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>50.0</td>
<td>70.7</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Applied Mathematics</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>50.0</td>
<td>70.7</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Problem Solving</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>50.0</td>
<td>70.7</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Working in Groups</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>0.0</td>
<td>0.0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Single fact or step</td>
<td>91.7</td>
<td>11.8</td>
<td>100.0</td>
<td>0.0</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>100.0</td>
<td>0.0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Several facts or steps</td>
<td>91.7</td>
<td>11.8</td>
<td>50.0</td>
<td>70.7</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>100.0</td>
<td>0.0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Extend knowledge or skill</td>
<td>50.0</td>
<td>70.7</td>
<td>50.0</td>
<td>70.7</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>50.0</td>
<td>70.7</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Number of Segments                      | 6        | 1  | 0        | 0  | 0        | 1  | 0        |   |
<table>
<thead>
<tr>
<th></th>
<th>SUMMARY (WITH TECHNOLOGY)</th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>LESSON 1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td></td>
</tr>
<tr>
<td></td>
<td>M</td>
<td>SD</td>
<td>M</td>
<td>SD</td>
<td>M</td>
<td>SD</td>
<td>M</td>
</tr>
<tr>
<td>Tchr Quests</td>
<td>12.1</td>
<td>5.8</td>
<td>1.4</td>
<td>1.9</td>
<td>4.7</td>
<td>0.5</td>
<td>7.6</td>
</tr>
<tr>
<td>(ave/5 min)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>St Quests</td>
<td>0.2</td>
<td>0.2</td>
<td>1.6</td>
<td>2.2</td>
<td>1.1</td>
<td>0.4</td>
<td>0.7</td>
</tr>
<tr>
<td>(ave/5 min)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>% of Segments</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>With:</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Homework</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Reviewing</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>12.5</td>
</tr>
<tr>
<td>a Test</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Reviewing</td>
<td>16.7</td>
<td>23.6</td>
<td>7.1</td>
<td>10.1</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Material</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Using</td>
<td>100.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>10.0</td>
<td>0.0</td>
<td>5.6</td>
</tr>
<tr>
<td>Calculators</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Only</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Using</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>11.1</td>
</tr>
<tr>
<td>Computers</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Only</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Both</td>
<td>0.0</td>
<td>0.0</td>
<td>100.0</td>
<td>0.0</td>
<td>90.0</td>
<td>0.0</td>
<td>83.3</td>
</tr>
<tr>
<td>Calcs and</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Comps</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Student as</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>25.0</td>
<td>35.4</td>
<td>0.0</td>
</tr>
<tr>
<td>Manager</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Student as</td>
<td>29.2</td>
<td>5.9</td>
<td>50.0</td>
<td>70.7</td>
<td>60.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Task Setter</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Student as</td>
<td>16.7</td>
<td>23.6</td>
<td>0.0</td>
<td>0.0</td>
<td>15.0</td>
<td>21.2</td>
<td>0.0</td>
</tr>
<tr>
<td>Expainer</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Student as</td>
<td>16.7</td>
<td>23.6</td>
<td>21.4</td>
<td>30.3</td>
<td>40.0</td>
<td>0.0</td>
<td>11.1</td>
</tr>
<tr>
<td>Consultant</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>St Fellow</td>
<td>0.0</td>
<td>0.0</td>
<td>50.0</td>
<td>70.7</td>
<td>10.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Investigator</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Student as</td>
<td>16.7</td>
<td>23.6</td>
<td>0.0</td>
<td>0.0</td>
<td>10.0</td>
<td>14.1</td>
<td>0.0</td>
</tr>
<tr>
<td>Resource</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Students</td>
<td>100.0</td>
<td>0.0</td>
<td>57.1</td>
<td>60.6</td>
<td>75.0</td>
<td>35.4</td>
<td>100.0</td>
</tr>
<tr>
<td>Passive</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Students</td>
<td>100.0</td>
<td>0.0</td>
<td>100.0</td>
<td>0.0</td>
<td>100.0</td>
<td>0.0</td>
<td>100.0</td>
</tr>
<tr>
<td>Active: Writing</td>
<td>100.0</td>
<td>0.0</td>
<td>100.0</td>
<td>0.0</td>
<td>100.0</td>
<td>0.0</td>
<td>100.0</td>
</tr>
<tr>
<td>Students</td>
<td>100.0</td>
<td>0.0</td>
<td>100.0</td>
<td>0.0</td>
<td>100.0</td>
<td>0.0</td>
<td>100.0</td>
</tr>
<tr>
<td>Active: Talking</td>
<td>100.0</td>
<td>0.0</td>
<td>100.0</td>
<td>0.0</td>
<td>100.0</td>
<td>0.0</td>
<td>100.0</td>
</tr>
<tr>
<td>Students</td>
<td>100.0</td>
<td>0.0</td>
<td>50.0</td>
<td>70.7</td>
<td>70.0</td>
<td>28.3</td>
<td>94.4</td>
</tr>
<tr>
<td>Didactic</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Students</td>
<td>100.0</td>
<td>0.0</td>
<td>100.0</td>
<td>0.0</td>
<td>100.0</td>
<td>0.0</td>
<td>100.0</td>
</tr>
<tr>
<td>Symbolizing</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Students</td>
<td>87.5</td>
<td>17.7</td>
<td>100.0</td>
<td>0.0</td>
<td>100.0</td>
<td>0.0</td>
<td>94.4</td>
</tr>
<tr>
<td>Investigating</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Students</td>
<td>0.0</td>
<td>0.0</td>
<td>42.9</td>
<td>60.6</td>
<td>30.0</td>
<td>14.1</td>
<td>16.7</td>
</tr>
<tr>
<td>Problem Solving</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sts Higher</td>
<td>33.3</td>
<td>47.1</td>
<td>42.9</td>
<td>60.6</td>
<td>55.0</td>
<td>35.4</td>
<td>38.9</td>
</tr>
<tr>
<td>Level Thinking</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lesson</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td></td>
</tr>
<tr>
<td>--------</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td></td>
</tr>
<tr>
<td><strong>% of Segments With:</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Teacher as Manager</td>
<td>100.0</td>
<td>0.0</td>
<td>100.0</td>
<td>0.0</td>
<td>100.0</td>
<td>0.0</td>
<td>100.0</td>
</tr>
<tr>
<td>Teacher as Task Setter</td>
<td>100.0</td>
<td>0.0</td>
<td>85.7</td>
<td>20.2</td>
<td>45.0</td>
<td>7.1</td>
<td>94.4</td>
</tr>
<tr>
<td>Teacher as Explainer</td>
<td>50.0</td>
<td>70.7</td>
<td>50.0</td>
<td>30.3</td>
<td>50.0</td>
<td>28.3</td>
<td>77.8</td>
</tr>
<tr>
<td>Teacher as Consultant</td>
<td>0.0</td>
<td>0.0</td>
<td>100.0</td>
<td>0.0</td>
<td>55.0</td>
<td>7.1</td>
<td>11.1</td>
</tr>
<tr>
<td>Tchr Fellow Investigator</td>
<td>50.0</td>
<td>70.7</td>
<td>0.0</td>
<td>0.0</td>
<td>35.0</td>
<td>21.2</td>
<td>72.2</td>
</tr>
<tr>
<td>Teacher as Resource</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>5.0</td>
<td>7.1</td>
<td>0.0</td>
</tr>
<tr>
<td>Exposition</td>
<td>50.0</td>
<td>70.7</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>22.2</td>
</tr>
<tr>
<td>Exerc, Consolidat, Pract</td>
<td>83.3</td>
<td>23.6</td>
<td>14.3</td>
<td>0.0</td>
<td>100.0</td>
<td>0.0</td>
<td>88.9</td>
</tr>
<tr>
<td>Discussion</td>
<td>0.0</td>
<td>0.0</td>
<td>42.9</td>
<td>60.6</td>
<td>0.0</td>
<td>0.0</td>
<td>16.7</td>
</tr>
<tr>
<td>Investigation</td>
<td>50.0</td>
<td>70.7</td>
<td>50.0</td>
<td>70.7</td>
<td>20.0</td>
<td>28.3</td>
<td>44.4</td>
</tr>
<tr>
<td>Applied Mathematics</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>22.2</td>
</tr>
<tr>
<td>Problem Solving</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Working in Groups</td>
<td>0.0</td>
<td>0.0</td>
<td>100.0</td>
<td>0.0</td>
<td>45.0</td>
<td>21.2</td>
<td>0.0</td>
</tr>
<tr>
<td>Single fact or step</td>
<td>100.0</td>
<td>0.0</td>
<td>42.9</td>
<td>60.6</td>
<td>65.0</td>
<td>7.1</td>
<td>88.9</td>
</tr>
<tr>
<td>Several facts or steps</td>
<td>100.0</td>
<td>0.0</td>
<td>7.1</td>
<td>10.1</td>
<td>45.0</td>
<td>7.1</td>
<td>94.4</td>
</tr>
<tr>
<td>Extend knowledge or skill</td>
<td>50.0</td>
<td>70.7</td>
<td>35.7</td>
<td>50.5</td>
<td>10.0</td>
<td>14.1</td>
<td>33.3</td>
</tr>
</tbody>
</table>

Number of Segments: 3 7 10 9 8 9
<table>
<thead>
<tr>
<th>TABLE 12. CLASSROOM D: SUMMARY STATISTICS (TOTAL)</th>
</tr>
</thead>
<tbody>
<tr>
<td>LESSON</td>
</tr>
<tr>
<td>--------</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>Tchr Quests (ave/5 min)</td>
</tr>
<tr>
<td>St Quests (ave/5 min)</td>
</tr>
<tr>
<td>% of Segments With:</td>
</tr>
<tr>
<td>Homework Review</td>
</tr>
<tr>
<td>Lesson Development</td>
</tr>
<tr>
<td>Guided Practice</td>
</tr>
<tr>
<td>Reviewing a Test</td>
</tr>
<tr>
<td>Reviewing Material</td>
</tr>
<tr>
<td>Using Calculators Only</td>
</tr>
<tr>
<td>Using Computers Only</td>
</tr>
<tr>
<td>Both Calcs and Comps</td>
</tr>
<tr>
<td>Student as Manager</td>
</tr>
<tr>
<td>Student as Task Setter</td>
</tr>
<tr>
<td>Student as Explainer</td>
</tr>
<tr>
<td>Student as Consultant</td>
</tr>
<tr>
<td>St Fellow Investigator</td>
</tr>
<tr>
<td>Student as Resource</td>
</tr>
<tr>
<td>Students Passive</td>
</tr>
<tr>
<td>Students Active: Writing</td>
</tr>
<tr>
<td>Students Active: Talking</td>
</tr>
<tr>
<td>Students Didactic</td>
</tr>
<tr>
<td>Students Symbolizing</td>
</tr>
<tr>
<td>Students Investigating</td>
</tr>
<tr>
<td>Students Problem Solving</td>
</tr>
<tr>
<td>Sts Higher Level Thinking</td>
</tr>
<tr>
<td>% of Segments With:</td>
</tr>
<tr>
<td>---------------------------------------------</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>Teacher as Manager</td>
</tr>
<tr>
<td>Teacher as Task Setter</td>
</tr>
<tr>
<td>Teacher as Explainer</td>
</tr>
<tr>
<td>Teacher as Consultant</td>
</tr>
<tr>
<td>Tchr Fellow Investigator</td>
</tr>
<tr>
<td>Teacher as Resource</td>
</tr>
<tr>
<td>Exposition</td>
</tr>
<tr>
<td>Exerc, Consolidat, Pract</td>
</tr>
<tr>
<td>Discussion</td>
</tr>
<tr>
<td>Investigation</td>
</tr>
<tr>
<td>Applied Mathematics</td>
</tr>
<tr>
<td>Problem Solving</td>
</tr>
<tr>
<td>Working in Groups</td>
</tr>
<tr>
<td>Single fact or step</td>
</tr>
<tr>
<td>Several facts or steps</td>
</tr>
<tr>
<td>Extend knowledge or skill</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>Number of Segments</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
</tbody>
</table>

201
<table>
<thead>
<tr>
<th></th>
<th>SUMMARY (NO TECHNOLOGY)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>LESSON</strong></td>
<td><strong>1</strong></td>
</tr>
<tr>
<td>Tchr Quests (ave/5 min)</td>
<td>12.0</td>
</tr>
<tr>
<td>St Quests (ave/5 min)</td>
<td>1.5</td>
</tr>
<tr>
<td>% of Segments With:</td>
<td></td>
</tr>
<tr>
<td>Homework Review</td>
<td>0.0</td>
</tr>
<tr>
<td>Lesson Development</td>
<td>100.0</td>
</tr>
<tr>
<td>Guided Practice</td>
<td>0.0</td>
</tr>
<tr>
<td>Reviewing a Test</td>
<td>0.0</td>
</tr>
<tr>
<td>Reviewing Material</td>
<td>0.0</td>
</tr>
<tr>
<td>Using Calculators Only</td>
<td>0.0</td>
</tr>
<tr>
<td>Using Computers Only</td>
<td>0.0</td>
</tr>
<tr>
<td>Both Calcs and Comps</td>
<td>0.0</td>
</tr>
<tr>
<td>Student as Manager</td>
<td>0.0</td>
</tr>
<tr>
<td>Student as Task Setter</td>
<td>0.0</td>
</tr>
<tr>
<td>Student as Expaliner</td>
<td>0.0</td>
</tr>
<tr>
<td>Student as Consultant</td>
<td>0.0</td>
</tr>
<tr>
<td>St Fellow Investigator</td>
<td>0.0</td>
</tr>
<tr>
<td>Student as Resource</td>
<td>0.0</td>
</tr>
<tr>
<td>Students Passive</td>
<td>100.0</td>
</tr>
<tr>
<td>Students Active: Writing</td>
<td>0.0</td>
</tr>
<tr>
<td>Students Active: Talking</td>
<td>100.0</td>
</tr>
<tr>
<td>Students Didactic</td>
<td>100.0</td>
</tr>
<tr>
<td>Students Symbolizing</td>
<td>0.0</td>
</tr>
<tr>
<td>Students Investigating</td>
<td>0.0</td>
</tr>
<tr>
<td>Students Problem Solving</td>
<td>0.0</td>
</tr>
<tr>
<td>Sts Higher Level Thinking</td>
<td>0.0</td>
</tr>
<tr>
<td>Lesson</td>
<td>Summary (No Technology)</td>
</tr>
<tr>
<td>--------</td>
<td>------------------------</td>
</tr>
<tr>
<td></td>
<td>M</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>100.0</td>
</tr>
<tr>
<td>2</td>
<td>100.0</td>
</tr>
<tr>
<td>3</td>
<td>100.0</td>
</tr>
<tr>
<td>4</td>
<td>0.0</td>
</tr>
<tr>
<td>5</td>
<td>0.0</td>
</tr>
<tr>
<td>6</td>
<td>0.0</td>
</tr>
</tbody>
</table>

**Table 12 (cont'd). Classroom D: Summary (No Technology)**

<table>
<thead>
<tr>
<th>% of Segments With:</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
</tr>
</thead>
<tbody>
<tr>
<td>Teacher as Manager</td>
<td>100.0</td>
<td>N/A</td>
<td>100.0</td>
<td>0.0</td>
<td>100.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Teacher as Task Setter</td>
<td>100.0</td>
<td>N/A</td>
<td>75.0</td>
<td>35.4</td>
<td>100.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Teacher as Explainer</td>
<td>100.0</td>
<td>N/A</td>
<td>100.0</td>
<td>0.0</td>
<td>100.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Teacher as Consultant</td>
<td>0.0</td>
<td>N/A</td>
<td>50.0</td>
<td>70.7</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Tchr Fellow Investigator</td>
<td>0.0</td>
<td>N/A</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Teacher as Resource</td>
<td>0.0</td>
<td>N/A</td>
<td>0.0</td>
<td>0.0</td>
<td>7.1</td>
<td>10.1</td>
</tr>
<tr>
<td>Exposition</td>
<td>100.0</td>
<td>N/A</td>
<td>100.0</td>
<td>0.0</td>
<td>85.7</td>
<td>0.0</td>
</tr>
<tr>
<td>Exer, Consolidat, Pract</td>
<td>0.0</td>
<td>N/A</td>
<td>0.0</td>
<td>0.0</td>
<td>21.4</td>
<td>10.1</td>
</tr>
<tr>
<td>Discussion</td>
<td>0.0</td>
<td>N/A</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Investigation</td>
<td>0.0</td>
<td>N/A</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Applied Mathematics</td>
<td>100.0</td>
<td>N/A</td>
<td>0.0</td>
<td>0.0</td>
<td>7.1</td>
<td>10.1</td>
</tr>
<tr>
<td>Problem Solving</td>
<td>0.0</td>
<td>N/A</td>
<td>0.0</td>
<td>0.0</td>
<td>7.1</td>
<td>10.1</td>
</tr>
<tr>
<td>Working in Groups</td>
<td>0.0</td>
<td>N/A</td>
<td>25.0</td>
<td>35.4</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Single fact or step</td>
<td>100.0</td>
<td>N/A</td>
<td>100.0</td>
<td>0.0</td>
<td>100.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Several facts or steps</td>
<td>100.0</td>
<td>N/A</td>
<td>75.0</td>
<td>35.4</td>
<td>92.9</td>
<td>10.1</td>
</tr>
<tr>
<td>Extend knowledge or skill</td>
<td>100.0</td>
<td>N/A</td>
<td>0.0</td>
<td>0.0</td>
<td>64.3</td>
<td>10.1</td>
</tr>
</tbody>
</table>

Number of Segments: 1 ** 1.5 ** 0 7 4 8.5 **

*One observer noted no segments without technology.

**The average of the number of segments noted by the observers.
<table>
<thead>
<tr>
<th>TABLE 12 (cont'd). CLASSROOM D:</th>
<th>SUMMARY (WITH TECHNOLOGY)</th>
</tr>
</thead>
<tbody>
<tr>
<td>LESSON</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>M</td>
</tr>
<tr>
<td>Tchr Quests (ave/5 mln)</td>
<td>7.5</td>
</tr>
<tr>
<td>St Quests (ave/5 mln)</td>
<td>1.0</td>
</tr>
<tr>
<td>% of Segments With:</td>
<td></td>
</tr>
<tr>
<td>Homework Review</td>
<td>0.0</td>
</tr>
<tr>
<td>Lesson Development</td>
<td>87.5</td>
</tr>
<tr>
<td>Guided Practice</td>
<td>25.0</td>
</tr>
<tr>
<td>Reviewing a Test</td>
<td>0.0</td>
</tr>
<tr>
<td>Reviewing Material</td>
<td>12.5</td>
</tr>
<tr>
<td>Using Calculators Only</td>
<td>50.0</td>
</tr>
<tr>
<td>Using Computers Only</td>
<td>25.0</td>
</tr>
<tr>
<td>Both Calcs and Comps</td>
<td>25.0</td>
</tr>
<tr>
<td>Student as Manager</td>
<td>0.0</td>
</tr>
<tr>
<td>Student as Task Setter</td>
<td>0.0</td>
</tr>
<tr>
<td>Student as Explaner</td>
<td>0.0</td>
</tr>
<tr>
<td>Student as Consultant</td>
<td>0.0</td>
</tr>
<tr>
<td>St Fellow Investigator</td>
<td>0.0</td>
</tr>
<tr>
<td>Student as Resource</td>
<td>0.0</td>
</tr>
<tr>
<td>Students Passive</td>
<td>100.0</td>
</tr>
<tr>
<td>Students Active: Writing</td>
<td>87.5</td>
</tr>
<tr>
<td>Students Active: Talking</td>
<td>100.0</td>
</tr>
<tr>
<td>Students Didactic</td>
<td>100.0</td>
</tr>
<tr>
<td>Students Symbolizing</td>
<td>75.0</td>
</tr>
<tr>
<td>Students Investigating</td>
<td>75.0</td>
</tr>
<tr>
<td>Students Problem Solving</td>
<td>0.0</td>
</tr>
<tr>
<td>Sts Higher Level Thinking</td>
<td>12.5</td>
</tr>
</tbody>
</table>
### TABLE 12 (cont'd).  CLASSROOM D: SUMMARY (WITH TECHNOLOGY)

<table>
<thead>
<tr>
<th>Lesson</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>M</td>
<td>SD</td>
<td>M</td>
<td>SD</td>
<td>M</td>
<td>SD</td>
</tr>
<tr>
<td>% of Segments With:</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Teacher as Manager</td>
<td>100.0</td>
<td>0.0</td>
<td>83.3</td>
<td>23.6</td>
<td>100.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Teacher as Task Setter</td>
<td>100.0</td>
<td>0.0</td>
<td>58.3</td>
<td>11.8</td>
<td>54.5</td>
<td>64.3</td>
</tr>
<tr>
<td>Teacher as Explainer</td>
<td>87.5</td>
<td>17.7</td>
<td>83.3</td>
<td>23.6</td>
<td>100.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Teacher as Consultant</td>
<td>12.5</td>
<td>17.7</td>
<td>100.0</td>
<td>0.0</td>
<td>86.4</td>
<td>6.4</td>
</tr>
<tr>
<td>Tchr Fellow Investigator</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Teacher as Resource</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>31.8</td>
<td>45.0</td>
</tr>
<tr>
<td>Exposition</td>
<td>75.0</td>
<td>35.4</td>
<td>83.3</td>
<td>23.6</td>
<td>9.1</td>
<td>12.9</td>
</tr>
<tr>
<td>Exerc. Consolidat, Pract</td>
<td>0.0</td>
<td>0.0</td>
<td>50.0</td>
<td>70.7</td>
<td>50.0</td>
<td>45.0</td>
</tr>
<tr>
<td>Discussion</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Investigation</td>
<td>37.5</td>
<td>53.0</td>
<td>0.0</td>
<td>0.0</td>
<td>4.5</td>
<td>6.4</td>
</tr>
<tr>
<td>Applied Mathematics</td>
<td>25.0</td>
<td>35.4</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Problem Solving</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Working in Groups</td>
<td>0.0</td>
<td>0.0</td>
<td>100.0</td>
<td>0.0</td>
<td>0.0</td>
<td>86.4</td>
</tr>
<tr>
<td>Single fact or step</td>
<td>100.0</td>
<td>0.0</td>
<td>58.3</td>
<td>11.8</td>
<td>40.9</td>
<td>6.4</td>
</tr>
<tr>
<td>Several facts or steps</td>
<td>62.5</td>
<td>53.0</td>
<td>58.3</td>
<td>11.8</td>
<td>36.4</td>
<td>0.0</td>
</tr>
<tr>
<td>Extend knowledge or skill</td>
<td>37.5</td>
<td>17.7</td>
<td>0.0</td>
<td>0.0</td>
<td>4.5</td>
<td>6.4</td>
</tr>
</tbody>
</table>

**Number of Segments**

| 3 | 2.5 ** | 11 | 2 | 4 | 0.5 ** |

**The average of the number of segments noted by the observers.
<table>
<thead>
<tr>
<th>TABLE 13. CLASSROOM E: SUMMARY STATISTICS (TOTAL)</th>
</tr>
</thead>
<tbody>
<tr>
<td>LESSON</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>Tchr Ques (ave/5 min)</td>
</tr>
<tr>
<td>St Ques (ave/5 min)</td>
</tr>
<tr>
<td>% of Segments With:</td>
</tr>
<tr>
<td>Homework Review</td>
</tr>
<tr>
<td>Lesson Development</td>
</tr>
<tr>
<td>Guided Practice</td>
</tr>
<tr>
<td>Reviewing a Test</td>
</tr>
<tr>
<td>Reviewing Material</td>
</tr>
<tr>
<td>Using Calculators Only</td>
</tr>
<tr>
<td>Using Computers Only</td>
</tr>
<tr>
<td>Both Calcs and Comps</td>
</tr>
<tr>
<td>Student as Manager</td>
</tr>
<tr>
<td>Student as Task Setter</td>
</tr>
<tr>
<td>Student as Explainer</td>
</tr>
<tr>
<td>Student as Consultant</td>
</tr>
<tr>
<td>St Fellow Investigator</td>
</tr>
<tr>
<td>Student as Resource</td>
</tr>
<tr>
<td>Students Passive</td>
</tr>
<tr>
<td>Students Active: Writing</td>
</tr>
<tr>
<td>Students Active: Talking</td>
</tr>
<tr>
<td>Students Didactic</td>
</tr>
<tr>
<td>Students Symbolizing</td>
</tr>
<tr>
<td>Students Investigating</td>
</tr>
<tr>
<td>Students Problem Solving</td>
</tr>
<tr>
<td>Sts Higher Level Thinking</td>
</tr>
<tr>
<td>% of Segments With:</td>
</tr>
<tr>
<td>-------------------------------------</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>Teacher as Manager</td>
</tr>
<tr>
<td>Teacher as Task Setter</td>
</tr>
<tr>
<td>Teacher as Explainer</td>
</tr>
<tr>
<td>Teacher as Consultant</td>
</tr>
<tr>
<td>Tchr Fellow Investigator</td>
</tr>
<tr>
<td>Teacher as Resource</td>
</tr>
<tr>
<td>Exposition</td>
</tr>
<tr>
<td>Exerc, Consolidat, Pract</td>
</tr>
<tr>
<td>Discussion</td>
</tr>
<tr>
<td>Investigation</td>
</tr>
<tr>
<td>Applied Mathematics</td>
</tr>
<tr>
<td>Problem Solving</td>
</tr>
<tr>
<td>Working in Groups</td>
</tr>
<tr>
<td>Single fact or step</td>
</tr>
<tr>
<td>Several facts or steps</td>
</tr>
<tr>
<td>Extend knowledge or skill</td>
</tr>
</tbody>
</table>

Number of Segments: 5 8 8 8 6 7
<table>
<thead>
<tr>
<th></th>
<th>SUMMARY (NO TECHNOLOGY)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>LESSON 1</td>
</tr>
<tr>
<td></td>
<td>M</td>
</tr>
<tr>
<td>Tchr Quests (ave/5 min)</td>
<td>3.6</td>
</tr>
<tr>
<td>St Quests (ave/5 min)</td>
<td>0.0</td>
</tr>
<tr>
<td>% of Segments With:</td>
<td></td>
</tr>
<tr>
<td>Homework Review</td>
<td>0.0</td>
</tr>
<tr>
<td>Lesson Development</td>
<td>90.0</td>
</tr>
<tr>
<td>Guided Practice</td>
<td>10.0</td>
</tr>
<tr>
<td>Reviewing a Test</td>
<td>0.0</td>
</tr>
<tr>
<td>Reviewing Material</td>
<td>0.0</td>
</tr>
<tr>
<td>Using Calculators Only</td>
<td>0.0</td>
</tr>
<tr>
<td>Using Computers Only</td>
<td>0.0</td>
</tr>
<tr>
<td>Both Calcs and Comps</td>
<td>0.0</td>
</tr>
<tr>
<td>Student as Manager</td>
<td>0.0</td>
</tr>
<tr>
<td>Student as Task Setter</td>
<td>0.0</td>
</tr>
<tr>
<td>Student as Explainor</td>
<td>0.0</td>
</tr>
<tr>
<td>Student as Consultant</td>
<td>0.0</td>
</tr>
<tr>
<td>St Fellow Investigator</td>
<td>0.0</td>
</tr>
<tr>
<td>Student as Resource</td>
<td>0.0</td>
</tr>
<tr>
<td>Students Passive</td>
<td>100.0</td>
</tr>
<tr>
<td>Students Active: Writing</td>
<td>50.0</td>
</tr>
<tr>
<td>Students Active: Talking</td>
<td>70.0</td>
</tr>
<tr>
<td>Students Didactic</td>
<td>100.0</td>
</tr>
<tr>
<td>Students Symbolizing</td>
<td>40.0</td>
</tr>
<tr>
<td>Students Investigating</td>
<td>60.0</td>
</tr>
<tr>
<td>Students Problem Solving</td>
<td>0.0</td>
</tr>
<tr>
<td>Sts Higher Level Thinking</td>
<td>40.0</td>
</tr>
<tr>
<td>% of Segments With:</td>
<td>1</td>
</tr>
<tr>
<td>----------------------------------------</td>
<td>-----</td>
</tr>
<tr>
<td>Teacher as Manager</td>
<td>100.0</td>
</tr>
<tr>
<td>Teacher as Task Setter</td>
<td>60.0</td>
</tr>
<tr>
<td>Teacher as Explainer</td>
<td>90.0</td>
</tr>
<tr>
<td>Teacher as Consultant</td>
<td>10.0</td>
</tr>
<tr>
<td>Tchr Fellow Investigator</td>
<td>0.0</td>
</tr>
<tr>
<td>Teacher as Resource</td>
<td>0.0</td>
</tr>
</tbody>
</table>

| Exposition                            | 100.0 | 0.0 | 100.0 | 0.0 | 0.0 | 0.0 | 91.7 | 11.8 | 66.7 | 47.1 | 66.7 | 47.1 |
| Exerc, Consolidat, Pract              | 10.0 | 14.1 | 7.1 | 10.1 | 100.0 | 0.0 | 25.0 | 35.4 | 33.3 | 47.1 | 33.3 | 47.1 |
| Discussion                            | 0.0 | 0.0 | 0.0 | 0.0 | 8.3 | 11.8 | 0.0 | 0.0 | 12.5 | 17.7 | 0.0 | 0.0 |
| Investigation                         | 10.0 | 14.1 | 42.9 | 60.6 | 0.0 | 0.0 | 0.0 | 0.0 | 16.7 | 23.6 | 16.7 | 23.6 |
| Applied Mathematics                   | 0.0 | 0.0 | 14.3 | 20.2 | 8.3 | 11.8 | 25.0 | 11.8 | 0.0 | 0.0 | 0.0 | 0.0 |
| Problem Solving                       | 0.0 | 0.0 | 0.0 | 0.0 | 8.3 | 11.8 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Working in Groups                     | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |

| Single fact or step                   | 40.0 | 28.3 | 100.0 | 0.0 | 81.7 | 2.4 | 83.3 | 23.6 | 100.0 | 0.0 | 100.0 | 0.0 |
| Several facts or steps                | 50.0 | 14.1 | 92.9 | 10.1 | 73.3 | 9.4 | 83.3 | 0.0 | 83.3 | 23.6 | 66.7 | 0.0 |
| Extend knowledge or skill             | 30.0 | 14.1 | 35.7 | 10.1 | 43.3 | 33.0 | 33.3 | 23.6 | 37.5 | 53.0 | 33.3 | 47.1 |

Number of Segments: 5 7 5.5 * 6 3.5 * 3

*The average of the number of segments noted by the observers
<table>
<thead>
<tr>
<th>TABLE 13 (cont'd). CLASSROOM E: SUMMARY (WITH TECHNOLOGY)</th>
</tr>
</thead>
<tbody>
<tr>
<td>LESSON 1</td>
</tr>
<tr>
<td>M</td>
</tr>
<tr>
<td>---------------------------------------------</td>
</tr>
<tr>
<td><strong>Tchr Quests (ave/5 min)</strong></td>
</tr>
<tr>
<td>9.5</td>
</tr>
<tr>
<td><strong>St Quests (ave/5 min)</strong></td>
</tr>
<tr>
<td>0.5</td>
</tr>
<tr>
<td><strong>% of Segments With:</strong></td>
</tr>
<tr>
<td>Homework Review</td>
</tr>
<tr>
<td>0.0</td>
</tr>
<tr>
<td>Lesson Development</td>
</tr>
<tr>
<td>100.0</td>
</tr>
<tr>
<td>Guided Practice</td>
</tr>
<tr>
<td>50.0</td>
</tr>
<tr>
<td>Reviewing a Test</td>
</tr>
<tr>
<td>0.0</td>
</tr>
<tr>
<td>Reviewing Material</td>
</tr>
<tr>
<td>0.0</td>
</tr>
<tr>
<td>Using Calculators Only</td>
</tr>
<tr>
<td>100.0</td>
</tr>
<tr>
<td>Using Computers Only</td>
</tr>
<tr>
<td>0.0</td>
</tr>
<tr>
<td>Both Calcs and Comps</td>
</tr>
<tr>
<td>0.0</td>
</tr>
<tr>
<td>Student as Manager</td>
</tr>
<tr>
<td>0.0</td>
</tr>
<tr>
<td>Student as Task Setter</td>
</tr>
<tr>
<td>0.0</td>
</tr>
<tr>
<td>Student as Explainer</td>
</tr>
<tr>
<td>0.0</td>
</tr>
<tr>
<td>Student as Consultant</td>
</tr>
<tr>
<td>0.0</td>
</tr>
<tr>
<td>St Fellow Investigator</td>
</tr>
<tr>
<td>0.0</td>
</tr>
<tr>
<td>Student as Resource</td>
</tr>
<tr>
<td>0.0</td>
</tr>
<tr>
<td>Students Passive</td>
</tr>
<tr>
<td>100.0</td>
</tr>
<tr>
<td>Students Active: Writing</td>
</tr>
<tr>
<td>100.0</td>
</tr>
<tr>
<td>Students Active: Talking</td>
</tr>
<tr>
<td>100.0</td>
</tr>
<tr>
<td>Students Didactic</td>
</tr>
<tr>
<td>100.0</td>
</tr>
<tr>
<td>Students Symbolizing</td>
</tr>
<tr>
<td>100.0</td>
</tr>
<tr>
<td>Students Investigating</td>
</tr>
<tr>
<td>100.0</td>
</tr>
<tr>
<td>Students Problem Solving</td>
</tr>
<tr>
<td>0.0</td>
</tr>
<tr>
<td>Sts Higher Level Thinking</td>
</tr>
<tr>
<td>50.0</td>
</tr>
<tr>
<td>% of Segments With:</td>
</tr>
<tr>
<td>--------------------------------------------</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>Teacher as Manager</td>
</tr>
<tr>
<td>Teacher as Task Setter</td>
</tr>
<tr>
<td>Teacher as Explainer</td>
</tr>
<tr>
<td>Teacher as Consultant</td>
</tr>
<tr>
<td>Tchr Fellow Investigator</td>
</tr>
<tr>
<td>Teacher as Resource</td>
</tr>
<tr>
<td>Exposition</td>
</tr>
<tr>
<td>Exerc, Consolidat, Pract</td>
</tr>
<tr>
<td>Discussion</td>
</tr>
<tr>
<td>Investigation</td>
</tr>
<tr>
<td>Applied Mathematics</td>
</tr>
<tr>
<td>Problem Solving</td>
</tr>
<tr>
<td>Working in Groups</td>
</tr>
<tr>
<td>Single fact or step</td>
</tr>
<tr>
<td>Several facts or steps</td>
</tr>
<tr>
<td>Extend knowledge or skill</td>
</tr>
</tbody>
</table>

Number of Segments: 0  1  2.5 *  2  2.5 *  4

*The average of the number of segments noted by the observers
<table>
<thead>
<tr>
<th>LESSON</th>
<th>SUMMARY STATISTICS (TOTAL)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>M</td>
</tr>
<tr>
<td>Tchr Quests (ave/5 min)</td>
<td>3.3</td>
</tr>
<tr>
<td>Stt Quests (ave/5 min)</td>
<td>1.5</td>
</tr>
<tr>
<td>% of Segments With:</td>
<td></td>
</tr>
<tr>
<td>Homework Review</td>
<td>22.2</td>
</tr>
<tr>
<td>Lesson Development</td>
<td>0.0</td>
</tr>
<tr>
<td>Guided Practice</td>
<td>61.1</td>
</tr>
<tr>
<td>Reviewing a Test</td>
<td>0.0</td>
</tr>
<tr>
<td>Reviewing Material</td>
<td>77.8</td>
</tr>
<tr>
<td>Using Calculators Only</td>
<td>38.9</td>
</tr>
<tr>
<td>Using Computers Only</td>
<td>11.1</td>
</tr>
<tr>
<td>Both Calcs and Comps</td>
<td>16.7</td>
</tr>
<tr>
<td>Student as Manager</td>
<td>0.0</td>
</tr>
<tr>
<td>Student as Task Setter</td>
<td>0.0</td>
</tr>
<tr>
<td>Student as Explainer</td>
<td>5.6</td>
</tr>
<tr>
<td>Student as Consultant</td>
<td>16.7</td>
</tr>
<tr>
<td>Stt Fellow Investigator</td>
<td>0.0</td>
</tr>
<tr>
<td>Student as Resource</td>
<td>0.0</td>
</tr>
<tr>
<td>Students Passive</td>
<td>100.0</td>
</tr>
<tr>
<td>Students Active: Writing</td>
<td>83.3</td>
</tr>
<tr>
<td>Students Active: Talking</td>
<td>100.0</td>
</tr>
<tr>
<td>Students Didactic</td>
<td>94.4</td>
</tr>
<tr>
<td>Students Symbolizing</td>
<td>88.9</td>
</tr>
<tr>
<td>Students Investigating</td>
<td>88.9</td>
</tr>
<tr>
<td>Students Problem Solving</td>
<td>22.2</td>
</tr>
<tr>
<td>Stts Higher Level Thinking</td>
<td>27.8</td>
</tr>
</tbody>
</table>
### TABLE 14 (cont'd).  CLASSROOM F:

<table>
<thead>
<tr>
<th>% of Segments With:</th>
<th>LESSON 1</th>
<th>SUMMARY STATISTICS (TOTAL)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>M</td>
<td>SD</td>
</tr>
<tr>
<td>Teacher as Manager</td>
<td>100.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Teacher as Task Setter</td>
<td>88.9</td>
<td>15.7</td>
</tr>
<tr>
<td>Teacher as Explainer</td>
<td>88.9</td>
<td>15.7</td>
</tr>
<tr>
<td>Teacher as Consultant</td>
<td>22.2</td>
<td>31.4</td>
</tr>
<tr>
<td>Tchr Fellow Investigator</td>
<td>11.1</td>
<td>15.7</td>
</tr>
<tr>
<td>Teacher as Resource</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Exposition</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Exerc, Consolidat, Pract</td>
<td>100.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Discussion</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Investigation</td>
<td>50.0</td>
<td>70.7</td>
</tr>
<tr>
<td>Applied Mathematics</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Problem Solving</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Working In Groups</td>
<td>5.6</td>
<td>7.9</td>
</tr>
<tr>
<td>Single fact or step</td>
<td>77.8</td>
<td>0.0</td>
</tr>
<tr>
<td>Several facts or steps</td>
<td>50.0</td>
<td>7.9</td>
</tr>
<tr>
<td>Extend knowledge or skill</td>
<td>11.1</td>
<td>15.7</td>
</tr>
<tr>
<td>Number of Segments</td>
<td>9</td>
<td>9</td>
</tr>
<tr>
<td></td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>------------------</td>
<td>------------</td>
<td>------------</td>
</tr>
<tr>
<td></td>
<td>M</td>
<td>SD</td>
</tr>
<tr>
<td>Tchr Quests (ave/5 min)</td>
<td>6.3</td>
<td>0.4</td>
</tr>
<tr>
<td>St Quests (ave/5 min)</td>
<td>1.1</td>
<td>0.1</td>
</tr>
<tr>
<td>% of Segments With:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Homework Review</td>
<td>50.0</td>
<td>70.7</td>
</tr>
<tr>
<td>Lesson Development</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Guided Practice</td>
<td>50.0</td>
<td>70.7</td>
</tr>
<tr>
<td>Reviewing a Test</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Reviewing Material</td>
<td>100.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Using Calculators Only</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Using Computers Only</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Both Cals and Comps</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Student as Manager</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Student as Task Setter</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Student as Explainer</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Student as Consultant</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>St Fellow Investigator</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Student as Resource</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Students Passive</td>
<td>100.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Students Active: Writing</td>
<td>30.0</td>
<td>42.4</td>
</tr>
<tr>
<td>Students Active: Talking</td>
<td>100.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Students Didactic</td>
<td>100.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Students Symbolizing</td>
<td>80.0</td>
<td>28.3</td>
</tr>
<tr>
<td>Students Investigating</td>
<td>80.0</td>
<td>28.3</td>
</tr>
<tr>
<td>Students Problem Solving</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Sta Higher Level Thinking</td>
<td>50.0</td>
<td>70.7</td>
</tr>
<tr>
<td>% of Segments With:</td>
<td>Lesson 1</td>
<td>Lesson 2</td>
</tr>
<tr>
<td>------------------------------------------</td>
<td>----------</td>
<td>----------</td>
</tr>
<tr>
<td>Teacher as Manager</td>
<td>100.0</td>
<td>100.0</td>
</tr>
<tr>
<td>Teacher as Task Setter</td>
<td>50.0</td>
<td>70.7</td>
</tr>
<tr>
<td>Teacher as Explainer</td>
<td>100.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Teacher as Consultant</td>
<td>50.0</td>
<td>70.7</td>
</tr>
<tr>
<td>Tchr Fellow Investigator</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Teacher as Resource</td>
<td>0.0</td>
<td>0.0</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>% of Segments With:</th>
<th>Lesson 1</th>
<th>Lesson 2</th>
<th>Lesson 3</th>
<th>Lesson 4</th>
<th>Lesson 5</th>
<th>Lesson 6</th>
</tr>
</thead>
<tbody>
<tr>
<td>Exposition</td>
<td>0.0</td>
<td>0.0</td>
<td>41.7</td>
<td>58.9</td>
<td>37.5</td>
<td>53.0</td>
</tr>
<tr>
<td>Exerc, Consolidat, Pract</td>
<td>100.0</td>
<td>0.0</td>
<td>100.0</td>
<td>0.0</td>
<td>87.5</td>
<td>17.7</td>
</tr>
<tr>
<td>Discussion</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>29.2</td>
<td>5.9</td>
</tr>
<tr>
<td>Investigation</td>
<td>50.0</td>
<td>70.7</td>
<td>0.0</td>
<td>0.0</td>
<td>16.7</td>
<td>23.6</td>
</tr>
<tr>
<td>Applied Mathematics</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Problem Solving</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Working In Groups</td>
<td>0.0</td>
<td>0.0</td>
<td>12.5</td>
<td>17.7</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Single fact or step</td>
<td>90.0</td>
<td>14.1</td>
<td>93.8</td>
<td>8.8</td>
<td>100.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Several facts or steps</td>
<td>90.0</td>
<td>14.1</td>
<td>60.4</td>
<td>32.4</td>
<td>83.3</td>
<td>23.6</td>
</tr>
<tr>
<td>Extend knowledge or skill</td>
<td>20.0</td>
<td>28.3</td>
<td>25.0</td>
<td>35.4</td>
<td>0.0</td>
<td>0.0</td>
</tr>
</tbody>
</table>

Number of Segments: 3  7  3.5*  7  4  4

*The average of the number of segments noted by the observers.
<table>
<thead>
<tr>
<th>% of Segments With:</th>
<th>Lesson 1</th>
<th>Lesson 2</th>
<th>Lesson 3</th>
<th>Lesson 4</th>
<th>Lesson 5</th>
<th>Lesson 6</th>
</tr>
</thead>
<tbody>
<tr>
<td>Teacher as Manager</td>
<td>100.0</td>
<td>100.0</td>
<td>100.0</td>
<td>100.0</td>
<td>100.0</td>
<td>100.0</td>
</tr>
<tr>
<td>Teacher as Task Setter</td>
<td>93.8</td>
<td>100.0</td>
<td>100.0</td>
<td>100.0</td>
<td>100.0</td>
<td>100.0</td>
</tr>
<tr>
<td>Teacher as Explainer</td>
<td>87.5</td>
<td>100.0</td>
<td>77.5</td>
<td>3.5</td>
<td>87.5</td>
<td>100.0</td>
</tr>
<tr>
<td>Teacher as Consultant</td>
<td>18.8</td>
<td>16.7</td>
<td>23.6</td>
<td>47.5</td>
<td>38.9</td>
<td>75.0</td>
</tr>
<tr>
<td>Tchr Fellow Investigator</td>
<td>12.5</td>
<td>17.7</td>
<td>0.0</td>
<td>0.0</td>
<td>10.0</td>
<td>14.1</td>
</tr>
<tr>
<td>Teacher as Resource</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>25.0</td>
</tr>
<tr>
<td>Exposition</td>
<td>0.0</td>
<td>0.0</td>
<td>66.7</td>
<td>47.1</td>
<td>37.5</td>
<td>53.0</td>
</tr>
<tr>
<td>Exerc, Consolidat, Pract</td>
<td>100.0</td>
<td>100.0</td>
<td>100.0</td>
<td>100.0</td>
<td>100.0</td>
<td>50.0</td>
</tr>
<tr>
<td>Discussion</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Investigation</td>
<td>50.0</td>
<td>70.7</td>
<td>0.0</td>
<td>0.0</td>
<td>40.0</td>
<td>56.6</td>
</tr>
<tr>
<td>Applied Mathematics</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Problem Solving</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>25.0</td>
<td>35.4</td>
</tr>
<tr>
<td>Working in Groups</td>
<td>6.3</td>
<td>8.8</td>
<td>0.0</td>
<td>0.0</td>
<td>25.0</td>
<td>35.4</td>
</tr>
<tr>
<td>Single fact or step</td>
<td>75.0</td>
<td>100.0</td>
<td>100.0</td>
<td>100.0</td>
<td>50.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Several facts or steps</td>
<td>31.3</td>
<td>8.8</td>
<td>83.3</td>
<td>23.6</td>
<td>77.5</td>
<td>3.5</td>
</tr>
<tr>
<td>Extend knowledge or skill</td>
<td>0.0</td>
<td>0.0</td>
<td>33.3</td>
<td>47.1</td>
<td>0.0</td>
<td>0.0</td>
</tr>
</tbody>
</table>

Number of Segments

6  2  4.5  0  4  2

*The average of the number of segments noted by the observers.
<table>
<thead>
<tr>
<th></th>
<th>LESSON 1</th>
<th></th>
<th>LESSON 2</th>
<th></th>
<th>LESSON 3</th>
<th></th>
<th>LESSON 4</th>
<th></th>
<th>LESSON 5</th>
<th></th>
<th>LESSON 6</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Tchr Quests</td>
<td>M</td>
<td>SD</td>
<td>M</td>
<td>SD</td>
<td>M</td>
<td>SD</td>
<td>M</td>
<td>SD</td>
<td>M</td>
<td>SD</td>
<td>M</td>
<td>SD</td>
</tr>
<tr>
<td>(ave/5 min)</td>
<td>1.6</td>
<td>0.2</td>
<td>3.8</td>
<td>1.2</td>
<td>5.6</td>
<td>1.9</td>
<td>4.5</td>
<td>0.7</td>
<td>1.3</td>
<td>0.4</td>
<td></td>
<td></td>
</tr>
<tr>
<td>St Quests</td>
<td>M</td>
<td>SD</td>
<td>M</td>
<td>SD</td>
<td>M</td>
<td>SD</td>
<td>M</td>
<td>SD</td>
<td>M</td>
<td>SD</td>
<td>M</td>
<td>SD</td>
</tr>
<tr>
<td>(ave/5 min)</td>
<td>1.9</td>
<td>0.9</td>
<td>1.8</td>
<td>0.2</td>
<td>0.5</td>
<td>0.1</td>
<td>1.4</td>
<td>1.2</td>
<td>0.3</td>
<td>0.4</td>
<td></td>
<td></td>
</tr>
<tr>
<td>% of Segments With:</td>
<td></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>Homework Review</td>
<td>18.8</td>
<td>26.5</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lesson Development</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>100.0</td>
<td>0.0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Guided Practice</td>
<td>75.0</td>
<td>35.4</td>
<td>0.0</td>
<td>0.0</td>
<td>100.0</td>
<td>0.0</td>
<td>25.0</td>
<td>35.4</td>
<td>50.0</td>
<td>70.7</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Reviewing a Test</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Reviewing Material</td>
<td>62.5</td>
<td>17.7</td>
<td>100.0</td>
<td>0.0</td>
<td>100.0</td>
<td>0.0</td>
<td>75.0</td>
<td>35.4</td>
<td>0.0</td>
<td>0.0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Using Calculators Only</td>
<td>62.5</td>
<td>17.7</td>
<td>100.0</td>
<td>0.0</td>
<td>100.0</td>
<td>0.0</td>
<td>100.0</td>
<td>0.0</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Using Computers Only</td>
<td>12.5</td>
<td>17.7</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Both Calcs and Comps</td>
<td>25.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Student as Manager</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Student as Task Setter</td>
<td>0.0</td>
<td>0.0</td>
<td>50.0</td>
<td>70.7</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>50.0</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Student as Explainer</td>
<td>6.3</td>
<td>8.8</td>
<td>0.0</td>
<td>0.0</td>
<td>25.0</td>
<td>35.4</td>
<td>0.0</td>
<td>0.0</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Student as Consultant</td>
<td>18.8</td>
<td>26.5</td>
<td>50.0</td>
<td>70.7</td>
<td>12.5</td>
<td>17.7</td>
<td>12.5</td>
<td>17.7</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>St Fellow Investigator</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Student as Resource</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Students Passive</td>
<td>100.0</td>
<td>0.0</td>
<td>100.0</td>
<td>0.0</td>
<td>87.5</td>
<td>17.7</td>
<td>87.5</td>
<td>17.7</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Students Active: Writing</td>
<td>100.0</td>
<td>0.0</td>
<td>100.0</td>
<td>0.0</td>
<td>77.5</td>
<td>3.5</td>
<td>100.0</td>
<td>0.0</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Students Active: Talking</td>
<td>100.0</td>
<td>0.0</td>
<td>100.0</td>
<td>0.0</td>
<td>100.0</td>
<td>0.0</td>
<td>100.0</td>
<td>75.0</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Students Didactic</td>
<td>93.8</td>
<td>8.8</td>
<td>100.0</td>
<td>0.0</td>
<td>87.5</td>
<td>17.7</td>
<td>100.0</td>
<td>0.0</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Students Symbolizing</td>
<td>100.0</td>
<td>0.0</td>
<td>100.0</td>
<td>0.0</td>
<td>77.5</td>
<td>3.5</td>
<td>100.0</td>
<td>0.0</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Students Investigating</td>
<td>100.0</td>
<td>0.0</td>
<td>100.0</td>
<td>0.0</td>
<td>100.0</td>
<td>0.0</td>
<td>100.0</td>
<td>75.0</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Students Problem Solving</td>
<td>37.5</td>
<td>17.7</td>
<td>16.7</td>
<td>23.6</td>
<td>12.5</td>
<td>17.7</td>
<td>12.5</td>
<td>17.7</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sts Higher Level Thinking</td>
<td>25.0</td>
<td>35.4</td>
<td>0.0</td>
<td>0.0</td>
<td>32.5</td>
<td>10.6</td>
<td>37.5</td>
<td>53.0</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>217</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
APPENDIX B

OBSERVERS’ RECORDS FOR EACH LESSON
### Table 15. Classroom A/Lesson 1: Observers' Records

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>TIME</td>
<td>1</td>
<td>1</td>
<td>2</td>
<td>2</td>
<td>3</td>
<td>3</td>
<td>4</td>
<td>4</td>
<td>5</td>
<td>5</td>
<td>6</td>
<td>6</td>
<td>7</td>
<td>7</td>
<td>8</td>
<td>8</td>
</tr>
<tr>
<td>Teaching Activity</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>17</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Demand on STs</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>13</td>
<td>12</td>
<td>12</td>
<td>12</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>12</td>
<td>12</td>
<td>1</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>#Questions by TCHR</td>
<td>3</td>
<td>1</td>
<td>3</td>
<td>1</td>
<td>8</td>
<td>9</td>
<td>11</td>
<td>12</td>
<td>9</td>
<td>12</td>
<td>6</td>
<td>7</td>
<td>5</td>
<td>3</td>
<td>4</td>
<td>3</td>
</tr>
<tr>
<td>#Questions by STs</td>
<td>2</td>
<td>1</td>
<td>1</td>
<td></td>
<td>6</td>
<td>4</td>
<td>3</td>
<td>1</td>
<td>3</td>
<td>3</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Homework Review</td>
<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>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lesson Develop</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td></td>
<td></td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Guided Practice</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></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>Go Over Test</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></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>Review Previous Material</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></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>Technology</td>
<td>1</td>
<td>13</td>
<td>13</td>
<td>13</td>
<td>3</td>
<td>3</td>
<td>123</td>
<td>23</td>
<td>13</td>
<td>123</td>
<td>13</td>
<td>123</td>
<td>123</td>
<td>123</td>
<td>1</td>
<td>13</td>
</tr>
<tr>
<td>Manager</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td></td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Task Setter</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>12</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>explainer</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td></td>
<td></td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>counselor</td>
<td></td>
<td>12</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fellow Invist</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></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>Resource</td>
<td>3</td>
<td>34</td>
<td>4</td>
<td>4</td>
<td>3</td>
<td>345</td>
<td>3</td>
<td>34</td>
<td>34</td>
<td>345</td>
<td>3</td>
<td>34</td>
<td>34</td>
<td>345</td>
<td>35</td>
<td></td>
</tr>
<tr>
<td>STs Passive</td>
<td>12</td>
<td>12</td>
<td>12</td>
<td>12</td>
<td>12</td>
<td>12</td>
<td>12</td>
<td>12</td>
<td>12</td>
<td>12</td>
<td>12</td>
<td>12</td>
<td>12</td>
<td>12</td>
<td>12</td>
<td></td>
</tr>
<tr>
<td>STs Writing</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>15</td>
<td>1</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>15</td>
<td>135</td>
<td>25</td>
<td></td>
</tr>
<tr>
<td>STs Talking</td>
<td></td>
<td>12</td>
<td>12</td>
<td>2</td>
<td>12</td>
<td>27</td>
<td>2</td>
<td>147</td>
<td>124</td>
<td>24</td>
<td>124</td>
<td>14</td>
<td>124</td>
<td>124</td>
<td>124</td>
<td></td>
</tr>
<tr>
<td>STs Didactic</td>
<td>13</td>
<td>13</td>
<td>13</td>
<td>13</td>
<td>123</td>
<td>12</td>
<td>123</td>
<td>12</td>
<td>13</td>
<td>123</td>
<td>13</td>
<td>123</td>
<td>123</td>
<td>123</td>
<td></td>
<td></td>
</tr>
<tr>
<td>STs Symbolizing</td>
<td>25</td>
<td>2</td>
<td>25</td>
<td>2</td>
<td>25</td>
<td>25</td>
<td>25</td>
<td>25</td>
<td>2</td>
<td>25</td>
<td>2</td>
<td>25</td>
<td>225</td>
<td>2</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>STs Investig</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>3</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>3</td>
<td>3</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>STs Ph Solving</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></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>STs High Level</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

219
<table>
<thead>
<tr>
<th></th>
<th>TOTAL</th>
<th></th>
<th></th>
<th></th>
<th>NO TECHNOLOGY</th>
<th></th>
<th></th>
<th></th>
<th>WITH TECHNOLOGY</th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>A</td>
<td>B</td>
<td>M</td>
<td>SD</td>
<td>A</td>
<td>B</td>
<td>M</td>
<td>SD</td>
<td>A</td>
<td>B</td>
<td>M</td>
<td>SD</td>
</tr>
<tr>
<td>Tchr QSTS (ave/5 min)</td>
<td>6.1</td>
<td>6.0</td>
<td>6.1</td>
<td>0.1</td>
<td>8.0</td>
<td>9.0</td>
<td>8.5</td>
<td>0.7</td>
<td>5.9</td>
<td>5.6</td>
<td>5.7</td>
<td>0.2</td>
</tr>
<tr>
<td>St QSTS (ave/5 min)</td>
<td>1.8</td>
<td>1.3</td>
<td>1.5</td>
<td>0.4</td>
<td>2.0</td>
<td>1.0</td>
<td>1.5</td>
<td>0.7</td>
<td>1.7</td>
<td>1.3</td>
<td>1.5</td>
<td>0.3</td>
</tr>
<tr>
<td>% of Segments With:</td>
<td></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>Homework Review</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Lesson Development</td>
<td>87.5</td>
<td>100.0</td>
<td>93.8</td>
<td>8.8</td>
<td>100.0</td>
<td>100.0</td>
<td>100.0</td>
<td>0.0</td>
<td>85.7</td>
<td>100.0</td>
<td>92.9</td>
<td>10.1</td>
</tr>
<tr>
<td>Guided Practice</td>
<td>12.5</td>
<td>0.0</td>
<td>6.3</td>
<td>8.8</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>14.3</td>
<td>0.0</td>
<td>7.1</td>
<td>10.1</td>
</tr>
<tr>
<td>Reviewing a Test</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Reviewing Material</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Using Calculators Only</td>
<td>62.5</td>
<td>25.0</td>
<td>43.8</td>
<td>26.5</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>71.4</td>
<td>28.6</td>
<td>50.0</td>
<td>30.3</td>
</tr>
<tr>
<td>Using Computers Only</td>
<td>0.0</td>
<td>12.5</td>
<td>6.3</td>
<td>8.8</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>14.3</td>
<td>7.1</td>
<td>10.1</td>
</tr>
<tr>
<td>Both Calcs and Comps</td>
<td>25.0</td>
<td>50.0</td>
<td>37.5</td>
<td>17.7</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>28.6</td>
<td>57.1</td>
<td>42.9</td>
<td>20.2</td>
</tr>
<tr>
<td>Student as Manager</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Student as Task Setter</td>
<td>12.5</td>
<td>0.0</td>
<td>6.3</td>
<td>8.8</td>
<td>100.0</td>
<td>0.0</td>
<td>50.0</td>
<td>70.7</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Student as Explainer</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Student as Consultant</td>
<td>12.5</td>
<td>0.0</td>
<td>6.3</td>
<td>8.8</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>14.3</td>
<td>0.0</td>
<td>7.1</td>
<td>10.1</td>
</tr>
<tr>
<td>St Fellow Investigator</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Student as Resource</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Students Passive</td>
<td>100.0</td>
<td>100.0</td>
<td>100.0</td>
<td>0.0</td>
<td>100.0</td>
<td>100.0</td>
<td>100.0</td>
<td>0.0</td>
<td>100.0</td>
<td>100.0</td>
<td>100.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Students Active: Writing</td>
<td>100.0</td>
<td>87.5</td>
<td>93.8</td>
<td>8.8</td>
<td>100.0</td>
<td>0.0</td>
<td>50.0</td>
<td>70.7</td>
<td>100.0</td>
<td>100.0</td>
<td>100.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Students Active: Talking</td>
<td>75.0</td>
<td>75.0</td>
<td>75.0</td>
<td>0.0</td>
<td>100.0</td>
<td>100.0</td>
<td>100.0</td>
<td>0.0</td>
<td>71.4</td>
<td>71.4</td>
<td>71.4</td>
<td>0.0</td>
</tr>
<tr>
<td>Students Didactic</td>
<td>87.5</td>
<td>100.0</td>
<td>93.8</td>
<td>8.8</td>
<td>100.0</td>
<td>100.0</td>
<td>100.0</td>
<td>0.0</td>
<td>85.7</td>
<td>100.0</td>
<td>92.9</td>
<td>10.1</td>
</tr>
<tr>
<td>Students Symbolizing</td>
<td>87.5</td>
<td>75.0</td>
<td>81.3</td>
<td>8.8</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>100.0</td>
<td>85.7</td>
<td>92.9</td>
<td>10.1</td>
</tr>
<tr>
<td>Students Investigating</td>
<td>37.5</td>
<td>12.5</td>
<td>25.0</td>
<td>17.7</td>
<td>100.0</td>
<td>0.0</td>
<td>50.0</td>
<td>70.7</td>
<td>28.6</td>
<td>14.3</td>
<td>21.4</td>
<td>10.1</td>
</tr>
<tr>
<td>Students Problem Solving</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Sts Higher Level Thinking</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>% of Segments With:</td>
<td>TOTAL</td>
<td></td>
<td>NO TECHNOLOGY</td>
<td></td>
<td>WITH TECHNOLOGY</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>-----------------------------------------</td>
<td>-------</td>
<td>---</td>
<td>---------------</td>
<td>---</td>
<td>-----------------</td>
<td>---</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>A</td>
<td>B</td>
<td>M</td>
<td>SD</td>
<td>A</td>
<td>B</td>
<td>M</td>
<td>SD</td>
<td>A</td>
<td>B</td>
<td>M</td>
<td>SD</td>
</tr>
<tr>
<td>Teacher as Manager</td>
<td>100.0</td>
<td>100.0</td>
<td>100.0</td>
<td>0.0</td>
<td>100.0</td>
<td>100.0</td>
<td>100.0</td>
<td>0.0</td>
<td>100.0</td>
<td>100.0</td>
<td>100.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Teacher as Task Setter</td>
<td>100.0</td>
<td>100.0</td>
<td>100.0</td>
<td>0.0</td>
<td>100.0</td>
<td>100.0</td>
<td>100.0</td>
<td>0.0</td>
<td>100.0</td>
<td>100.0</td>
<td>100.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Teacher as Explainer</td>
<td>87.5</td>
<td>100.0</td>
<td>93.8</td>
<td>8.8</td>
<td>100.0</td>
<td>100.0</td>
<td>100.0</td>
<td>0.0</td>
<td>85.7</td>
<td>100.0</td>
<td>92.9</td>
<td>10.1</td>
</tr>
<tr>
<td>Teacher as Consultant</td>
<td>37.5</td>
<td>37.5</td>
<td>37.5</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>42.9</td>
<td>42.9</td>
<td>42.9</td>
<td>0.0</td>
</tr>
<tr>
<td>Tchr Fellow Investigator</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Teacher as Resource</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Exposition</td>
<td>100.0</td>
<td>100.0</td>
<td>100.0</td>
<td>0.0</td>
<td>100.0</td>
<td>100.0</td>
<td>100.0</td>
<td>0.0</td>
<td>100.0</td>
<td>100.0</td>
<td>100.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Exerc, Consolidat, Pract</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Discussion</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Investigation</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Applied Mathematics</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Problem Solving</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Working In Groups</td>
<td>12.5</td>
<td>0.0</td>
<td>6.3</td>
<td>8.8</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>14.3</td>
<td>0.0</td>
<td>7.1</td>
<td>10.1</td>
</tr>
<tr>
<td>Single fact or step</td>
<td>100.0</td>
<td>100.0</td>
<td>100.0</td>
<td>0.0</td>
<td>100.0</td>
<td>100.0</td>
<td>100.0</td>
<td>0.0</td>
<td>100.0</td>
<td>100.0</td>
<td>100.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Several facts or steps</td>
<td>25.0</td>
<td>37.5</td>
<td>31.3</td>
<td>8.8</td>
<td>0.0</td>
<td>100.0</td>
<td>50.0</td>
<td>70.7</td>
<td>28.6</td>
<td>28.6</td>
<td>28.6</td>
<td>0.0</td>
</tr>
<tr>
<td>Extend knowledge or skill</td>
<td>12.5</td>
<td>0.0</td>
<td>6.3</td>
<td>8.8</td>
<td>100.0</td>
<td>0.0</td>
<td>50.0</td>
<td>70.7</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
</tbody>
</table>

Number of Segments: 8 8 1 1 7 7
<table>
<thead>
<tr>
<th>TIME</th>
<th>1</th>
<th>1</th>
<th>2</th>
<th>2</th>
<th>3</th>
<th>3</th>
<th>4</th>
<th>4</th>
<th>5</th>
<th>5</th>
<th>6</th>
<th>6</th>
<th>7</th>
<th>7</th>
<th>8</th>
<th>8</th>
<th>9</th>
<th>9</th>
</tr>
</thead>
<tbody>
<tr>
<td>TEACHING ACTIV</td>
<td>1</td>
<td>2</td>
<td>1</td>
<td>2</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>147</td>
<td>1</td>
<td>14</td>
<td>14</td>
<td>124</td>
<td>14</td>
<td>124</td>
<td></td>
</tr>
<tr>
<td>DEMAND on STs</td>
<td>12</td>
<td>1</td>
<td>12</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>13</td>
<td>1</td>
<td>13</td>
<td>2</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>12</td>
<td>1</td>
<td>12</td>
<td>2</td>
</tr>
<tr>
<td>#QUESTs by TCHR</td>
<td>12</td>
<td>14</td>
<td>8</td>
<td>7</td>
<td>8</td>
<td>4</td>
<td>7</td>
<td>9</td>
<td>7</td>
<td>5</td>
<td>2</td>
<td>3</td>
<td>17</td>
<td>19</td>
<td>14</td>
<td>18</td>
<td>6</td>
<td>13</td>
</tr>
<tr>
<td>#QUESTs by STs</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>2</td>
<td>1</td>
<td>2</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>HMWK REVIEW</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>LESSON DEVELOP</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>GUIDED PRACTICE</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>GO OVER TEST</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>REVIEW PREV MAT</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>TECHNOLOGY</td>
<td>13</td>
<td>13</td>
<td>13</td>
<td>13</td>
<td>13</td>
<td>13</td>
<td>1</td>
<td>1</td>
<td>123</td>
<td>13</td>
<td>13</td>
<td>13</td>
<td>3</td>
<td>3</td>
<td>2</td>
<td>23</td>
<td>2</td>
<td>23</td>
</tr>
<tr>
<td>MANAGER</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>TASK SETTER</td>
<td>12</td>
<td>1</td>
<td>12</td>
<td>1</td>
<td>12</td>
<td>1</td>
<td>12</td>
<td>1</td>
<td>12</td>
<td>1</td>
<td>12</td>
<td>1</td>
<td>12</td>
<td>1</td>
<td>12</td>
<td>1</td>
<td>12</td>
<td>1</td>
</tr>
<tr>
<td>EXPLAINER</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>COUNSELOR</td>
<td>2</td>
<td>2</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>2</td>
<td>12</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>FELLOW INVEST</td>
<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>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>RESOURCE</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>STs PASSIVE</td>
<td>12</td>
<td>12</td>
<td>12</td>
<td>12</td>
<td>12</td>
<td>12</td>
<td>12</td>
<td>12</td>
<td>12</td>
<td>12</td>
<td>12</td>
<td>12</td>
<td>12</td>
<td>12</td>
<td>12</td>
<td>12</td>
<td>12</td>
<td>12</td>
</tr>
<tr>
<td>STs WRITING</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>STs TALKING</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>24</td>
<td>12</td>
<td>2</td>
<td>24</td>
<td>1</td>
<td>12</td>
<td>2</td>
<td>2</td>
<td>27</td>
<td>247</td>
<td>236</td>
<td>1247</td>
</tr>
<tr>
<td>STs DIDACTIC</td>
<td>123</td>
<td>123</td>
<td>123</td>
<td>123</td>
<td>123</td>
<td>123</td>
<td>123</td>
<td>123</td>
<td>123</td>
<td>123</td>
<td>123</td>
<td>123</td>
<td>123</td>
<td>123</td>
<td>123</td>
<td>123</td>
<td>123</td>
<td>123</td>
</tr>
<tr>
<td>STs SYMBOLZNG</td>
<td>2</td>
<td>14</td>
<td>14</td>
<td>14</td>
<td>2</td>
<td>2</td>
<td>14</td>
<td>2</td>
<td>14</td>
<td>2</td>
<td>14</td>
<td>2</td>
<td>14</td>
<td>2</td>
<td>14</td>
<td>2</td>
<td>14</td>
<td>2</td>
</tr>
<tr>
<td>STs INVESTIG</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>STs PR SOLVNG</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>STs HIGH LEVEL</td>
<td>23</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>23</td>
<td>2</td>
<td>23</td>
<td>2</td>
<td>23</td>
<td>23</td>
<td>23</td>
<td>23</td>
<td>23</td>
<td>23</td>
<td>23</td>
<td>23</td>
<td>23</td>
</tr>
<tr>
<td>222</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></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>TABLE 16 (cont'd).</td>
<td>TOTAL</td>
<td>NO TECHNOLOGY</td>
<td>WITH TECHNOLOGY</td>
<td></td>
<td></td>
<td></td>
<td></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>-----------------------------</td>
<td>-----------</td>
<td>---------------</td>
<td>-----------------</td>
<td></td>
<td></td>
<td></td>
<td></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></td>
<td>OBSERVER</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></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></td>
<td>A</td>
<td>B</td>
<td>M</td>
<td>SD</td>
<td>A</td>
<td>B</td>
<td>M</td>
<td>SD</td>
<td>A</td>
<td>B</td>
<td>M</td>
<td>SD</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tchr Quests (ave/5 min)</td>
<td>9.0</td>
<td>10.2</td>
<td>9.6</td>
<td>0.9</td>
<td>9.5</td>
<td>19.0</td>
<td>14.3</td>
<td>6.7</td>
<td>8.9</td>
<td>9.1</td>
<td>9.0</td>
<td>0.2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>St Quests (ave/5 min)</td>
<td>0.4</td>
<td>0.8</td>
<td>0.6</td>
<td>0.2</td>
<td>1.0</td>
<td>0.0</td>
<td>0.5</td>
<td>0.7</td>
<td>0.3</td>
<td>0.9</td>
<td>0.6</td>
<td>0.4</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>% of Segments With:</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></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>Homework Review</td>
<td>11.1</td>
<td>11.1</td>
<td>11.1</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>14.3</td>
<td>12.5</td>
<td>13.4</td>
<td>1.3</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lesson Development</td>
<td>100.0</td>
<td>66.7</td>
<td>83.3</td>
<td>23.6</td>
<td>100.0</td>
<td>100.0</td>
<td>100.0</td>
<td>0.0</td>
<td>100.0</td>
<td>62.5</td>
<td>81.3</td>
<td>26.5</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Guided Practice</td>
<td>11.1</td>
<td>44.4</td>
<td>27.8</td>
<td>23.6</td>
<td>0.0</td>
<td>100.0</td>
<td>50.0</td>
<td>70.7</td>
<td>14.3</td>
<td>37.5</td>
<td>25.9</td>
<td>16.4</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Reviewing a Test</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Reviewing Material</td>
<td>44.4</td>
<td>44.4</td>
<td>44.4</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>57.1</td>
<td>50.0</td>
<td>53.6</td>
<td>5.1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Using Calculators Only</td>
<td>55.6</td>
<td>55.6</td>
<td>55.6</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>71.4</td>
<td>62.5</td>
<td>67.0</td>
<td>6.3</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Using Computers Only</td>
<td>22.2</td>
<td>22.2</td>
<td>22.2</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>28.6</td>
<td>25.0</td>
<td>26.8</td>
<td>2.5</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Both CaCs and Comp</td>
<td>0.0</td>
<td>11.1</td>
<td>5.6</td>
<td>7.9</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>12.5</td>
<td>6.3</td>
<td>8.8</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Student as Manager</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Student as Task Setter</td>
<td>33.3</td>
<td>0.0</td>
<td>16.7</td>
<td>23.6</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>42.9</td>
<td>0.0</td>
<td>21.4</td>
<td>30.3</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Student as Explainer</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Student as Consultant</td>
<td>22.2</td>
<td>33.3</td>
<td>27.8</td>
<td>7.9</td>
<td>50.0</td>
<td>0.0</td>
<td>25.0</td>
<td>35.4</td>
<td>14.3</td>
<td>37.5</td>
<td>25.9</td>
<td>16.4</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>St as Fellow Investigator</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Student as Resource</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Students Passive</td>
<td>100.0</td>
<td>100.0</td>
<td>100.0</td>
<td>0.0</td>
<td>100.0</td>
<td>100.0</td>
<td>100.0</td>
<td>0.0</td>
<td>100.0</td>
<td>100.0</td>
<td>100.0</td>
<td>0.0</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Students Active: Writing</td>
<td>66.7</td>
<td>55.6</td>
<td>61.1</td>
<td>7.9</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>85.7</td>
<td>62.5</td>
<td>74.1</td>
<td>16.4</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Students Active: Talking</td>
<td>100.0</td>
<td>100.0</td>
<td>100.0</td>
<td>0.0</td>
<td>100.0</td>
<td>100.0</td>
<td>100.0</td>
<td>0.0</td>
<td>100.0</td>
<td>100.0</td>
<td>100.0</td>
<td>0.0</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Students Didactic</td>
<td>100.0</td>
<td>100.0</td>
<td>100.0</td>
<td>0.0</td>
<td>100.0</td>
<td>100.0</td>
<td>100.0</td>
<td>0.0</td>
<td>100.0</td>
<td>100.0</td>
<td>100.0</td>
<td>0.0</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Students Symbolizing</td>
<td>55.6</td>
<td>88.9</td>
<td>72.2</td>
<td>23.6</td>
<td>0.0</td>
<td>100.0</td>
<td>50.0</td>
<td>70.7</td>
<td>71.4</td>
<td>87.5</td>
<td>79.5</td>
<td>11.4</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Students Investigating</td>
<td>44.4</td>
<td>88.9</td>
<td>66.7</td>
<td>31.4</td>
<td>50.0</td>
<td>100.0</td>
<td>75.0</td>
<td>35.4</td>
<td>42.9</td>
<td>87.5</td>
<td>65.2</td>
<td>31.6</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Students Problem Solving</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sts Higher Level Thinking</td>
<td>22.2</td>
<td>33.3</td>
<td>27.8</td>
<td>7.9</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>28.6</td>
<td>37.5</td>
<td>33.0</td>
<td>6.3</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>TABLE 16 (cont’d).</td>
<td>TOTAL</td>
<td>NO TECHNOLOGY</td>
<td>WITH TECHNOLOGY</td>
<td></td>
<td></td>
<td></td>
<td></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>--------------------</td>
<td>-------</td>
<td>---------------</td>
<td>-----------------</td>
<td></td>
<td></td>
<td></td>
<td></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></td>
<td>% of min Segments With:</td>
<td>A</td>
<td>B</td>
<td>M</td>
<td>SD</td>
<td>A</td>
<td>B</td>
<td>M</td>
<td>SD</td>
<td>A</td>
<td>B</td>
<td>M</td>
<td>SD</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Teacher as Manager</td>
<td>100.0</td>
<td>100.0</td>
<td>100.0</td>
<td>0.0</td>
<td>100.0</td>
<td>100.0</td>
<td>100.0</td>
<td>0.0</td>
<td>100.0</td>
<td>100.0</td>
<td>100.0</td>
<td>0.0</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Teacher as Task Setter</td>
<td>88.9</td>
<td>100.0</td>
<td>94.4</td>
<td>7.9</td>
<td>50.0</td>
<td>100.0</td>
<td>75.0</td>
<td>35.4</td>
<td>100.0</td>
<td>100.0</td>
<td>100.0</td>
<td>0.0</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Teacher as Explainer</td>
<td>66.7</td>
<td>100.0</td>
<td>83.3</td>
<td>23.6</td>
<td>100.0</td>
<td>100.0</td>
<td>100.0</td>
<td>0.0</td>
<td>57.1</td>
<td>100.0</td>
<td>78.6</td>
<td>30.3</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Teacher as Consultant</td>
<td>33.3</td>
<td>22.2</td>
<td>27.8</td>
<td>7.9</td>
<td>50.0</td>
<td>0.0</td>
<td>25.0</td>
<td>35.4</td>
<td>28.6</td>
<td>25.0</td>
<td>26.8</td>
<td>2.5</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tchr Fellow Investigator</td>
<td>0.0</td>
<td>11.1</td>
<td>5.6</td>
<td>7.9</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>12.5</td>
<td>6.3</td>
<td>8.8</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Teacher as Resource</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Exposition</td>
<td>100.0</td>
<td>66.7</td>
<td>83.3</td>
<td>23.6</td>
<td>100.0</td>
<td>100.0</td>
<td>100.0</td>
<td>0.0</td>
<td>100.0</td>
<td>62.5</td>
<td>81.3</td>
<td>26.5</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Exerc, Consolidit, Pract</td>
<td>0.0</td>
<td>55.6</td>
<td>27.8</td>
<td>39.3</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>62.5</td>
<td>31.3</td>
<td>44.2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Discussion</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Investigation</td>
<td>22.2</td>
<td>44.4</td>
<td>33.3</td>
<td>15.7</td>
<td>0.0</td>
<td>100.0</td>
<td>50.0</td>
<td>70.7</td>
<td>28.6</td>
<td>37.5</td>
<td>33.0</td>
<td>6.3</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Applied Mathematics</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Problem Solving</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Working in Groups</td>
<td>0.0</td>
<td>11.1</td>
<td>5.6</td>
<td>7.9</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>12.5</td>
<td>6.3</td>
<td>8.8</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Recall single fact or step</td>
<td>100.0</td>
<td>77.8</td>
<td>88.9</td>
<td>15.7</td>
<td>100.0</td>
<td>100.0</td>
<td>100.0</td>
<td>0.0</td>
<td>100.0</td>
<td>75.0</td>
<td>87.5</td>
<td>17.7</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Several facts or steps</td>
<td>44.4</td>
<td>22.2</td>
<td>33.3</td>
<td>15.7</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>57.1</td>
<td>25.0</td>
<td>41.1</td>
<td>22.7</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Extend knowledge or skill</td>
<td>22.2</td>
<td>0.0</td>
<td>11.1</td>
<td>15.7</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>28.6</td>
<td>0.0</td>
<td>14.3</td>
<td>20.2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Number of Segments | 9 | 9 | 2 | 1 | 7 | 8 |
<table>
<thead>
<tr>
<th>TABLE 17. CLASSROOM A/LESSON 3: OBSERVERS’ RECORDS</th>
</tr>
</thead>
<tbody>
<tr>
<td>TIME</td>
</tr>
<tr>
<td>TEACHNG ACTIV</td>
</tr>
<tr>
<td>DEMAND on STs</td>
</tr>
<tr>
<td>#QUESTs by TCHR</td>
</tr>
<tr>
<td>#QUESTs by STs</td>
</tr>
<tr>
<td>HMWK REVIEW</td>
</tr>
<tr>
<td>LESSON DEVELO</td>
</tr>
<tr>
<td>GUIDED PRACTICE</td>
</tr>
<tr>
<td>GO OVER TEST</td>
</tr>
<tr>
<td>Review Prev Mat</td>
</tr>
<tr>
<td>TECHNOLOGY</td>
</tr>
<tr>
<td>MANAGER</td>
</tr>
<tr>
<td>TASK SETTER</td>
</tr>
<tr>
<td>EXPLAINER</td>
</tr>
<tr>
<td>COUNSELOR</td>
</tr>
<tr>
<td>FELLOW INVEST</td>
</tr>
<tr>
<td>RESOURCE</td>
</tr>
<tr>
<td>STs PASSIVE</td>
</tr>
<tr>
<td>STs WRITING</td>
</tr>
<tr>
<td>STs TALKING</td>
</tr>
<tr>
<td>STs DIDACTIC</td>
</tr>
<tr>
<td>STs SYMBLZNG</td>
</tr>
<tr>
<td>STs INVESTIG</td>
</tr>
<tr>
<td>STs PR SOLVNG</td>
</tr>
<tr>
<td>STs HIGH LEVEL</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>--------------------------</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>Tchr Quests (ave/5 min)</td>
</tr>
<tr>
<td>St Quests (ave/5 min)</td>
</tr>
<tr>
<td>% of Segments With:</td>
</tr>
<tr>
<td>Homework Review</td>
</tr>
<tr>
<td>Lesson Development</td>
</tr>
<tr>
<td>Guided Practice</td>
</tr>
<tr>
<td>Reviewing a Test</td>
</tr>
<tr>
<td>Reviewing Material</td>
</tr>
<tr>
<td>Using Calculators Only</td>
</tr>
<tr>
<td>Using Computers Only</td>
</tr>
<tr>
<td>Both Calcs and Comps</td>
</tr>
<tr>
<td>Student as Manager</td>
</tr>
<tr>
<td>Student as Task Setter</td>
</tr>
<tr>
<td>Student as Explainer</td>
</tr>
<tr>
<td>Student as Consultant</td>
</tr>
<tr>
<td>St Fellow Investigator</td>
</tr>
<tr>
<td>Student as Resource</td>
</tr>
<tr>
<td>Students Passive</td>
</tr>
<tr>
<td>Students Active: Writing</td>
</tr>
<tr>
<td>Students Active: Talking</td>
</tr>
<tr>
<td>Students Didactic</td>
</tr>
<tr>
<td>Students Symbolizing</td>
</tr>
<tr>
<td>Students Investigating</td>
</tr>
<tr>
<td>Students Problem Solving</td>
</tr>
<tr>
<td>Sts Higher Level Thinking</td>
</tr>
<tr>
<td>% of Segments With:</td>
</tr>
<tr>
<td>-----------------------------------------</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>Teacher as Manager</td>
</tr>
<tr>
<td>Teacher as Task Setter</td>
</tr>
<tr>
<td>Teacher as Explainer</td>
</tr>
<tr>
<td>Teacher as Consultant</td>
</tr>
<tr>
<td>Tchr Fellow Investigator</td>
</tr>
<tr>
<td>Teacher as Resource</td>
</tr>
<tr>
<td>Exposition</td>
</tr>
<tr>
<td>Exerc, Consolidat, Pract</td>
</tr>
<tr>
<td>Discussion</td>
</tr>
<tr>
<td>Investigation</td>
</tr>
<tr>
<td>Applied Mathematics</td>
</tr>
<tr>
<td>Problem Solving</td>
</tr>
<tr>
<td>Working in Groups</td>
</tr>
<tr>
<td>Single fact or step</td>
</tr>
<tr>
<td>Several facts or steps</td>
</tr>
<tr>
<td>Extend knowledge or skill</td>
</tr>
</tbody>
</table>

<p>| Number of Segments                      | 7 7    | 1 1      | 6 6           |          |                |          |</p>
<table>
<thead>
<tr>
<th>TABLE 18. CLASSROOM A/LESSON 4: OBSERVERS’ RECORDS</th>
</tr>
</thead>
<tbody>
<tr>
<td>OBSERVER</td>
</tr>
<tr>
<td>TIME</td>
</tr>
<tr>
<td>TEACHING ACTIV</td>
</tr>
<tr>
<td>DEMAND on STs</td>
</tr>
<tr>
<td>#QUESTs by TCHR</td>
</tr>
<tr>
<td>#QUESTs by STs</td>
</tr>
<tr>
<td>HMWK REVIEW</td>
</tr>
<tr>
<td>LESSON DEVELOP</td>
</tr>
<tr>
<td>GUIDED PRACTICE</td>
</tr>
<tr>
<td>GO OVER TEST</td>
</tr>
<tr>
<td>REVIEW PREV MAT</td>
</tr>
<tr>
<td>TECHNOLOGY</td>
</tr>
<tr>
<td>MANAGER</td>
</tr>
<tr>
<td>TASK SETTER</td>
</tr>
<tr>
<td>EXPLAINER</td>
</tr>
<tr>
<td>COUNSELOR</td>
</tr>
<tr>
<td>FELLOW INVEST</td>
</tr>
<tr>
<td>RESOURCE</td>
</tr>
<tr>
<td>STs PASSIVE</td>
</tr>
<tr>
<td>STs WRITING</td>
</tr>
<tr>
<td>STs TALKING</td>
</tr>
<tr>
<td>STs DIDACTIC</td>
</tr>
<tr>
<td>STs SYMBLZNG</td>
</tr>
<tr>
<td>STs INVESTIG</td>
</tr>
<tr>
<td>STs PR SOLVNG</td>
</tr>
<tr>
<td>STs HIGH LEVEL</td>
</tr>
<tr>
<td>TABLE 18 (cont’d).</td>
</tr>
<tr>
<td>--------------------</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>Tchr Quests (ave/5 min)</td>
</tr>
<tr>
<td>St Quests (ave/5 min)</td>
</tr>
<tr>
<td>% of Segments With:</td>
</tr>
<tr>
<td>Homework Review</td>
</tr>
<tr>
<td>Lesson Development</td>
</tr>
<tr>
<td>Guided Practice</td>
</tr>
<tr>
<td>Reviewing a Test</td>
</tr>
<tr>
<td>Reviewing Material</td>
</tr>
<tr>
<td>Using Calculators Only</td>
</tr>
<tr>
<td>Using Computers Only</td>
</tr>
<tr>
<td>Both Caics and Comps</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>Students Passive</td>
</tr>
<tr>
<td>Students Active:</td>
</tr>
<tr>
<td>Writing</td>
</tr>
<tr>
<td>Talking</td>
</tr>
<tr>
<td>Students Didactic</td>
</tr>
<tr>
<td>Students Symbolizing</td>
</tr>
<tr>
<td>Students Investigating</td>
</tr>
<tr>
<td>Students Problem Solving</td>
</tr>
<tr>
<td>Sts Higher Level Thinking</td>
</tr>
<tr>
<td>TABLE 19. CLASSROOM A/LESSON 5: OBSERVERS' RECORDS</td>
</tr>
<tr>
<td>-----------------------------------------------</td>
</tr>
<tr>
<td><strong>TIME</strong></td>
</tr>
<tr>
<td><strong>TEACHNG ACTIV</strong></td>
</tr>
<tr>
<td><strong>DEMAND on STs</strong></td>
</tr>
<tr>
<td><strong>#QUESTs by TCHR</strong></td>
</tr>
<tr>
<td><strong>#QUESTs by STs</strong></td>
</tr>
<tr>
<td><strong>HMWK REVIEW</strong></td>
</tr>
<tr>
<td><strong>LESSON DEVELOP</strong></td>
</tr>
<tr>
<td><strong>GUIDED PRACTICE</strong></td>
</tr>
<tr>
<td><strong>GO OVER TEST</strong></td>
</tr>
<tr>
<td><strong>ReVIEW PREV MAT</strong></td>
</tr>
<tr>
<td><strong>TECHNOLOGY</strong></td>
</tr>
<tr>
<td><strong>MANAGER</strong></td>
</tr>
<tr>
<td><strong>TASK SETTER</strong></td>
</tr>
<tr>
<td><strong>EXPLAINER</strong></td>
</tr>
<tr>
<td><strong>COUNSELOR</strong></td>
</tr>
<tr>
<td><strong>FELLOW INVEST</strong></td>
</tr>
<tr>
<td><strong>RESOURCE</strong></td>
</tr>
<tr>
<td><strong>STs PASSIVE</strong></td>
</tr>
<tr>
<td><strong>STs WRITING</strong></td>
</tr>
<tr>
<td><strong>STs TALKING</strong></td>
</tr>
<tr>
<td><strong>STs DIDACTIC</strong></td>
</tr>
<tr>
<td><strong>STs SYMBLZNG</strong></td>
</tr>
<tr>
<td><strong>STs INVESTIG</strong></td>
</tr>
<tr>
<td><strong>STs PR SOLVNG</strong></td>
</tr>
<tr>
<td><strong>STs HIGH LEVEL</strong></td>
</tr>
<tr>
<td>TABLE 19 (cont’d).</td>
</tr>
<tr>
<td>---------------------</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>Tchr Quests (ave/5 mln)</td>
</tr>
<tr>
<td>St Quests (ave/5 mln)</td>
</tr>
<tr>
<td>% of Segments With:</td>
</tr>
<tr>
<td>Homework Review</td>
</tr>
<tr>
<td>Lesson Development</td>
</tr>
<tr>
<td>Guided Practice</td>
</tr>
<tr>
<td>Reviewing a Test</td>
</tr>
<tr>
<td>Reviewing Material</td>
</tr>
<tr>
<td>Using Calculators Only</td>
</tr>
<tr>
<td>Using Computers Only</td>
</tr>
<tr>
<td>Both Calcs and Comps</td>
</tr>
<tr>
<td>Student as Manager</td>
</tr>
<tr>
<td>Student as Task Setter</td>
</tr>
<tr>
<td>Student as Explainer</td>
</tr>
<tr>
<td>Student as Consultant</td>
</tr>
<tr>
<td>St Fellow Investigator</td>
</tr>
<tr>
<td>Student as Resource</td>
</tr>
<tr>
<td>Students Passive</td>
</tr>
<tr>
<td>Students Active: Writing</td>
</tr>
<tr>
<td>Students Active: Talking</td>
</tr>
<tr>
<td>Students Didactic</td>
</tr>
<tr>
<td>Students Symbolizing</td>
</tr>
<tr>
<td>Students Investigating</td>
</tr>
<tr>
<td>Students Problem Solving</td>
</tr>
<tr>
<td>Sts Higher Level Thinking</td>
</tr>
<tr>
<td>% of Segments With:</td>
</tr>
<tr>
<td>-------------------------------------</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>Teacher as Manager</td>
</tr>
<tr>
<td>Teacher as Task Setter</td>
</tr>
<tr>
<td>Teacher as Explainer</td>
</tr>
<tr>
<td>Teacher as Consultant</td>
</tr>
<tr>
<td>Tchr Fellow Investigator</td>
</tr>
<tr>
<td>Teacher as Resource</td>
</tr>
<tr>
<td>Exposition</td>
</tr>
<tr>
<td>Exerc, Consolidat, Pract</td>
</tr>
<tr>
<td>Discussion</td>
</tr>
<tr>
<td>Investigation</td>
</tr>
<tr>
<td>Applied Mathematics</td>
</tr>
<tr>
<td>Problem Solving</td>
</tr>
<tr>
<td>Working in Groups</td>
</tr>
<tr>
<td>Single fact or step</td>
</tr>
<tr>
<td>Several facts or steps</td>
</tr>
<tr>
<td>Extend knowledge or skill</td>
</tr>
</tbody>
</table>

Number of Segments: 10 10 5 3 5 7
<p>| TABLE 20. CLASSROOM A/LESSON 6: OBSERVERS’ RECORDS |
|-----------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|
| OBSERVER        | A 1 | B 2 | A 3 | B 4 | A 5 | B 6 | A 7 | B 8 | A 9 | B 9 |
| TIME            | 1   | 1   | 2   | 1   | 2   | 1   | 2   | 2   | 1   | 2   | 2   | 2   | 2   | 2   | 2   | 2   | 2   | 2   | 2   |
| TEACHING ACTIV  |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
| DEMAND on STs   | 1   | 1   | 1   | 13  | 123 | 13  | 12  | 123 | 12  | 123 | 1   | 123 | 12  | 123 | 12  | 123 | 12  | 123 | 12  |
| #QUESTs by TCHR | 2   | 2   | 5   | 4   | 5   | 3   | 4   | 4   | 16  | 15  | 7   | 5   | 17  | 11  | 9   | 8   | 8   | 20  | 9   |
| #QUESTs by STs  | 1   | 1   | 3   | 2   | 1   |     | 3   | 3   | 4   | 3   | 5   | 5   | 4   | 3   | 3   | 2   |     |     |     |     |
| HMWK REVIEW     | 1   | 1   |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
| LESSON DEVELOP  |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
| GUIDED PRACTICE |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
| GO OVER TEST    |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
| REVIEW PREV MAT | 1   | 1   | 1   | 1   | 1   | 1   | 1   | 1   | 1   | 1   | 1   | 1   | 1   | 1   | 1   | 1   | 1   | 1   | 1   |
| TECHNOLOGY      | 234 | 123 | 1234| 123 | 1234| 12  | 123 | 13  | 13  | 13  | 13  | 13  | 3   | 3   | 3   | 3   | 3   | 13  |     |
| MANAGER         |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
| TASK SETTER     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
| EXPLAINER       |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
| COUNSELOR       |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
| FELLOW INVEST   |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
| RESOURCE        | 4   | 4   | 345 | 34  | 345 | 34  | 35  | 3   | 35  | 3   | 35  | 35  | 3   | 5   |     |     |     |     |     |
| STs PASSIVE     | 12  | 12  | 12  | 12  | 12  | 12  | 12  | 12  | 12  | 12  | 12  | 12  | 12  | 12  | 12  | 12  | 12  | 12  | 12  |
| STs WRITING     | 15  | 25  | 5   | 25  | 5   | 25  | 5   | 25  | 15  | 25  | 15  | 25  | 15  | 25  | 1   | 2   | 15  |     |     |
| STs TALKING     |     |     | 1   | 12  | 127 | 12  | 7   | 127 | 27  | 27  | 127 | 12  | 127 | 12  | 12  | 12  | 12  | 12  |     |
| STs DIDACTIC    | 1   | 123 | 123 | 123 | 123 | 123 | 123 | 123 | 123 | 123 | 123 | 123 | 123 | 123 | 123 | 123 | 123 |     |
| STs SYMBLZNG    | 25  | 2   | 25  | 2   | 25  | 2   | 25  | 2   | 25  | 2   | 25  | 2   | 4   | 2   | 4   | 2   | 4   | 25  |     |
| STs INVESTIG    | 3   | 3   | 3   | 3   | 3   | 3   | 3   | 3   | 3   | 3   | 3   | 3   | 3   | 3   | 3   | 3   | 3   | 3   |     |
| STs PR SOLVNG   |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     | 45   |
| STs HIGH LEVEL  | 7   | 2   |     |     | 23  |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
|                  | 124 | 123 | 123 | 123 | 123 |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |</p>
<table>
<thead>
<tr>
<th>TABLE 20 (cont'd).</th>
<th>TOTAL</th>
<th>NO TECHNOLOGY</th>
<th>WITH TECHNOLOGY</th>
</tr>
</thead>
<tbody>
<tr>
<td>Observer</td>
<td></td>
<td>A</td>
<td>B</td>
</tr>
<tr>
<td>Tchr Quests (ave/5 min)</td>
<td>9.6</td>
<td>6.8</td>
<td>8.2</td>
</tr>
<tr>
<td>St Quests (ave/5 min)</td>
<td>2.6</td>
<td>2.2</td>
<td>2.4</td>
</tr>
<tr>
<td>% of Segments With:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Homework Review</td>
<td>0.0</td>
<td>33.3</td>
<td>16.7</td>
</tr>
<tr>
<td>Lesson Development</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Guided Practice</td>
<td>0.0</td>
<td>88.9</td>
<td>44.4</td>
</tr>
<tr>
<td>Reviewing a Test</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Reviewing Material</td>
<td>100.0</td>
<td>100.0</td>
<td>100.0</td>
</tr>
<tr>
<td>Using Calculators Only</td>
<td>44.4</td>
<td>44.4</td>
<td>44.4</td>
</tr>
<tr>
<td>Using Computers Only</td>
<td>11.1</td>
<td>0.0</td>
<td>5.6</td>
</tr>
<tr>
<td>Both Calcs and Comps</td>
<td>33.3</td>
<td>33.3</td>
<td>33.3</td>
</tr>
<tr>
<td>Student as Manager</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Student as Task Setter</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Student as Explainer</td>
<td>0.0</td>
<td>33.3</td>
<td>16.7</td>
</tr>
<tr>
<td>Student as Consultant</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>St Fellow Investigator</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Student as Resource</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Students Passive</td>
<td>100.0</td>
<td>100.0</td>
<td>100.0</td>
</tr>
<tr>
<td>Students Active: Writing</td>
<td>88.9</td>
<td>100.0</td>
<td>94.4</td>
</tr>
<tr>
<td>Students Active: Talking</td>
<td>100.0</td>
<td>100.0</td>
<td>100.0</td>
</tr>
<tr>
<td>Students Didactic</td>
<td>100.0</td>
<td>100.0</td>
<td>100.0</td>
</tr>
<tr>
<td>Students Symbolizing</td>
<td>77.8</td>
<td>100.0</td>
<td>88.9</td>
</tr>
<tr>
<td>Students Investigating</td>
<td>77.8</td>
<td>100.0</td>
<td>88.9</td>
</tr>
<tr>
<td>Students Problem Solving</td>
<td>0.0</td>
<td>11.1</td>
<td>5.6</td>
</tr>
<tr>
<td>Sts Higher Level Thinking</td>
<td>0.0</td>
<td>77.8</td>
<td>38.9</td>
</tr>
<tr>
<td>% of Segments With:</td>
<td>TOTAL</td>
<td></td>
<td>NO TECHNOLOGY</td>
</tr>
<tr>
<td>---------------------</td>
<td>-------</td>
<td>---</td>
<td>-------------</td>
</tr>
<tr>
<td></td>
<td>OBSERVER</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>A</td>
<td>B</td>
<td>M</td>
</tr>
<tr>
<td>Teacher as Manager</td>
<td>100.0</td>
<td>100.0</td>
<td>100.0</td>
</tr>
<tr>
<td>Teacher as Task Setter</td>
<td>100.0</td>
<td>66.7</td>
<td>83.3</td>
</tr>
<tr>
<td>Teacher as Explainer</td>
<td>100.0</td>
<td>100.0</td>
<td>100.0</td>
</tr>
<tr>
<td>Teacher as Consultant</td>
<td>0.0</td>
<td>22.2</td>
<td>11.1</td>
</tr>
<tr>
<td>Tchr Fellow Investigator</td>
<td>0.1</td>
<td>11.1</td>
<td>5.6</td>
</tr>
<tr>
<td>Teacher as Resource</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Exposition</td>
<td>55.6</td>
<td>0.0</td>
<td>27.8</td>
</tr>
<tr>
<td>Exerc, Consolidat, Pract</td>
<td>44.4</td>
<td>100.0</td>
<td>72.2</td>
</tr>
<tr>
<td>Discussion</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Investigation</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Applied Mathematics</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Problem Solving</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Working In Groups</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Single fact or step</td>
<td>100.0</td>
<td>100.0</td>
<td>100.0</td>
</tr>
<tr>
<td>Several facts or steps</td>
<td>55.6</td>
<td>66.7</td>
<td>61.1</td>
</tr>
<tr>
<td>Extend knowledge or skill</td>
<td>77.8</td>
<td>11.1</td>
<td>44.4</td>
</tr>
</tbody>
</table>

Number of Segments

<table>
<thead>
<tr>
<th></th>
<th>TOTAL</th>
<th>NO TECHNOLOGY</th>
<th>WITH TECHNOLOGY</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Number of Segments</td>
<td>9</td>
<td>9</td>
<td>1</td>
</tr>
<tr>
<td>TABLE 21. CLASSROOM B/LESSON 1: OBSERVERS' RECORDS</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>-----------------------------------------------</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>TIME</td>
<td>1</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>Teaching Activity</td>
<td>15</td>
<td>14</td>
<td>145</td>
</tr>
<tr>
<td>Demand on STs</td>
<td>12</td>
<td>1</td>
<td>12</td>
</tr>
<tr>
<td>#Quests by TCHR</td>
<td>1</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>#Quests by STs</td>
<td>2</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>HWK Review</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Lesson Develop</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>GUIDED PRACTICE</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>GO OVER TEST</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>REVIEW Previous MAT</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>TECHNOLOGY</td>
<td>23</td>
<td>23</td>
<td>2</td>
</tr>
<tr>
<td>Manager</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>TASK SETTER</td>
<td>1</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>EXPLAINER</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>COUNSELOR</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>FELLOW INVEST</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>RESOURCE</td>
<td>4</td>
<td>4</td>
<td>45</td>
</tr>
<tr>
<td>STs Passive</td>
<td>12</td>
<td>12</td>
<td>12</td>
</tr>
<tr>
<td>STs WRITING</td>
<td>1</td>
<td>1</td>
<td>5</td>
</tr>
<tr>
<td>STs TALKING</td>
<td>1</td>
<td>1</td>
<td>23</td>
</tr>
<tr>
<td>STs Didactic</td>
<td>1</td>
<td>123</td>
<td>1</td>
</tr>
<tr>
<td>STs SYMBOLIZING</td>
<td>4</td>
<td>15</td>
<td>15</td>
</tr>
<tr>
<td>STs INVESTIG</td>
<td>3</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>STs PR SOLVING</td>
<td>12</td>
<td>12</td>
<td>12</td>
</tr>
</tbody>
</table>

236
<table>
<thead>
<tr>
<th>TABLE 21 (cont’d).</th>
<th>TOTAL</th>
<th>NO TECHNOLOGY</th>
<th>WITH TECHNOLOGY</th>
</tr>
</thead>
<tbody>
<tr>
<td>Observer</td>
<td>A  B  M  SD</td>
<td>A  B  M  SD</td>
<td>A  B  M  SD</td>
</tr>
<tr>
<td>Tchr Quests (ave/5 min)</td>
<td>1.6 2.7 2.2 0.8</td>
<td>1.6 3.7 2.6 1.4</td>
<td>1.7 1.6 1.6 0.0</td>
</tr>
<tr>
<td>St Quests (ave/5 min)</td>
<td>1.5 2.1 1.8 0.4</td>
<td>1.6 2.0 1.8 0.3</td>
<td>1.0 2.2 1.6 0.8</td>
</tr>
<tr>
<td>% of Segments With:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Homework Review</td>
<td>54.5 72.7 63.6 12.9</td>
<td>62.5 50.0 56.3 8.8</td>
<td>33.3 100.0 66.7 47.1</td>
</tr>
<tr>
<td>Lesson Development</td>
<td>36.4 27.3 31.8 6.4</td>
<td>25.0 50.0 37.5 17.7</td>
<td>66.7 0.0 33.3 47.1</td>
</tr>
<tr>
<td>Guided Practice</td>
<td>0.0 45.5 22.7 32.1</td>
<td>0.0 50.0 25.0 35.4</td>
<td>0.0 40.0 20.0 28.3</td>
</tr>
<tr>
<td>Reviewing a Test</td>
<td>0.0 0.0 0.0 0.0</td>
<td>0.0 0.0 0.0 0.0</td>
<td>0.0 0.0 0.0 0.0</td>
</tr>
<tr>
<td>Reviewing Material</td>
<td>90.9 72.7 81.8 12.9</td>
<td>87.5 50.0 68.8 26.5</td>
<td>100.0 100.0 100.0 0.0</td>
</tr>
<tr>
<td>Using Calculators Only</td>
<td>0.0 18.2 9.1 12.9</td>
<td>0.0 0.0 0.0 0.0</td>
<td>0.0 40.0 20.0 28.3</td>
</tr>
<tr>
<td>Using Computers Only</td>
<td>27.3 9.1 18.2 12.9</td>
<td>0.0 0.0 0.0 0.0</td>
<td>100.0 20.0 60.0 56.8</td>
</tr>
<tr>
<td>Both Calcs and Comps</td>
<td>0.0 18.2 9.1 12.9</td>
<td>0.0 0.0 0.0 0.0</td>
<td>0.0 40.0 20.0 28.3</td>
</tr>
<tr>
<td>Student as Manager</td>
<td>0.0 0.0 0.0 0.0</td>
<td>0.0 0.0 0.0 0.0</td>
<td>0.0 0.0 0.0 0.0</td>
</tr>
<tr>
<td>Student as Task Setter</td>
<td>0.0 54.5 27.3 38.6</td>
<td>0.0 50.0 25.0 35.4</td>
<td>0.0 60.0 30.0 42.4</td>
</tr>
<tr>
<td>Student as Explaner</td>
<td>0.0 27.3 13.6 19.3</td>
<td>0.0 16.7 8.3 11.8</td>
<td>0.0 40.0 20.0 28.3</td>
</tr>
<tr>
<td>Student as Consultant</td>
<td>9.1 9.1 9.1 0.0</td>
<td>12.5 16.7 14.6 2.9</td>
<td>0.0 0.0 0.0 0.0</td>
</tr>
<tr>
<td>St Fellow Investigator</td>
<td>0.0 0.0 0.0 0.0</td>
<td>0.0 0.0 0.0 0.0</td>
<td>0.0 0.0 0.0 0.0</td>
</tr>
<tr>
<td>Student as Resource</td>
<td>0.0 0.0 0.0 0.0</td>
<td>0.0 0.0 0.0 0.0</td>
<td>0.0 0.0 0.0 0.0</td>
</tr>
<tr>
<td>Students Passive</td>
<td>100.0 100.0 100.0 0.0</td>
<td>100.0 100.0 100.0 0.0</td>
<td>100.0 100.0 100.0 0.0</td>
</tr>
<tr>
<td>Students Active: Writing</td>
<td>54.5 54.5 54.5 0.0</td>
<td>50.0 16.7 33.3 23.6</td>
<td>66.7 100.0 83.3 23.6</td>
</tr>
<tr>
<td>Students Active: Talking</td>
<td>100.0 100.0 100.0 0.0</td>
<td>100.0 100.0 100.0 0.0</td>
<td>100.0 100.0 100.0 0.0</td>
</tr>
<tr>
<td>Students Didactic</td>
<td>100.0 100.0 100.0 0.0</td>
<td>100.0 100.0 100.0 0.0</td>
<td>100.0 100.0 100.0 0.0</td>
</tr>
<tr>
<td>Students Symbolizing</td>
<td>36.4 81.8 59.1 32.1</td>
<td>50.0 66.7 58.3 11.8</td>
<td>0.0 100.0 50.0 70.7</td>
</tr>
<tr>
<td>Students Investigating</td>
<td>72.7 90.0 81.8 12.9</td>
<td>62.5 83.3 72.9 14.7</td>
<td>100.0 100.0 100.0 0.0</td>
</tr>
<tr>
<td>Students Problem Solving</td>
<td>9.1 0.0 4.5 6.4</td>
<td>12.5 0.0 6.3 8.8</td>
<td>0.0 0.0 0.0 0.0</td>
</tr>
<tr>
<td>St Higher Level Thinking</td>
<td>54.5 72.7 63.6 12.9</td>
<td>75.0 50.0 62.5 17.7</td>
<td>0.0 100.0 50.0 70.7</td>
</tr>
<tr>
<td>TABLE 21 (cont'd).</td>
<td>TOTAL</td>
<td></td>
<td></td>
</tr>
<tr>
<td>---------------------</td>
<td>-------</td>
<td>---------</td>
<td>---------</td>
</tr>
<tr>
<td></td>
<td>OBSERVER</td>
<td>A</td>
<td>B</td>
</tr>
<tr>
<td>% of Segments With:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Teacher as Manager</td>
<td>100.0</td>
<td>100.0</td>
<td>100.0</td>
</tr>
<tr>
<td>Teacher as Task Setter</td>
<td>54.5</td>
<td>27.3</td>
<td>40.9</td>
</tr>
<tr>
<td>Teacher as Explainer</td>
<td>81.8</td>
<td>100.0</td>
<td>90.9</td>
</tr>
<tr>
<td>Teacher as Consultant</td>
<td>45.5</td>
<td>0.0</td>
<td>22.7</td>
</tr>
<tr>
<td>Tchr Fellow Investigator</td>
<td>36.4</td>
<td>27.3</td>
<td>31.8</td>
</tr>
<tr>
<td>Teacher as Resource</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Exposition</td>
<td>63.6</td>
<td>45.5</td>
<td>54.5</td>
</tr>
<tr>
<td>Exerc, Consolidat, Pract</td>
<td>72.7</td>
<td>54.5</td>
<td>63.6</td>
</tr>
<tr>
<td>Discussion</td>
<td>0.0</td>
<td>18.2</td>
<td>9.1</td>
</tr>
<tr>
<td>Investigation</td>
<td>9.1</td>
<td>63.6</td>
<td>36.4</td>
</tr>
<tr>
<td>Applied Mathematics</td>
<td>45.5</td>
<td>0.0</td>
<td>22.7</td>
</tr>
<tr>
<td>Problem Solving</td>
<td>27.3</td>
<td>0.0</td>
<td>13.6</td>
</tr>
<tr>
<td>Working in Groups</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Single fact or step</td>
<td>81.8</td>
<td>81.8</td>
<td>81.8</td>
</tr>
<tr>
<td>Several facts or steps</td>
<td>9.1</td>
<td>36.4</td>
<td>22.7</td>
</tr>
<tr>
<td>Extend knowledge or skill</td>
<td>18.2</td>
<td>9.1</td>
<td>13.6</td>
</tr>
</tbody>
</table>

Number of Segments | 11 | 11 | 8 | 6 | 3 | 5
| 1    | TEACHNG ACTIV | 12 | 2 | 12 | 2 | 12 | 2 | 12 | 1 | 12 | 2 | 12 | 2 | 12 | 2 | 12 | 2 | 12 | 2 | 12 | 1 |
| 2    | DEMAND on STs | 12 | 2 | 1 | 1 | 12 | 13 | 1 | 1 | 1 | 12 | 12 | 1 | 12 | 12 | 1 |
| 3    | #QUESTs by TCHR | 6 | 2 | 1 | 1 | 2 | 2 | 2 | 1 | 2 | 6 | 3 | 1 |
| 4    | #QUESTs by STs | 4 | 3 | 7 | 9 | 3 | 3 | 7 | 6 | 4 | 4 | 3 | 2 | 2 | 1 | 1 | 3 |
| 5    | HMWK REVIEW | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 6    | LESSON DEVELOP | 1 |
| 7    | GUIDED PRACTICE | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 8    | GO OVER TEST | 1 |
| 9    | ReVIEW PREV MAT | 1 |
| 10   | TECHNOLOGY | 13 | 13 | 13 | 13 | 13 | 13 | 13 | 13 | 13 | 13 | 13 | 13 | 13 | 13 | 13 | 13 | 13 | 13 | 13 | 3 | 3 | 3 |
| 11   | MANAGER | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 12   | TASK SETTER | 1 | 1 | 1 | 1 | 1 | 1 | 2 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 13   | EXPLAINER | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 14   | COUNSELOR | 1 | 1 | 1 | 1 | 1 |
| 15   | FELLOW INVEST | 35 | 35 | 3 | 35 | 3 | 3 | 3 | 3 | 3 | 3 | 4 | 3 | 3 | 4 | 3 | 4 | 5 |
| 16   | RESOURCE | 35 | 35 | 3 | 35 | 3 | 3 | 3 | 3 | 3 | 3 | 4 | 3 | 3 | 4 | 3 | 4 | 5 |
| 17   | STs PASSIVE | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 12 |
| 18   | STs WRITING | 5 | 5 | 15 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 15 | 1 |
| 19   | STs TALKING | 12 | 125 | 1 | 125 | 12 | 124 | 1 | 14 | 12 | 124 | 124 | 147 | 14 | 147 | 2 | 27 | 24 | 1 |
| 20   | STs DIDACTIC | 123 | 12 | 123 | 123 | 123 | 123 | 123 | 123 | 123 | 123 | 123 | 123 | 13 | 123 | 12 | 12 | 1 | 1 |
| 21   | STs SYMBLZNG | 2 | 2 | 25 | 2 | 25 | 2 | 25 | 2 | 25 | 2 | 25 | 2 | 25 | 2 | 25 | 25 |
| 22   | STs INVESTIG | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 |
| 23   | STs PR SOLVNG | 45 |
| 24   | STs HIGH LEVEL | 2 | 2 | 2 | 2 |

Note: The table represents a breakdown of classroom observations and activities during Lesson 2. Each column indicates the frequency of activities observed at different times.
<table>
<thead>
<tr>
<th>TABLE 22 (cont’d).</th>
<th>TOTAL</th>
<th>NO TECHNOLOGY</th>
<th>WITH TECHNOLOGY</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>OBSERVER</td>
<td>A</td>
<td>B</td>
</tr>
<tr>
<td>Tchr Quests (ave/5 min)</td>
<td>1.7</td>
<td>1.1</td>
<td>1.4</td>
</tr>
<tr>
<td>St Quests (ave/5 min)</td>
<td>3.4</td>
<td>3.4</td>
<td>3.4</td>
</tr>
<tr>
<td>% of Segments With:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Homework Review</td>
<td>0.0</td>
<td>88.9</td>
<td>44.4</td>
</tr>
<tr>
<td>Lesson Development</td>
<td>10.0</td>
<td>0.0</td>
<td>5.0</td>
</tr>
<tr>
<td>Guided Practice</td>
<td>70.0</td>
<td>88.9</td>
<td>79.4</td>
</tr>
<tr>
<td>Reviewing a Test</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Reviewing Material</td>
<td>30.0</td>
<td>100.0</td>
<td>65.0</td>
</tr>
<tr>
<td>Using Calculators Only</td>
<td>40.0</td>
<td>55.6</td>
<td>47.8</td>
</tr>
<tr>
<td>Using Computers Only</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Both Calcs and Comps</td>
<td>30.0</td>
<td>33.3</td>
<td>31.7</td>
</tr>
<tr>
<td>Student as Manager</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Student as Task Setter</td>
<td>0.0</td>
<td>11.1</td>
<td>5.6</td>
</tr>
<tr>
<td>Student as Explainer</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Student as Consultant</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>St Fellow Investigator</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Student as Resource</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Students Passive</td>
<td>100.0</td>
<td>100.0</td>
<td>100.0</td>
</tr>
<tr>
<td>Students Active: Writing</td>
<td>70.0</td>
<td>88.9</td>
<td>79.4</td>
</tr>
<tr>
<td>Students Active: Talking</td>
<td>100.0</td>
<td>100.0</td>
<td>100.0</td>
</tr>
<tr>
<td>Students Didactic</td>
<td>100.0</td>
<td>88.9</td>
<td>94.4</td>
</tr>
<tr>
<td>Students Symbolizing</td>
<td>70.0</td>
<td>77.8</td>
<td>73.9</td>
</tr>
<tr>
<td>Students Investigating</td>
<td>70.0</td>
<td>88.9</td>
<td>79.4</td>
</tr>
<tr>
<td>Students Problem Solving</td>
<td>0.0</td>
<td>11.1</td>
<td>5.6</td>
</tr>
<tr>
<td>Sts Higher Level Thinking</td>
<td>0.0</td>
<td>33.3</td>
<td>16.7</td>
</tr>
<tr>
<td>% of Segments With:</td>
<td>TOTAL</td>
<td></td>
<td></td>
</tr>
<tr>
<td>-------------------------------------</td>
<td>--------</td>
<td>------------</td>
<td>------------</td>
</tr>
<tr>
<td></td>
<td>OBSERVER</td>
<td>A</td>
<td>B</td>
</tr>
<tr>
<td>Teacher as Manager</td>
<td></td>
<td>100.0</td>
<td>100.0</td>
</tr>
<tr>
<td>Teacher as Task Setter</td>
<td></td>
<td>100.0</td>
<td>33.3</td>
</tr>
<tr>
<td>Teacher as Explainer</td>
<td></td>
<td>100.0</td>
<td>77.8</td>
</tr>
<tr>
<td>Teacher as Consultant</td>
<td></td>
<td>20.0</td>
<td>22.2</td>
</tr>
<tr>
<td>Tchr Fellow Investigator</td>
<td></td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Teacher as Resource</td>
<td></td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Exposition</td>
<td></td>
<td>100.0</td>
<td>22.2</td>
</tr>
<tr>
<td>Exerc, Consolidat, Pract</td>
<td></td>
<td>100.0</td>
<td>77.8</td>
</tr>
<tr>
<td>Discussion</td>
<td></td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Investigation</td>
<td></td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Applied Mathematics</td>
<td></td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Problem Solving</td>
<td></td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Working in Groups</td>
<td></td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Single fact or step</td>
<td></td>
<td>60.0</td>
<td>44.4</td>
</tr>
<tr>
<td>Several facts or steps</td>
<td></td>
<td>20.0</td>
<td>33.3</td>
</tr>
<tr>
<td>Extend knowledge or skill</td>
<td></td>
<td>10.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Number of Segments</td>
<td></td>
<td>9</td>
<td>9</td>
</tr>
<tr>
<td>TABLE 23. CLASSROOM B/LESSON 3: OBSERVERS’ RECORDS</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>---------------------------------------------------</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>OBSERVER</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>TIME</td>
<td>1</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>TEACHNG ACTIV                                  1</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>DEMAND on STs                                 1</td>
<td>2</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>#QUESTs by TCHR                                2</td>
<td>2</td>
<td>3</td>
<td>5</td>
</tr>
<tr>
<td>#QUESTs by STs                                 1</td>
<td>2</td>
<td>1</td>
<td>5</td>
</tr>
<tr>
<td>HMWK REVIEW                                    1</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>LESSON DEVELOP                                 1</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>GUIDED PRACTICE                                1</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>GO OVER TEST                                   1</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>ReVIEW PREV MAT                                1</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>TECHNOLOGY                                     35</td>
<td>35</td>
<td>3</td>
<td>35</td>
</tr>
<tr>
<td>MANAGER                                        1</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>TASK SETTER                                    1</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>EXPLAINER                                      1</td>
<td>1</td>
<td>12</td>
<td>12</td>
</tr>
<tr>
<td>COUNSELOR                                      1</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>FELLOW INVEST RESOURCE                         5</td>
<td>5</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>RESOURCE                                       1</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>STs PASSIVE                                    12</td>
<td>12</td>
<td>12</td>
<td>12</td>
</tr>
<tr>
<td>STs WRITING                                    14</td>
<td>4</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>STs TALKING                                    1</td>
<td>2</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>STs DIDACTIC                                   12</td>
<td>12</td>
<td>12</td>
<td>123</td>
</tr>
<tr>
<td>STs SYMBLZNG                                   1</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>STs INVESTIG                                   3</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>STs PR SOLVNG                                  1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>STs HIGH LEVEL                                 1</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>TABLE 23 (cont'd).</td>
<td>TOTAL = NO TECHNOLOGY</td>
<td>TOTAL = NO TECHNOLOGY</td>
<td></td>
</tr>
<tr>
<td>---------------------</td>
<td>-----------------------</td>
<td>-----------------------</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Observer</td>
<td>A</td>
<td>B</td>
</tr>
<tr>
<td>Tchr Quests (ave/5 min)</td>
<td>4.3</td>
<td>5.4</td>
<td>4.9</td>
</tr>
<tr>
<td>St Quests (ave/5 min)</td>
<td>1.5</td>
<td>2.0</td>
<td>1.8</td>
</tr>
<tr>
<td>% of Segments With:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Homework Review</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Lesson Development</td>
<td>100.0</td>
<td>100.0</td>
<td>100.0</td>
</tr>
<tr>
<td>Guided Practice</td>
<td>10.0</td>
<td>0.0</td>
<td>5.0</td>
</tr>
<tr>
<td>Reviewing a Test</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Reviewing Material</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Using Calculators Only</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Using Computers Only</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Both Calcs and Comps</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Student as Manager</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Student as Task Setter</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Student as Explainer</td>
<td>10.0</td>
<td>20.0</td>
<td>15.0</td>
</tr>
<tr>
<td>Student as Consultant</td>
<td>10.0</td>
<td>0.0</td>
<td>5.0</td>
</tr>
<tr>
<td>St Fellow Investigator</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Student as Resource</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Students Passive</td>
<td>100.0</td>
<td>100.0</td>
<td>100.0</td>
</tr>
<tr>
<td>Students Active:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Writing</td>
<td>60.0</td>
<td>10.0</td>
<td>35.0</td>
</tr>
<tr>
<td>Talking</td>
<td>90.0</td>
<td>100.0</td>
<td>95.0</td>
</tr>
<tr>
<td>Students Didactic</td>
<td>90.0</td>
<td>100.0</td>
<td>95.0</td>
</tr>
<tr>
<td>Students Symbolizing</td>
<td>30.0</td>
<td>10.0</td>
<td>20.0</td>
</tr>
<tr>
<td>Students Investigating</td>
<td>20.0</td>
<td>0.0</td>
<td>10.0</td>
</tr>
<tr>
<td>Students Problem Solving</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Sts Higher Level Thinking</td>
<td>20.0</td>
<td>0.0</td>
<td>10.0</td>
</tr>
<tr>
<td>TIME</td>
<td>A</td>
<td>B</td>
<td>A</td>
</tr>
<tr>
<td>------</td>
<td>----</td>
<td>----</td>
<td>----</td>
</tr>
<tr>
<td></td>
<td>23</td>
<td>2</td>
<td>24</td>
</tr>
<tr>
<td>TEACHING ACTIV</td>
<td>13</td>
<td>2</td>
<td>123</td>
</tr>
<tr>
<td>DEMAND on STs</td>
<td>1</td>
<td>1</td>
<td>9</td>
</tr>
<tr>
<td>#QUESTs by TCHR</td>
<td>2</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>#QUESTs by STs</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>HMWK REVIEW</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>LESSON DEVELOP</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>GUIDED PRACTICE</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>GO OVER TEST</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>REVIEW PREV MAT</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>TECHNOLOGY</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>MANAGER</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>TASK SETTER</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>EXPLAINER</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>COUNSELOR</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>FELLOW INVEST</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>RESOURCE</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>STs PASSIVE</td>
<td>12</td>
<td>12</td>
<td>12</td>
</tr>
<tr>
<td>STs WRITING</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>STs TALKING</td>
<td>1</td>
<td>1247</td>
<td>2</td>
</tr>
<tr>
<td>STs DIDACTIC</td>
<td>1</td>
<td>2</td>
<td>123</td>
</tr>
<tr>
<td>STs SYMBLZNG</td>
<td>4</td>
<td>1</td>
<td>4</td>
</tr>
<tr>
<td>STs INVESTIG</td>
<td>3</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>STs PR SOLVNG</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>STs HIGH LEVEL</td>
<td>7</td>
<td>235</td>
<td>2</td>
</tr>
<tr>
<td>TABLE 24 (cont’d).</td>
<td>TOTAL A</td>
<td>B</td>
<td>M</td>
</tr>
<tr>
<td>---------------------</td>
<td>--------</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>Tchr Quests (ave/5 min)</td>
<td>3.0</td>
<td>3.5</td>
<td>3.3</td>
</tr>
<tr>
<td>St Quests (ave/5 min)</td>
<td>1.3</td>
<td>1.7</td>
<td>1.5</td>
</tr>
<tr>
<td>% of Segments With:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Homework Review</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Lesson Development</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Guided Practice</td>
<td>0.0</td>
<td>83.3</td>
<td>41.7</td>
</tr>
<tr>
<td>Reviewing a Test</td>
<td>16.7</td>
<td>16.7</td>
<td>16.7</td>
</tr>
<tr>
<td>Reviewing Material</td>
<td>100.0</td>
<td>100.0</td>
<td>100.0</td>
</tr>
<tr>
<td>Using Calculators Only</td>
<td>33.3</td>
<td>16.7</td>
<td>25.0</td>
</tr>
<tr>
<td>Using Computers Only</td>
<td>33.3</td>
<td>16.7</td>
<td>25.0</td>
</tr>
<tr>
<td>Both CaIcs and Comps</td>
<td>0.0</td>
<td>33.3</td>
<td>16.7</td>
</tr>
<tr>
<td>Student as Manager</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Student as Task Getter</td>
<td>16.7</td>
<td>16.7</td>
<td>16.7</td>
</tr>
<tr>
<td>Student as Explainer</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Student as Consultant</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>St Fellow Investigator</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Student as Resource</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Students Passive</td>
<td>100.0</td>
<td>100.0</td>
<td>100.0</td>
</tr>
<tr>
<td>Students Active: Writing</td>
<td>16.7</td>
<td>100.0</td>
<td>58.3</td>
</tr>
<tr>
<td>Students Active: Talking</td>
<td>83.3</td>
<td>100.0</td>
<td>91.7</td>
</tr>
<tr>
<td>Students Didactic</td>
<td>83.3</td>
<td>100.0</td>
<td>91.7</td>
</tr>
<tr>
<td>Students Symbolizing</td>
<td>33.3</td>
<td>100.0</td>
<td>66.7</td>
</tr>
<tr>
<td>Students Investigating</td>
<td>33.3</td>
<td>100.0</td>
<td>66.7</td>
</tr>
<tr>
<td>Students Problem Solving</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Sts Higher Level Thinking</td>
<td>16.7</td>
<td>83.3</td>
<td>50.0</td>
</tr>
<tr>
<td>% of Segments With:</td>
<td>TOTAL</td>
<td>NO TECHNOLOGY</td>
<td>WITH TECHNOLOGY</td>
</tr>
<tr>
<td>----------------------------------------</td>
<td>-------------</td>
<td>---------------</td>
<td>-----------------</td>
</tr>
<tr>
<td></td>
<td>OBSERVER A</td>
<td>B</td>
<td>M</td>
</tr>
<tr>
<td>Teacher as Manager</td>
<td>100.0</td>
<td>100.0</td>
<td>100.0</td>
</tr>
<tr>
<td>Teacher as Task Setter</td>
<td>83.3</td>
<td>33.3</td>
<td>58.3</td>
</tr>
<tr>
<td>Teacher as Explainer</td>
<td>83.3</td>
<td>100.0</td>
<td>91.7</td>
</tr>
<tr>
<td>Teacher as Consultant</td>
<td>50.0</td>
<td>33.3</td>
<td>41.7</td>
</tr>
<tr>
<td>Tchr Fellow Investigator</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Teacher as Resource</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Exposition</td>
<td>16.7</td>
<td>0.0</td>
<td>8.3</td>
</tr>
<tr>
<td>Exerc, Consolidat, Pract</td>
<td>100.0</td>
<td>100.0</td>
<td>100.0</td>
</tr>
<tr>
<td>Discussion</td>
<td>16.7</td>
<td>0.0</td>
<td>8.3</td>
</tr>
<tr>
<td>Investigation</td>
<td>0.0</td>
<td>83.3</td>
<td>41.7</td>
</tr>
<tr>
<td>Applied Mathematics</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Problem Solving</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Working In Groups</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Single fact or step</td>
<td>100.0</td>
<td>50.0</td>
<td>75.0</td>
</tr>
<tr>
<td>Several facts or steps</td>
<td>33.3</td>
<td>83.3</td>
<td>58.3</td>
</tr>
<tr>
<td>Extend knowledge or skill</td>
<td>33.3</td>
<td>0.0</td>
<td>16.7</td>
</tr>
</tbody>
</table>

Number of Segments 6 6 4 4 2 2
<table>
<thead>
<tr>
<th>TIME</th>
<th>A</th>
<th>B</th>
<th>A</th>
<th>B</th>
<th>A</th>
<th>B</th>
<th>A</th>
<th>B</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>134</td>
<td>1</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>12</td>
<td>1</td>
<td>12</td>
<td>1</td>
<td>12</td>
<td>123</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>4</td>
<td>3</td>
<td>7</td>
<td>8</td>
<td>7</td>
<td>4</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>4</td>
<td>2</td>
<td>3</td>
<td>2</td>
<td>3</td>
<td>2</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>13</td>
<td>13</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>1</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>3</td>
<td>3</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td></td>
<td>12</td>
<td>12</td>
<td>12</td>
<td>12</td>
<td>12</td>
<td>12</td>
<td>12</td>
<td>12</td>
</tr>
<tr>
<td>5</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>12</td>
<td>12</td>
<td>12</td>
<td>123</td>
<td>1247</td>
<td>1247</td>
<td>1247</td>
<td>13</td>
</tr>
<tr>
<td>5</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>12</td>
<td>12</td>
<td>123</td>
<td>12</td>
<td>12</td>
<td>1</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>1</td>
<td>4</td>
<td>14</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>
</tr>
<tr>
<td>23</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>257</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**TABLE 25. CLASSROOM B/LESSON 5: OBSERVERS' RECORDS**
<table>
<thead>
<tr>
<th>TABLE 25 (cont'd).</th>
<th>TOTAL</th>
<th>NO TECHNOLOGY</th>
<th>WITH TECHNOLOGY</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>OBSERVER</td>
<td>A</td>
<td>B</td>
</tr>
<tr>
<td>Tchr Quests (ave/5 min)</td>
<td></td>
<td>4.5</td>
<td>3.8</td>
</tr>
<tr>
<td>Stt Quests (ave/5 min)</td>
<td></td>
<td>2.8</td>
<td>1.8</td>
</tr>
<tr>
<td>% of Segments With:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Homework Review</td>
<td></td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Lesson Development</td>
<td>100.0</td>
<td>100.0</td>
<td>100.0</td>
</tr>
<tr>
<td>Guided Practice</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Reviewing a Test</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Reviewing Material</td>
<td>0.0</td>
<td>50.0</td>
<td>25.0</td>
</tr>
<tr>
<td>Using Calculators Only</td>
<td>25.0</td>
<td>25.0</td>
<td>25.0</td>
</tr>
<tr>
<td>Using Computers Only</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Both Calcs and Comp</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Student as Manager</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Student as Task Setter</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Student as Explaner</td>
<td>0.0</td>
<td>25.0</td>
<td>12.5</td>
</tr>
<tr>
<td>Student as Consultant</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Stt Fellow Investigator</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Student as Resource</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Students Passive</td>
<td>100.0</td>
<td>100.0</td>
<td>100.0</td>
</tr>
<tr>
<td>Students Active: Writing</td>
<td>0.0</td>
<td>25.0</td>
<td>12.5</td>
</tr>
<tr>
<td>Students Active: Talking</td>
<td>100.0</td>
<td>100.0</td>
<td>100.0</td>
</tr>
<tr>
<td>Students Didactic</td>
<td>100.0</td>
<td>100.0</td>
<td>100.0</td>
</tr>
<tr>
<td>Students Symbolizing</td>
<td>0.0</td>
<td>75.0</td>
<td>37.5</td>
</tr>
<tr>
<td>Students Investigating</td>
<td>0.0</td>
<td>50.0</td>
<td>25.0</td>
</tr>
<tr>
<td>Students Problem Solving</td>
<td>0.0</td>
<td>25.0</td>
<td>12.5</td>
</tr>
<tr>
<td>Stts Higher Level Thinking</td>
<td>0.0</td>
<td>50.0</td>
<td>25.0</td>
</tr>
<tr>
<td>% of Segments With:</td>
<td>TOTAL</td>
<td>NO TECHNOLOGY</td>
<td>WITH TECHNOLOGY</td>
</tr>
<tr>
<td>---------------------</td>
<td>-------</td>
<td>---------------</td>
<td>-----------------</td>
</tr>
<tr>
<td></td>
<td>A</td>
<td>B</td>
<td>M</td>
</tr>
<tr>
<td>Teacher as Manager</td>
<td>100.0</td>
<td>100.0</td>
<td>100.0</td>
</tr>
<tr>
<td>Teacher as Task Setter</td>
<td>100.0</td>
<td>100.0</td>
<td>100.0</td>
</tr>
<tr>
<td>Teacher as Explainer</td>
<td>100.0</td>
<td>75.0</td>
<td>87.5</td>
</tr>
<tr>
<td>Teacher as Consultant</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Tchr Fellow Investigator</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Teacher as Resource</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Exposition</td>
<td>100.0</td>
<td>100.0</td>
<td>100.0</td>
</tr>
<tr>
<td>Exerc, Consolidat, Pract</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Discussion</td>
<td>0.0</td>
<td>25.0</td>
<td>12.5</td>
</tr>
<tr>
<td>Investigation</td>
<td>0.0</td>
<td>25.0</td>
<td>12.5</td>
</tr>
<tr>
<td>Applied Mathematics</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Problem Solving</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Working in Groups</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Single fact or step</td>
<td>75.0</td>
<td>75.0</td>
<td>75.0</td>
</tr>
<tr>
<td>Several facts or steps</td>
<td>75.0</td>
<td>25.0</td>
<td>50.0</td>
</tr>
<tr>
<td>Extend knowledge or skill</td>
<td>0.0</td>
<td>25.0</td>
<td>12.5</td>
</tr>
</tbody>
</table>

Number of Segments
4  4
<table>
<thead>
<tr>
<th>TIME</th>
<th>A</th>
<th>B*</th>
<th>A</th>
<th>B*</th>
<th>A</th>
<th>B*</th>
<th>A</th>
<th>B*</th>
<th>A</th>
<th>B*</th>
<th>A</th>
<th>B*</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>12</td>
<td>13</td>
<td>12</td>
<td>13</td>
<td>12</td>
<td>13</td>
<td>12</td>
<td>13</td>
<td>12</td>
<td>13</td>
<td>12</td>
<td>13</td>
</tr>
<tr>
<td>2</td>
<td>12</td>
<td>13</td>
<td>12</td>
<td>13</td>
<td>12</td>
<td>13</td>
<td>12</td>
<td>13</td>
<td>12</td>
<td>13</td>
<td>12</td>
<td>13</td>
</tr>
<tr>
<td>3</td>
<td>12</td>
<td>13</td>
<td>12</td>
<td>13</td>
<td>12</td>
<td>13</td>
<td>12</td>
<td>13</td>
<td>12</td>
<td>13</td>
<td>12</td>
<td>13</td>
</tr>
<tr>
<td>4</td>
<td>12</td>
<td>13</td>
<td>12</td>
<td>13</td>
<td>12</td>
<td>13</td>
<td>12</td>
<td>13</td>
<td>12</td>
<td>13</td>
<td>12</td>
<td>13</td>
</tr>
<tr>
<td>5</td>
<td>12</td>
<td>13</td>
<td>12</td>
<td>13</td>
<td>12</td>
<td>13</td>
<td>12</td>
<td>13</td>
<td>12</td>
<td>13</td>
<td>12</td>
<td>13</td>
</tr>
<tr>
<td>6</td>
<td>12</td>
<td>13</td>
<td>12</td>
<td>13</td>
<td>12</td>
<td>13</td>
<td>12</td>
<td>13</td>
<td>12</td>
<td>13</td>
<td>12</td>
<td>13</td>
</tr>
<tr>
<td>7</td>
<td>12</td>
<td>13</td>
<td>12</td>
<td>13</td>
<td>12</td>
<td>13</td>
<td>12</td>
<td>13</td>
<td>12</td>
<td>13</td>
<td>12</td>
<td>13</td>
</tr>
</tbody>
</table>

**TABLE 26. CLASSROOM B/LESSON 6: OBSERVERS' RECORDS**

- **TEACHNG ACTIV**
- **DEMAND on STs**
- **#QUESTs by TCHR**
- **#QUESTs by STs**
- **HMWK REVIEW**
- **LESSON DEVELOP**
- **GUIDED PRACTICE**
- **GO OVER TEST**
- **RevIEW PREV MAT**
- **TECHNOLOGY**
- **MANAGER**
- **TASK SETTER**
- **EXPLAINER**
- **COUNSELOR**
- **FELLOW INVEST**
- **RESOURCE**
- **STs PASSIVE**
- **STs WRITING**
- **STs TALKING**
- **STs DIDACTIC**
- **STs SYMBl2NNG**
- **STs INVESTIG**
- **STs PR SOLVNG**
- **STs HIGH LEVEL**
<table>
<thead>
<tr>
<th>TIME</th>
</tr>
</thead>
<tbody>
<tr>
<td>8</td>
</tr>
<tr>
<td>9</td>
</tr>
<tr>
<td>10</td>
</tr>
<tr>
<td>11</td>
</tr>
<tr>
<td>12</td>
</tr>
<tr>
<td>13</td>
</tr>
<tr>
<td>14</td>
</tr>
</tbody>
</table>

<p>| TEACHING ACTIV | 125 | 12 | 2 | 12 | 12 | 123 | 12 | 12 | 12 |
| DEMAND on STs | 23  | 2  | 12 | 12 | 12 | 1 | 123 | 123 | 123 |
| #QUESTs by TCHR | 4 | 1 | 8 | 8 | 3 | 2 | 2 | 6 | 9 | 5 |
| #QUESTs by STs | 6 | 3 | 3 | 4 | 1 | 2 | 5 | 1 | 4 | 5 |
| HMWK REVIEW | 1 |
| LESSON DEVELOP | 1 |
| GUIDED PRACTICE | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| GO OVER TEST | 1 |
| REVIEW PREV MAT | 1 |
| TECHNOLOGY | 3 | 13 | 3 | 13 | 3 | 13 | 3 | 13 | 3 | 3 | 3 |
| MANAGER | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| TASK SETTER | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| EXPLAINER | 1 | 1 | 12 | 1 | 1 | 1 | 1 | 1 | 12 | 12 |
| COUNSELOR | 12 | 12 |
| FELLOW INVEST | 1 |
| RESOURCE | 5 | 3 | 5 | 35 | 5 | 3 | 5 | 35 | 5 | 25 | 25 |
| STs PASSIVE | 123 | 12 | 123 | 12 | 123 | 12 | 12 | 12 | 12 |
| STs WRITING | 3 | 35 | 34 | 35 | 4 | 235 | 5 | 35 | 34 | 34 |
| STs TALKING | 26 | 127 | 125 | 12 | 125 | 12 | 124 | 12 | 125 | 127 |
| STs DIDACTIC | 1 | 123 | 13 | 123 | 1 | 123 | 1 | 23 | 1 | 123 | 123 |
| STs SYMBLZNG | 2 | 1 | 2 | 1 | 2 | 2 | 1 | 1 |
| STs INVESTIG | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 |
| STs PR SOLVNG | 1 | 2 |</p>
<table>
<thead>
<tr>
<th>TABLE 26 (cont'd).</th>
<th>TOTAL</th>
<th></th>
<th>NO TECHNOLOGY</th>
<th></th>
<th>WITH TECHNOLOGY</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>OBSERVER</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>A</td>
<td>B*</td>
<td>M</td>
<td>SD</td>
<td>A</td>
</tr>
<tr>
<td>Tehr Quests (ave/5 min)</td>
<td>3.0</td>
<td>3.6</td>
<td>3.3</td>
<td>0.5</td>
<td>4.0</td>
</tr>
<tr>
<td>St Quests (ave/5 min)</td>
<td>4.0</td>
<td>3.5</td>
<td>3.7</td>
<td>0.4</td>
<td>3.6</td>
</tr>
<tr>
<td>% of Segments With:</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Homework Review</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Lesson Development</td>
<td>72.7</td>
<td>6.7</td>
<td>39.7</td>
<td>46.7</td>
<td>62.5</td>
</tr>
<tr>
<td>Guided Practice</td>
<td>36.4</td>
<td>100.0</td>
<td>68.2</td>
<td>45.0</td>
<td>50.0</td>
</tr>
<tr>
<td>Reviewing a Test</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Reviewing Material</td>
<td>9.1</td>
<td>0.0</td>
<td>4.5</td>
<td>6.4</td>
<td>12.5</td>
</tr>
<tr>
<td>Using Calculators Only</td>
<td>27.3</td>
<td>53.3</td>
<td>40.3</td>
<td>18.4</td>
<td>0.0</td>
</tr>
<tr>
<td>Using Computers Only</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Both Calcs and Comps</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Student as Manager</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Student as Task Setter</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Student as Explainer</td>
<td>27.3</td>
<td>13.3</td>
<td>20.3</td>
<td>9.9</td>
<td>37.5</td>
</tr>
<tr>
<td>Student as Consultant</td>
<td>72.7</td>
<td>0.0</td>
<td>36.4</td>
<td>51.4</td>
<td>75.0</td>
</tr>
<tr>
<td>St Fellow Investigator</td>
<td>9.1</td>
<td>0.0</td>
<td>4.5</td>
<td>6.4</td>
<td>0.0</td>
</tr>
<tr>
<td>Student as Resource</td>
<td>0.0</td>
<td>13.3</td>
<td>6.7</td>
<td>9.4</td>
<td>0.0</td>
</tr>
<tr>
<td>Students Passive</td>
<td>100.0</td>
<td>100.0</td>
<td>100.0</td>
<td>0.0</td>
<td>100.0</td>
</tr>
<tr>
<td>Students Active: Writing</td>
<td>90.9</td>
<td>66.7</td>
<td>78.8</td>
<td>17.1</td>
<td>87.5</td>
</tr>
<tr>
<td>Students Active: Talking</td>
<td>90.9</td>
<td>100.0</td>
<td>95.5</td>
<td>6.4</td>
<td>87.5</td>
</tr>
<tr>
<td>Students Didactic</td>
<td>100.0</td>
<td>100.0</td>
<td>100.0</td>
<td>0.0</td>
<td>100.0</td>
</tr>
<tr>
<td>Students Symbolizing</td>
<td>81.8</td>
<td>66.7</td>
<td>74.2</td>
<td>10.7</td>
<td>75.0</td>
</tr>
<tr>
<td>Students Investigating</td>
<td>81.8</td>
<td>86.7</td>
<td>84.2</td>
<td>3.4</td>
<td>75.0</td>
</tr>
<tr>
<td>Students Problem Solving</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Sts Higher Level Thinking</td>
<td>72.7</td>
<td>0.0</td>
<td>36.4</td>
<td>51.4</td>
<td>62.5</td>
</tr>
<tr>
<td></td>
<td>TOTAL</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>----------------------</td>
<td>-------</td>
<td>-----------------</td>
<td>-----------------</td>
<td>-----------------</td>
<td>----------------------</td>
</tr>
<tr>
<td></td>
<td>A</td>
<td>B*</td>
<td>M</td>
<td>SD</td>
<td>A</td>
</tr>
<tr>
<td>% of Segments With:</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Teacher as Manager</td>
<td>100.0</td>
<td>100.0</td>
<td>100.0</td>
<td>0.0</td>
<td>100.0</td>
</tr>
<tr>
<td>Teacher as Task Setter</td>
<td>100.0</td>
<td>100.0</td>
<td>100.0</td>
<td>0.0</td>
<td>100.0</td>
</tr>
<tr>
<td>Teacher as Explainer</td>
<td>90.9</td>
<td>93.3</td>
<td>92.1</td>
<td>1.7</td>
<td>100.0</td>
</tr>
<tr>
<td>Teacher as Consultant</td>
<td>54.5</td>
<td>0.0</td>
<td>27.3</td>
<td>38.6</td>
<td>62.5</td>
</tr>
<tr>
<td>Tchr Fellow Investigator</td>
<td>27.3</td>
<td>0.0</td>
<td>13.6</td>
<td>19.3</td>
<td>12.5</td>
</tr>
<tr>
<td>Teacher as Resource</td>
<td>45.5</td>
<td>0.0</td>
<td>22.7</td>
<td>32.1</td>
<td>25.0</td>
</tr>
<tr>
<td>Exposition</td>
<td>90.9</td>
<td>100.0</td>
<td>95.5</td>
<td>6.4</td>
<td>87.5</td>
</tr>
<tr>
<td>Exerc, Consolidat, Pract</td>
<td>36.4</td>
<td>100.0</td>
<td>68.2</td>
<td>45.0</td>
<td>50.0</td>
</tr>
<tr>
<td>Discussion</td>
<td>27.3</td>
<td>0.0</td>
<td>13.6</td>
<td>19.3</td>
<td>25.0</td>
</tr>
<tr>
<td>Investigation</td>
<td>27.3</td>
<td>0.0</td>
<td>13.6</td>
<td>19.3</td>
<td>12.5</td>
</tr>
<tr>
<td>Applied Mathematics</td>
<td>9.1</td>
<td>0.0</td>
<td>4.5</td>
<td>6.4</td>
<td>12.5</td>
</tr>
<tr>
<td>Problem Solving</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Working In Groups</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Single fact or step</td>
<td>63.6</td>
<td>60.0</td>
<td>61.8</td>
<td>2.6</td>
<td>75.0</td>
</tr>
<tr>
<td>Several facts or steps</td>
<td>45.5</td>
<td>53.3</td>
<td>49.4</td>
<td>5.6</td>
<td>62.5</td>
</tr>
<tr>
<td>Extend knowledge or skill</td>
<td>9.1</td>
<td>48.7</td>
<td>27.9</td>
<td>26.8</td>
<td>12.5</td>
</tr>
</tbody>
</table>

Number of Segments  
11  14

8  6

3  8

*Observer B viewed the tape using a defective timer.

The segment length for Observer B is approximately 3:55.

The segment length for Observer A is 5 minutes.
<table>
<thead>
<tr>
<th>TABLE 27. CLASSROOM C/LESSON 1: OBSERVERS’ RECORDS</th>
</tr>
</thead>
<tbody>
<tr>
<td>OBSERVER</td>
</tr>
<tr>
<td>AGGREGATIVE TIME</td>
</tr>
<tr>
<td>TIME 1</td>
</tr>
<tr>
<td>TEACHING ACTIV</td>
</tr>
<tr>
<td>DEMAND on STs</td>
</tr>
<tr>
<td>#QUESTs by TCHR</td>
</tr>
<tr>
<td>#QUESTs by STs</td>
</tr>
<tr>
<td>HMWK REVIEW</td>
</tr>
<tr>
<td>LESSON DEVELOP</td>
</tr>
<tr>
<td>GUIDED PRACTICE</td>
</tr>
<tr>
<td>GO OVER TEST</td>
</tr>
<tr>
<td>ReVIEW PREV MAT</td>
</tr>
<tr>
<td>TECHNOLOGY</td>
</tr>
<tr>
<td>MANAGER</td>
</tr>
<tr>
<td>TASK SETTER</td>
</tr>
<tr>
<td>EXPLAINER</td>
</tr>
<tr>
<td>COUNSELOR</td>
</tr>
<tr>
<td>FELLOW INVEST</td>
</tr>
<tr>
<td>RESOURCE</td>
</tr>
<tr>
<td>STs PASSIVE</td>
</tr>
<tr>
<td>STs WRITING</td>
</tr>
<tr>
<td>STs DIDACTIC</td>
</tr>
<tr>
<td>STs SYMBLZNG</td>
</tr>
<tr>
<td>STs INVESTIG</td>
</tr>
<tr>
<td>STs PR SOLVNG</td>
</tr>
</tbody>
</table>

254
<table>
<thead>
<tr>
<th>TABLE 27 (cont'd).</th>
<th>TOTAL A</th>
<th>B*</th>
<th>M</th>
<th>SD</th>
<th>TOTAL A</th>
<th>B*</th>
<th>M</th>
<th>SD</th>
<th>TOTAL A</th>
<th>B*</th>
<th>M</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Tchr Quests (ave/5 min)</strong></td>
<td>6.4</td>
<td>14.6</td>
<td>10.5</td>
<td>5.7</td>
<td>5.7</td>
<td>13.6</td>
<td>9.6</td>
<td>5.6</td>
<td>8.0</td>
<td>16.2</td>
<td>12.1</td>
<td>5.8</td>
</tr>
<tr>
<td><strong>St Quests (ave/5 min)</strong></td>
<td>0.3</td>
<td>0.1</td>
<td>0.2</td>
<td>0.2</td>
<td>0.5</td>
<td>0.0</td>
<td>0.3</td>
<td>0.4</td>
<td>0.0</td>
<td>0.3</td>
<td>0.2</td>
<td>0.2</td>
</tr>
<tr>
<td><strong>% of Segments With:</strong></td>
<td></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>Homework Review</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Lesson Development</td>
<td>66.7</td>
<td>9.1</td>
<td>37.9</td>
<td>40.7</td>
<td>50.0</td>
<td>14.3</td>
<td>32.1</td>
<td>25.3</td>
<td>100.0</td>
<td>0.0</td>
<td>50.0</td>
<td>70.7</td>
</tr>
<tr>
<td>Guided Practice</td>
<td>66.7</td>
<td>100.0</td>
<td>83.3</td>
<td>23.6</td>
<td>66.7</td>
<td>100.0</td>
<td>83.3</td>
<td>23.6</td>
<td>66.7</td>
<td>100.0</td>
<td>83.3</td>
<td>23.6</td>
</tr>
<tr>
<td>Reviewing a Test</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Reviewing Material</td>
<td>22.2</td>
<td>0.0</td>
<td>11.1</td>
<td>15.7</td>
<td>16.7</td>
<td>0.0</td>
<td>8.3</td>
<td>11.8</td>
<td>33.3</td>
<td>0.0</td>
<td>16.7</td>
<td>23.6</td>
</tr>
<tr>
<td>Using Calculators Only</td>
<td>33.3</td>
<td>36.4</td>
<td>34.8</td>
<td>2.1</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>100.0</td>
<td>100.0</td>
<td>100.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Using Computers Only</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Both Calcs and Comps</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Student as Manager</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Student as Task Setter</td>
<td>33.3</td>
<td>36.4</td>
<td>34.8</td>
<td>2.1</td>
<td>33.3</td>
<td>42.9</td>
<td>38.1</td>
<td>6.7</td>
<td>33.3</td>
<td>25.0</td>
<td>29.2</td>
<td>5.9</td>
</tr>
<tr>
<td>Student as Explainer</td>
<td>55.6</td>
<td>0.0</td>
<td>27.8</td>
<td>39.3</td>
<td>66.7</td>
<td>0.0</td>
<td>33.3</td>
<td>47.1</td>
<td>33.3</td>
<td>0.0</td>
<td>16.7</td>
<td>23.6</td>
</tr>
<tr>
<td>Student as Consultant</td>
<td>44.4</td>
<td>0.0</td>
<td>22.2</td>
<td>31.4</td>
<td>50.0</td>
<td>0.0</td>
<td>25.0</td>
<td>35.4</td>
<td>33.3</td>
<td>0.0</td>
<td>16.7</td>
<td>23.6</td>
</tr>
<tr>
<td>St Fellow Investigator</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Student as Resource</td>
<td>44.4</td>
<td>0.0</td>
<td>22.2</td>
<td>31.4</td>
<td>50.0</td>
<td>0.0</td>
<td>25.0</td>
<td>35.4</td>
<td>33.3</td>
<td>0.0</td>
<td>16.7</td>
<td>23.6</td>
</tr>
<tr>
<td>Students Passive</td>
<td>100.0</td>
<td>100.0</td>
<td>100.0</td>
<td>3.0</td>
<td>100.0</td>
<td>100.0</td>
<td>100.0</td>
<td>0.0</td>
<td>100.0</td>
<td>100.0</td>
<td>100.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Students Active: Writing</td>
<td>66.7</td>
<td>54.5</td>
<td>60.6</td>
<td>8.6</td>
<td>50.0</td>
<td>28.6</td>
<td>39.3</td>
<td>15.2</td>
<td>100.0</td>
<td>100.0</td>
<td>100.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Students Active: Talking</td>
<td>100.0</td>
<td>100.0</td>
<td>100.0</td>
<td>0.0</td>
<td>100.0</td>
<td>100.0</td>
<td>100.0</td>
<td>0.0</td>
<td>100.0</td>
<td>100.0</td>
<td>100.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Students Didactic</td>
<td>100.0</td>
<td>100.0</td>
<td>100.0</td>
<td>0.0</td>
<td>100.0</td>
<td>100.0</td>
<td>100.0</td>
<td>0.0</td>
<td>100.0</td>
<td>100.0</td>
<td>100.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Students Symbolizing</td>
<td>77.8</td>
<td>54.5</td>
<td>66.2</td>
<td>16.4</td>
<td>66.7</td>
<td>28.6</td>
<td>47.6</td>
<td>26.9</td>
<td>100.0</td>
<td>100.0</td>
<td>100.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Students Investigating</td>
<td>88.9</td>
<td>81.8</td>
<td>85.4</td>
<td>5.0</td>
<td>83.3</td>
<td>85.7</td>
<td>84.5</td>
<td>1.7</td>
<td>100.0</td>
<td>75.0</td>
<td>87.5</td>
<td>17.7</td>
</tr>
<tr>
<td>Students Problem Solving</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Sts Higher Level Thinking</td>
<td>44.4</td>
<td>0.0</td>
<td>22.2</td>
<td>31.4</td>
<td>33.3</td>
<td>0.0</td>
<td>16.7</td>
<td>23.6</td>
<td>66.7</td>
<td>0.0</td>
<td>33.3</td>
<td>47.1</td>
</tr>
</tbody>
</table>
### TABLE 27 (cont’d).

<table>
<thead>
<tr>
<th></th>
<th>TOTAL</th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>A</td>
<td>B*</td>
<td>M</td>
<td>SD</td>
<td>A</td>
<td>B*</td>
<td>M</td>
<td>SD</td>
</tr>
<tr>
<td>% of Segments With:</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Teacher as Manager</td>
<td>100.0</td>
<td>100.0</td>
<td>100.0</td>
<td>0.0</td>
<td>100.0</td>
<td>100.0</td>
<td>100.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Teacher as Task Setter</td>
<td>100.0</td>
<td>100.0</td>
<td>100.0</td>
<td>0.0</td>
<td>100.0</td>
<td>100.0</td>
<td>100.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Teacher as Explainer</td>
<td>0.0</td>
<td>90.9</td>
<td>45.5</td>
<td>64.3</td>
<td>0.0</td>
<td>85.7</td>
<td>42.9</td>
<td>60.6</td>
</tr>
<tr>
<td>Teacher as Consultant</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Teacher Fellow Investigator</td>
<td>100.0</td>
<td>0.0</td>
<td>50.0</td>
<td>70.7</td>
<td>100.0</td>
<td>0.0</td>
<td>50.0</td>
<td>70.7</td>
</tr>
<tr>
<td>Teacher as Resource</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Exposition</td>
<td>0.0</td>
<td>90.9</td>
<td>45.5</td>
<td>64.3</td>
<td>0.0</td>
<td>85.7</td>
<td>42.9</td>
<td>60.6</td>
</tr>
<tr>
<td>Exerc, Consolidat, Pract</td>
<td>66.7</td>
<td>100.0</td>
<td>83.3</td>
<td>23.6</td>
<td>66.7</td>
<td>100.0</td>
<td>83.3</td>
<td>23.6</td>
</tr>
<tr>
<td>Discussion</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Investigation</td>
<td>100.0</td>
<td>0.0</td>
<td>50.0</td>
<td>70.7</td>
<td>100.0</td>
<td>0.0</td>
<td>50.0</td>
<td>70.7</td>
</tr>
<tr>
<td>Applied Mathematics</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Problem Solving</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Working in Groups</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Single fact or step</td>
<td>88.9</td>
<td>100.0</td>
<td>94.4</td>
<td>7.9</td>
<td>83.3</td>
<td>100.0</td>
<td>91.7</td>
<td>11.8</td>
</tr>
<tr>
<td>Several facts or steps</td>
<td>88.9</td>
<td>100.0</td>
<td>94.4</td>
<td>7.9</td>
<td>83.3</td>
<td>100.0</td>
<td>91.7</td>
<td>11.8</td>
</tr>
<tr>
<td>Extend knowledge or skill</td>
<td>0.0</td>
<td>100.0</td>
<td>50.0</td>
<td>70.7</td>
<td>0.0</td>
<td>100.0</td>
<td>50.0</td>
<td>70.7</td>
</tr>
</tbody>
</table>

**Number of Segments**

- **Observer A:** 9
- **Observer B:** 11
- **Observer M:** 6
- **Observer SD:** 7
- **Observer A:** 3
- **Observer B:** 4

*Observer B viewed the tape using an defective timer.
The segment length for Observer B is approximately 3:55.
The segment length for Observer A is 5 minutes.
The number of questions was adjusted to represent average per 5 minutes.
<table>
<thead>
<tr>
<th>TABLE 28. CLASSROOM C/LESSON 2: OBSERVERS' RECORDS</th>
</tr>
</thead>
<tbody>
<tr>
<td>TIME</td>
</tr>
<tr>
<td>TEACHING ACTIV</td>
</tr>
<tr>
<td>DEMAND on STs</td>
</tr>
<tr>
<td>#QUESTs by TCHR</td>
</tr>
<tr>
<td>#QUESTs by STs</td>
</tr>
<tr>
<td>HMWK REVIEW</td>
</tr>
<tr>
<td>LESSON DEVELOP</td>
</tr>
<tr>
<td>GUIDED PRACTICE</td>
</tr>
<tr>
<td>GO OVER TEST</td>
</tr>
<tr>
<td>REVIEW PREV MAT</td>
</tr>
<tr>
<td>TECHNOLOGY</td>
</tr>
<tr>
<td>MANAGER</td>
</tr>
<tr>
<td>TASK SETTER</td>
</tr>
<tr>
<td>EXPLAINER</td>
</tr>
<tr>
<td>COUNSELOR</td>
</tr>
<tr>
<td>FELLOW INVEST</td>
</tr>
<tr>
<td>RESOURCE</td>
</tr>
<tr>
<td>STs PASSIVE</td>
</tr>
<tr>
<td>STs WRITING</td>
</tr>
<tr>
<td>STs TALKING</td>
</tr>
<tr>
<td>STs DIDACTIC</td>
</tr>
<tr>
<td>STs INVESTIG</td>
</tr>
<tr>
<td>STs PR SOLVNG</td>
</tr>
<tr>
<td>STs HIGH LEVEL</td>
</tr>
</tbody>
</table>

257
<table>
<thead>
<tr>
<th>TABLE 28 (cont’d).</th>
<th>TOTAL</th>
<th></th>
<th>NO TECHNOLOGY</th>
<th></th>
<th>WITH TECHNOLOGY</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>OBSERVER</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>A</td>
<td>B</td>
<td>M</td>
<td>SD</td>
<td>A</td>
</tr>
<tr>
<td>Tchr Quests (ave/5 min)</td>
<td>3.4</td>
<td>1.4</td>
<td>2.4</td>
<td>1.4</td>
<td>8.0</td>
</tr>
<tr>
<td>St Quests (ave/5 min)</td>
<td>2.8</td>
<td>0.0</td>
<td>1.4</td>
<td>1.9</td>
<td>0.0</td>
</tr>
<tr>
<td>% of Segments With:</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Homework Review</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Lesson Development</td>
<td>87.5</td>
<td>0.0</td>
<td>43.8</td>
<td>61.9</td>
<td>0.0</td>
</tr>
<tr>
<td>Guided Practice</td>
<td>0.0</td>
<td>100.0</td>
<td>50.0</td>
<td>70.7</td>
<td>0.0</td>
</tr>
<tr>
<td>Reviewing a Test</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Reviewing Material</td>
<td>25.0</td>
<td>0.0</td>
<td>12.5</td>
<td>17.7</td>
<td>100.0</td>
</tr>
<tr>
<td>Using Calculators Only</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Using Computers Only</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Both Calcs and Comps</td>
<td>87.5</td>
<td>87.5</td>
<td>87.5</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Student as Manager</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Student as Task Setter</td>
<td>87.5</td>
<td>0.0</td>
<td>43.8</td>
<td>61.9</td>
<td>0.0</td>
</tr>
<tr>
<td>Student as Explaner</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Student as Consultant</td>
<td>37.5</td>
<td>0.0</td>
<td>18.8</td>
<td>26.5</td>
<td>0.0</td>
</tr>
<tr>
<td>St Fellow Investigator</td>
<td>87.5</td>
<td>0.0</td>
<td>43.8</td>
<td>61.9</td>
<td>0.0</td>
</tr>
<tr>
<td>Student as Resource</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Students Passive</td>
<td>25.0</td>
<td>100.0</td>
<td>62.5</td>
<td>53.0</td>
<td>100.0</td>
</tr>
<tr>
<td>Students Active:</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Writing</td>
<td>100.0</td>
<td>87.5</td>
<td>93.8</td>
<td>8.8</td>
<td>100.0</td>
</tr>
<tr>
<td>Talking</td>
<td>100.0</td>
<td>100.0</td>
<td>100.0</td>
<td>0.0</td>
<td>100.0</td>
</tr>
<tr>
<td>Students Didactic</td>
<td>12.5</td>
<td>100.0</td>
<td>56.3</td>
<td>61.9</td>
<td>100.0</td>
</tr>
<tr>
<td>Students Symbolizing</td>
<td>100.0</td>
<td>87.5</td>
<td>93.8</td>
<td>8.8</td>
<td>100.0</td>
</tr>
<tr>
<td>Students Investigating</td>
<td>100.0</td>
<td>87.5</td>
<td>93.8</td>
<td>8.8</td>
<td>100.0</td>
</tr>
<tr>
<td>Students Problem Solving</td>
<td>0.0</td>
<td>75.0</td>
<td>37.5</td>
<td>53.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Sts Higher Level Thinking</td>
<td>75.0</td>
<td>0.0</td>
<td>37.5</td>
<td>53.0</td>
<td>0.0</td>
</tr>
<tr>
<td>% of Segments With:</td>
<td>TOTAL</td>
<td>NO TECHNOLOGY</td>
<td>WITH TECHNOLOGY</td>
<td></td>
<td></td>
</tr>
<tr>
<td>----------------------------------------</td>
<td>----------------</td>
<td>---------------</td>
<td>-----------------</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>OBSERVER</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>A</td>
<td>B</td>
<td>M</td>
<td>SD</td>
<td>A</td>
</tr>
<tr>
<td>Teacher as Manager</td>
<td>100.0</td>
<td>100.0</td>
<td>100.0</td>
<td>0.0</td>
<td>100.0</td>
</tr>
<tr>
<td>Teacher as Task Setter</td>
<td>75.0</td>
<td>100.0</td>
<td>87.5</td>
<td>17.7</td>
<td>100.0</td>
</tr>
<tr>
<td>Teacher as Explainer</td>
<td>75.0</td>
<td>37.5</td>
<td>56.3</td>
<td>26.5</td>
<td>100.0</td>
</tr>
<tr>
<td>Teacher as Consultant</td>
<td>87.5</td>
<td>87.5</td>
<td>87.5</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Tchr Fellow Investigator</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Teacher as Resource</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Exposition</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Exerc, Consolidat, Pract</td>
<td>25.0</td>
<td>25.0</td>
<td>25.0</td>
<td>0.0</td>
<td>100.0</td>
</tr>
<tr>
<td>Discussion</td>
<td>75.0</td>
<td>0.0</td>
<td>37.5</td>
<td>53.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Investigation</td>
<td>87.5</td>
<td>0.0</td>
<td>43.8</td>
<td>61.9</td>
<td>0.0</td>
</tr>
<tr>
<td>Applied Mathematics</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Problem Solving</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Working in Groups</td>
<td>87.5</td>
<td>87.5</td>
<td>87.5</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Single fact or step</td>
<td>87.5</td>
<td>12.5</td>
<td>50.0</td>
<td>53.0</td>
<td>100.0</td>
</tr>
<tr>
<td>Several facts or steps</td>
<td>12.5</td>
<td>12.5</td>
<td>12.5</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Extend knowledge or skill</td>
<td>62.5</td>
<td>12.5</td>
<td>37.5</td>
<td>35.4</td>
<td>0.0</td>
</tr>
</tbody>
</table>

Number of Segments: 8 8 1 1 7 7
<table>
<thead>
<tr>
<th>TABLE 29. CLASSROOM C/LESSON 3: OBSERVERS' RECORDS</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>OBSERVER</strong></td>
</tr>
<tr>
<td><strong>TIME</strong></td>
</tr>
<tr>
<td><strong>TEACHNG ACTIV</strong></td>
</tr>
<tr>
<td><strong>DEMAND on STs</strong></td>
</tr>
<tr>
<td><strong>#QUESTs by TCHR</strong></td>
</tr>
<tr>
<td><strong>#QUESTs by STs</strong></td>
</tr>
<tr>
<td><strong>HMWK REVIEW</strong></td>
</tr>
<tr>
<td><strong>LESSON DEVELOP</strong></td>
</tr>
<tr>
<td><strong>GUIDED PRACTICE</strong></td>
</tr>
<tr>
<td><strong>GO OVER TEST</strong></td>
</tr>
<tr>
<td><strong>ReVIEW PREV MAT</strong></td>
</tr>
<tr>
<td><strong>TECHNOLOGY</strong></td>
</tr>
<tr>
<td><strong>MANAGER</strong></td>
</tr>
<tr>
<td><strong>TASK SETTER</strong></td>
</tr>
<tr>
<td><strong>EXPLAINER</strong></td>
</tr>
<tr>
<td><strong>COUNSELOR</strong></td>
</tr>
<tr>
<td><strong>FELLOW INVEST</strong></td>
</tr>
<tr>
<td><strong>RESOURCE</strong></td>
</tr>
<tr>
<td><strong>STs PASSIVE</strong></td>
</tr>
<tr>
<td><strong>STs WRITING</strong></td>
</tr>
<tr>
<td><strong>STs TALKING</strong></td>
</tr>
<tr>
<td><strong>STs DIDACTIC</strong></td>
</tr>
<tr>
<td><strong>STs SYMBLZNG</strong></td>
</tr>
<tr>
<td><strong>STs INVESTIG</strong></td>
</tr>
<tr>
<td><strong>STs PR SOLVNG</strong></td>
</tr>
<tr>
<td><strong>STs HIGH LEVEL</strong></td>
</tr>
<tr>
<td>TABLE 29 (cont'd.)</td>
</tr>
<tr>
<td>--------------------</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>TEACHING ACTIV</td>
</tr>
<tr>
<td>DEMAND on STs</td>
</tr>
<tr>
<td>#QUESTs by TCHR</td>
</tr>
<tr>
<td>#QUESTs by STs</td>
</tr>
<tr>
<td>HMWK REVIEW</td>
</tr>
<tr>
<td>LESSON DEVELOP</td>
</tr>
<tr>
<td>GUIDED PRACTICE</td>
</tr>
<tr>
<td>GO OVER TEST</td>
</tr>
<tr>
<td>REVIEW PREV MAT</td>
</tr>
<tr>
<td>TECHNOLOGY</td>
</tr>
<tr>
<td>MANAGER</td>
</tr>
<tr>
<td>TASK SETTER</td>
</tr>
<tr>
<td>EXPLAINER</td>
</tr>
<tr>
<td>COUNSELOR</td>
</tr>
<tr>
<td>FELLOW INVEST</td>
</tr>
<tr>
<td>RESOURCE</td>
</tr>
<tr>
<td>STs PASSIVE</td>
</tr>
<tr>
<td>STs WRITING</td>
</tr>
<tr>
<td>STs TALKING</td>
</tr>
<tr>
<td>STs DIDACTIC</td>
</tr>
<tr>
<td>STs SYMBOLIZING</td>
</tr>
<tr>
<td>STs INVESTIG</td>
</tr>
<tr>
<td>STs PR SOLVING</td>
</tr>
<tr>
<td>STs HIGH LEVEL</td>
</tr>
</tbody>
</table>
## TABLE 29 (cont'd).

<table>
<thead>
<tr>
<th>Observer</th>
<th>TOTAL = WITH TECHNOLOGY</th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>A</td>
<td>B</td>
<td>M</td>
<td>SD</td>
<td></td>
</tr>
<tr>
<td><strong>Tchr Quests (ave/5 min)</strong></td>
<td>5.0</td>
<td>4.3</td>
<td>4.7</td>
<td>0.5</td>
<td></td>
</tr>
<tr>
<td><strong>St Quests (ave/5 min)</strong></td>
<td>0.8</td>
<td>1.3</td>
<td>1.1</td>
<td>0.4</td>
<td></td>
</tr>
<tr>
<td><strong>% of Segments With:</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Homework Review</td>
<td>100.0</td>
<td>0.0</td>
<td>50.0</td>
<td>70.7</td>
<td></td>
</tr>
<tr>
<td>Lesson Development</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td></td>
</tr>
<tr>
<td>Guided Practice</td>
<td>0.0</td>
<td>100.0</td>
<td>50.0</td>
<td>70.7</td>
<td></td>
</tr>
<tr>
<td>Reviewing a Test</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td></td>
</tr>
<tr>
<td>Reviewing Material</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td></td>
</tr>
<tr>
<td>Using Calculators Only</td>
<td>10.0</td>
<td>10.0</td>
<td>10.0</td>
<td>0.0</td>
<td></td>
</tr>
<tr>
<td>Using Computers Only</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td></td>
</tr>
<tr>
<td>Both Cacls and Comps</td>
<td>90.0</td>
<td>90.0</td>
<td>90.0</td>
<td>0.0</td>
<td></td>
</tr>
<tr>
<td><strong>Student as Manager</strong></td>
<td>0.0</td>
<td>50.0</td>
<td>25.0</td>
<td>35.4</td>
<td></td>
</tr>
<tr>
<td><strong>Student as Task Setter</strong></td>
<td>60.0</td>
<td>60.0</td>
<td>60.0</td>
<td>0.0</td>
<td></td>
</tr>
<tr>
<td><strong>Student as Explainer</strong></td>
<td>0.0</td>
<td>30.0</td>
<td>15.0</td>
<td>21.2</td>
<td></td>
</tr>
<tr>
<td><strong>Student as Consultant</strong></td>
<td>40.0</td>
<td>40.0</td>
<td>40.0</td>
<td>0.0</td>
<td></td>
</tr>
<tr>
<td><strong>St Fellow Investigator</strong></td>
<td>10.0</td>
<td>10.0</td>
<td>10.0</td>
<td>0.0</td>
<td></td>
</tr>
<tr>
<td><strong>Student as Resource</strong></td>
<td>0.0</td>
<td>20.0</td>
<td>10.0</td>
<td>14.1</td>
<td></td>
</tr>
<tr>
<td><strong>Students Passive</strong></td>
<td>50.0</td>
<td>100.0</td>
<td>75.0</td>
<td>35.4</td>
<td></td>
</tr>
<tr>
<td><strong>Students Active: Writing</strong></td>
<td>100.0</td>
<td>100.0</td>
<td>100.0</td>
<td>0.0</td>
<td></td>
</tr>
<tr>
<td><strong>Students Active: Talking</strong></td>
<td>100.0</td>
<td>100.0</td>
<td>100.0</td>
<td>0.0</td>
<td></td>
</tr>
<tr>
<td><strong>Students Didactic</strong></td>
<td>50.0</td>
<td>90.0</td>
<td>70.0</td>
<td>28.3</td>
<td></td>
</tr>
<tr>
<td><strong>Students Symbolizing</strong></td>
<td>100.0</td>
<td>100.0</td>
<td>100.0</td>
<td>0.0</td>
<td></td>
</tr>
<tr>
<td><strong>Students Investigating</strong></td>
<td>100.0</td>
<td>100.0</td>
<td>100.0</td>
<td>0.0</td>
<td></td>
</tr>
<tr>
<td><strong>Students Problem Solving</strong></td>
<td>20.0</td>
<td>40.0</td>
<td>30.0</td>
<td>14.1</td>
<td></td>
</tr>
<tr>
<td><strong>Sts Higher Level Thinking</strong></td>
<td>80.0</td>
<td>30.0</td>
<td>55.0</td>
<td>35.4</td>
<td></td>
</tr>
</tbody>
</table>

## TABLE 29 (cont'd).

<table>
<thead>
<tr>
<th>Observer</th>
<th>TOTAL = WITH TECHNOLOGY</th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>A</td>
<td>B</td>
<td>M</td>
<td>SD</td>
<td></td>
</tr>
<tr>
<td><strong>% of Segments With:</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Teacher as Manager</td>
<td>100.0</td>
<td>100.0</td>
<td>100.0</td>
<td>0.0</td>
<td></td>
</tr>
<tr>
<td>Teacher as Task Setter</td>
<td>50.0</td>
<td>40.0</td>
<td>45.0</td>
<td>7.1</td>
<td></td>
</tr>
<tr>
<td>Teacher as Explainer</td>
<td>30.0</td>
<td>70.0</td>
<td>50.0</td>
<td>28.3</td>
<td></td>
</tr>
<tr>
<td>Teacher as Consultant</td>
<td>60.0</td>
<td>50.0</td>
<td>55.0</td>
<td>7.1</td>
<td></td>
</tr>
<tr>
<td>Tchr Fellow Investigator</td>
<td>20.0</td>
<td>50.0</td>
<td>35.0</td>
<td>21.2</td>
<td></td>
</tr>
<tr>
<td>Teacher as Resource</td>
<td>0.0</td>
<td>10.0</td>
<td>5.0</td>
<td>7.1</td>
<td></td>
</tr>
<tr>
<td>Exposition</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td></td>
</tr>
<tr>
<td>Exerc, Consolidat, Pract</td>
<td>100.0</td>
<td>100.0</td>
<td>100.0</td>
<td>0.0</td>
<td></td>
</tr>
<tr>
<td>Discussion</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td></td>
</tr>
<tr>
<td>Investigation</td>
<td>0.0</td>
<td>40.0</td>
<td>20.0</td>
<td>28.3</td>
<td></td>
</tr>
<tr>
<td>Applied Mathematics</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td></td>
</tr>
<tr>
<td>Problem Solving</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td></td>
</tr>
<tr>
<td>Working in Groups</td>
<td>60.0</td>
<td>30.0</td>
<td>45.0</td>
<td>21.2</td>
<td></td>
</tr>
<tr>
<td>Single fact or step</td>
<td>60.0</td>
<td>70.0</td>
<td>65.0</td>
<td>7.1</td>
<td></td>
</tr>
<tr>
<td>Several facts or steps</td>
<td>40.0</td>
<td>50.0</td>
<td>45.0</td>
<td>7.1</td>
<td></td>
</tr>
<tr>
<td>Extend knowledge or skill</td>
<td>20.0</td>
<td>0.0</td>
<td>10.0</td>
<td>14.1</td>
<td></td>
</tr>
</tbody>
</table>

Number of Segments: 10 10
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>15</td>
<td>3</td>
<td>2</td>
<td>12</td>
<td>24</td>
<td>24</td>
<td>25</td>
<td>12</td>
<td>12</td>
<td>234</td>
<td>12</td>
<td>24</td>
<td>12</td>
<td>24</td>
<td>25</td>
<td>24</td>
<td>25</td>
<td>24</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>
<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>
<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>
<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></td>
<td></td>
<td></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>6</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></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>7</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></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></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></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>9</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></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 30. Classroom C Lesson 4: Observers' Records**

- TEACHNG ACTIV
- DEMAND on STs
- #QUESTs by TCHR
- #QUESTs by STs
- HMWK REVIEW
- LESSON DEVELOP
- GUIDED PRACTICE
- GO OVER TEST
- ReVIEW PREV MAT
- TECHNOLOGY
- MANAGER
- TASK SETTER
- EXPLAINER
- COUNSELOR
- FELLOW INVEST
- RESOURCE
- STs PASSIVE
- STs WRITING
- STs TALKING
- STs DIDACTIC
- STs SYM BLZNG
- STs INVESTIG
- STs PR SOLVNG
- STs HIGH LEVEL

- 263
### TABLE 30 (cont'd).

<table>
<thead>
<tr>
<th>OBSERVER</th>
<th>TOTAL = WITH TECHNOLOGY</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>A</td>
</tr>
<tr>
<td>Tchr Quests (ave/5 min)</td>
<td>9.8</td>
</tr>
<tr>
<td>St Quests (ave/5 min)</td>
<td>1.3</td>
</tr>
<tr>
<td>% of Segments With:</td>
<td></td>
</tr>
<tr>
<td>Homework Review</td>
<td>0.0</td>
</tr>
<tr>
<td>Lesson Development</td>
<td>0.0</td>
</tr>
<tr>
<td>Guided Practice</td>
<td>100.0</td>
</tr>
<tr>
<td>Reviewing a Test</td>
<td>0.0</td>
</tr>
<tr>
<td>Reviewing Material</td>
<td>0.0</td>
</tr>
<tr>
<td>Using Calculators Only</td>
<td>11.1</td>
</tr>
<tr>
<td>Using Computers Only</td>
<td>0.0</td>
</tr>
<tr>
<td>Both Caics and Comps</td>
<td>88.9</td>
</tr>
<tr>
<td>Student as Manager</td>
<td>0.0</td>
</tr>
<tr>
<td>Student as Task Setter</td>
<td>0.0</td>
</tr>
<tr>
<td>Student as Explainer</td>
<td>0.0</td>
</tr>
<tr>
<td>Student as Consultant</td>
<td>0.0</td>
</tr>
<tr>
<td>St Fellow Investigator</td>
<td>0.0</td>
</tr>
<tr>
<td>Student as Resource</td>
<td>0.0</td>
</tr>
<tr>
<td>Students Passive</td>
<td>100.0</td>
</tr>
<tr>
<td>Students Active: Writing</td>
<td>100.0</td>
</tr>
<tr>
<td>Students Active: Talking</td>
<td>100.0</td>
</tr>
<tr>
<td>Students Didactic</td>
<td>100.0</td>
</tr>
<tr>
<td>Students Symbolizing</td>
<td>100.0</td>
</tr>
<tr>
<td>Students Investigating</td>
<td>88.9</td>
</tr>
<tr>
<td>Students Problem Solving</td>
<td>0.0</td>
</tr>
<tr>
<td>Sts Higher Level Thinking</td>
<td>0.0</td>
</tr>
</tbody>
</table>

### TABLE 30 (cont'd).

<table>
<thead>
<tr>
<th>OBSERVER</th>
<th>TOTAL = WITH TECHNOLOGY</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>A</td>
</tr>
<tr>
<td>% of Segments With:</td>
<td></td>
</tr>
<tr>
<td>Teacher as Manager</td>
<td>100.0</td>
</tr>
<tr>
<td>Teacher as Task Setter</td>
<td>100.0</td>
</tr>
<tr>
<td>Teacher as Explainer</td>
<td>100.0</td>
</tr>
<tr>
<td>Teacher as Consultant</td>
<td>11.1</td>
</tr>
<tr>
<td>Tchr Fellow Investigator</td>
<td>55.6</td>
</tr>
<tr>
<td>Teacher as Resource</td>
<td>0.0</td>
</tr>
<tr>
<td>Exposition</td>
<td>44.4</td>
</tr>
<tr>
<td>Exerc, Consolidat, Pract</td>
<td>88.9</td>
</tr>
<tr>
<td>Discussion</td>
<td>0.0</td>
</tr>
<tr>
<td>Investigation</td>
<td>0.0</td>
</tr>
<tr>
<td>Applied Mathematics</td>
<td>44.4</td>
</tr>
<tr>
<td>Problem Solving</td>
<td>0.0</td>
</tr>
<tr>
<td>Working in Groups</td>
<td>0.0</td>
</tr>
<tr>
<td>Single fact or step</td>
<td>100.0</td>
</tr>
<tr>
<td>Several facts or steps</td>
<td>100.0</td>
</tr>
<tr>
<td>Extend knowledge or skill</td>
<td>66.7</td>
</tr>
</tbody>
</table>

Number of Segments: 9 9
<table>
<thead>
<tr>
<th>TABLE 31. CLASSROOM C/LESSON 5: OBSERVERS’ RECORDS</th>
</tr>
</thead>
<tbody>
<tr>
<td>TIME</td>
</tr>
<tr>
<td>TEACHING ACTIV</td>
</tr>
<tr>
<td>DEMAND on STs</td>
</tr>
<tr>
<td>#QUESTs by TCHR</td>
</tr>
<tr>
<td>#QUESTs by STs</td>
</tr>
<tr>
<td>HMWK REVIEW</td>
</tr>
<tr>
<td>LESSON DEVELOP</td>
</tr>
<tr>
<td>GUIDED PRACTICE</td>
</tr>
<tr>
<td>GO OVER TEST</td>
</tr>
<tr>
<td>ReVIEW PREV MAT</td>
</tr>
<tr>
<td>TECHNOLOGY</td>
</tr>
<tr>
<td>MANAGER</td>
</tr>
<tr>
<td>TASK SETTER</td>
</tr>
<tr>
<td>EXPLAINER</td>
</tr>
<tr>
<td>COUNSELOR</td>
</tr>
<tr>
<td>FELLOW INVEST</td>
</tr>
<tr>
<td>RESOURCE</td>
</tr>
<tr>
<td>STs PASSIVE</td>
</tr>
<tr>
<td>STs WRITING</td>
</tr>
<tr>
<td>STs TALKING</td>
</tr>
<tr>
<td>STs DIDACTIC</td>
</tr>
<tr>
<td>STs SYMBLZNG</td>
</tr>
<tr>
<td>STs INVEStIG</td>
</tr>
<tr>
<td>STs PR SOLVNG</td>
</tr>
<tr>
<td>STs HIGH LEVEL</td>
</tr>
<tr>
<td>TABLE 31 (cont'd).</td>
</tr>
<tr>
<td>--------------------</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>Tchr Quests (ave/5 min)</td>
</tr>
<tr>
<td>St Quests (ave/5 min)</td>
</tr>
<tr>
<td>% of Segments With:</td>
</tr>
<tr>
<td>Homework Review</td>
</tr>
<tr>
<td>Lesson Development</td>
</tr>
<tr>
<td>Guided Practice</td>
</tr>
<tr>
<td>Reviewing a Test</td>
</tr>
<tr>
<td>Reviewing Material</td>
</tr>
<tr>
<td>Using Calculators Only</td>
</tr>
<tr>
<td>Using Computers Only</td>
</tr>
<tr>
<td>Both Calcs and Comps</td>
</tr>
<tr>
<td>Student as Manager</td>
</tr>
<tr>
<td>Student as Task Setter</td>
</tr>
<tr>
<td>Student as Explainer</td>
</tr>
<tr>
<td>Student as Consultant</td>
</tr>
<tr>
<td>St Fellow Investigator</td>
</tr>
<tr>
<td>Student as Resource</td>
</tr>
<tr>
<td>Students Passive</td>
</tr>
<tr>
<td>Students Active: Writing</td>
</tr>
<tr>
<td>Students Active: Talking</td>
</tr>
<tr>
<td>Students Didactic</td>
</tr>
<tr>
<td>Students Symbolizing</td>
</tr>
<tr>
<td>Students Investigating</td>
</tr>
<tr>
<td>Students Problem Solving</td>
</tr>
<tr>
<td>Sts Higher Level Thinking</td>
</tr>
<tr>
<td>% of Segments With:</td>
</tr>
<tr>
<td>------------------------------------------</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>Teacher as Manager</td>
</tr>
<tr>
<td>Teacher as Task Setter</td>
</tr>
<tr>
<td>Teacher as Explainer</td>
</tr>
<tr>
<td>Teacher as Consultant</td>
</tr>
<tr>
<td>Tchr Fellow Investigator</td>
</tr>
<tr>
<td>Teacher as Resource</td>
</tr>
<tr>
<td>Exposition</td>
</tr>
<tr>
<td>Exerc, Consolidat, Pract</td>
</tr>
<tr>
<td>Discussion</td>
</tr>
<tr>
<td>Investigation</td>
</tr>
<tr>
<td>Applied Mathematics</td>
</tr>
<tr>
<td>Problem Solving</td>
</tr>
<tr>
<td>Working in Groups</td>
</tr>
<tr>
<td>Single fact or step</td>
</tr>
<tr>
<td>Several facts or steps</td>
</tr>
<tr>
<td>Extend knowledge or skill</td>
</tr>
</tbody>
</table>

Number of Segments

<p>| | | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>TOTAL</td>
<td></td>
<td>9</td>
<td>9</td>
</tr>
<tr>
<td>NO TECHNOLOGY</td>
<td></td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>WITH TECHNOLOGY</td>
<td></td>
<td>8</td>
<td>8</td>
</tr>
</tbody>
</table>

267
<table>
<thead>
<tr>
<th>TABLE 32. CLASSROOM C/LESSON 6: OBSERVERS’ RECORDS</th>
</tr>
</thead>
<tbody>
<tr>
<td>TIME</td>
</tr>
<tr>
<td>TEACHING ACTIVITY</td>
</tr>
<tr>
<td>DEMAND on STs</td>
</tr>
<tr>
<td>#QUESTs by TCHR</td>
</tr>
<tr>
<td>#QUESTs by STs</td>
</tr>
<tr>
<td>HMWK REVIEW</td>
</tr>
<tr>
<td>LESSON DEVELOP</td>
</tr>
<tr>
<td>GUIDED PRACTICE</td>
</tr>
<tr>
<td>GO OVER TEST</td>
</tr>
<tr>
<td>ReVIEW PREV MAT</td>
</tr>
<tr>
<td>TECHNOLOGY</td>
</tr>
<tr>
<td>MANAGER</td>
</tr>
<tr>
<td>TASK SETTER</td>
</tr>
<tr>
<td>EXPLAINER</td>
</tr>
<tr>
<td>COUNSELOR</td>
</tr>
<tr>
<td>FELLOW INVEST</td>
</tr>
<tr>
<td>RESOURCE</td>
</tr>
<tr>
<td>STs PASSIVE</td>
</tr>
<tr>
<td>STs WRITING</td>
</tr>
<tr>
<td>STs TALKING</td>
</tr>
<tr>
<td>STs DIDACTIC</td>
</tr>
<tr>
<td>STs SYMBOLIZNG</td>
</tr>
<tr>
<td>STs INVESTIG</td>
</tr>
<tr>
<td>STs PR SOLVNG</td>
</tr>
<tr>
<td>STs HIGH LEVEL</td>
</tr>
</tbody>
</table>
### TABLE 32 (cont’d).

**TOTAL = WITH TECHNOLOGY**  

<table>
<thead>
<tr>
<th>OBSERVER</th>
<th>A</th>
<th>B</th>
<th>M</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tchr Quests (ave/5 min)</td>
<td>1.6</td>
<td>1.2</td>
<td>1.4</td>
<td>0.2</td>
</tr>
<tr>
<td>St Quests (ave/5 min)</td>
<td>1.0</td>
<td>0.2</td>
<td>0.6</td>
<td>0.5</td>
</tr>
<tr>
<td>% of Segments With:</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Homework Review</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Lesson Development</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Guided Practice</td>
<td>0.0</td>
<td>100.0</td>
<td>50.0</td>
<td>70.7</td>
</tr>
<tr>
<td>Reviewing a Test</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Using Calculators Only</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Using Computers Only</td>
<td>100.0</td>
<td>100.0</td>
<td>100.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Both Calcs and Comps</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
</tbody>
</table>

**TABLE 32 (cont’d).**  

**TOTAL = WITH TECHNOLOGY**  

<table>
<thead>
<tr>
<th>OBSERVER</th>
<th>A</th>
<th>B</th>
<th>M</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>% of Segments With:</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Teacher as Manager</td>
<td>33.3</td>
<td>66.7</td>
<td>50.0</td>
<td>23.6</td>
</tr>
<tr>
<td>Teacher as Task Setter</td>
<td>33.3</td>
<td>0.0</td>
<td>16.7</td>
<td>23.6</td>
</tr>
<tr>
<td>Teacher as Explainer</td>
<td>11.1</td>
<td>44.4</td>
<td>27.8</td>
<td>23.6</td>
</tr>
<tr>
<td>Teacher as Consultant</td>
<td>55.6</td>
<td>44.4</td>
<td>50.0</td>
<td>7.9</td>
</tr>
<tr>
<td>Tchr Fellow Investigator</td>
<td>66.7</td>
<td>88.9</td>
<td>77.8</td>
<td>15.7</td>
</tr>
<tr>
<td>Teacher as Resource</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Exposition</td>
<td>0.0</td>
<td>100.0</td>
<td>50.0</td>
<td>70.7</td>
</tr>
<tr>
<td>Exerc, Consol, Pract</td>
<td>77.8</td>
<td>0.0</td>
<td>38.9</td>
<td>55.0</td>
</tr>
<tr>
<td>Discussion</td>
<td>11.1</td>
<td>0.0</td>
<td>5.6</td>
<td>7.9</td>
</tr>
<tr>
<td>Investigation</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Applied Mathematics</td>
<td>55.6</td>
<td>0.0</td>
<td>27.8</td>
<td>39.3</td>
</tr>
<tr>
<td>Problem Solving</td>
<td>11.1</td>
<td>0.0</td>
<td>5.6</td>
<td>7.9</td>
</tr>
<tr>
<td>Working In Groups</td>
<td>100.0</td>
<td>100.0</td>
<td>100.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Single fact or step</td>
<td>44.4</td>
<td>55.6</td>
<td>50.0</td>
<td>7.9</td>
</tr>
<tr>
<td>Several facts or steps</td>
<td>11.1</td>
<td>11.1</td>
<td>11.1</td>
<td>0.0</td>
</tr>
<tr>
<td>Extend knowledge or skill</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
</tbody>
</table>

**Number of Segments**  

9 9

269
<table>
<thead>
<tr>
<th>TABLE 33. CLASSROOM D/LESSON 1: OBSERVERS' RECORDS</th>
</tr>
</thead>
<tbody>
<tr>
<td>OBSERVER</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>TIME</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>TEACHNG ACTIV</td>
</tr>
<tr>
<td>DEMAND on STs</td>
</tr>
<tr>
<td>#QUESTs by TCHR</td>
</tr>
<tr>
<td>#QUESTs by STs</td>
</tr>
<tr>
<td>HMWK REVIEW</td>
</tr>
<tr>
<td>LESSON DEVELOP</td>
</tr>
<tr>
<td>GUIDED PRACTICE</td>
</tr>
<tr>
<td>GO OVER TEST</td>
</tr>
<tr>
<td>ReVIEW PREV MAT</td>
</tr>
<tr>
<td>TECHNOLOGY</td>
</tr>
<tr>
<td>MANAGER</td>
</tr>
<tr>
<td>TASK SETTER</td>
</tr>
<tr>
<td>EXPLAINER</td>
</tr>
<tr>
<td>COUNSELOR</td>
</tr>
<tr>
<td>FELLOW INVEST</td>
</tr>
<tr>
<td>RESOURCE</td>
</tr>
<tr>
<td>STs PASSIVE</td>
</tr>
<tr>
<td>STs WRITING</td>
</tr>
<tr>
<td>STs TALKING</td>
</tr>
<tr>
<td>STs DIDACTIC</td>
</tr>
<tr>
<td>STs SYMBLZNG</td>
</tr>
<tr>
<td>STs INVESTIG</td>
</tr>
<tr>
<td>STs PR SOLVNG</td>
</tr>
<tr>
<td>STs HIGH LEVEL</td>
</tr>
<tr>
<td>TABLE 33 (cont'd).</td>
</tr>
<tr>
<td>---------------------</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>Tchr Quests (ave/5 min)</td>
</tr>
<tr>
<td>St Quests (ave/5 min)</td>
</tr>
<tr>
<td>% of Segments With:</td>
</tr>
<tr>
<td>Homework Review</td>
</tr>
<tr>
<td>Lesson Development</td>
</tr>
<tr>
<td>Guided Practice</td>
</tr>
<tr>
<td>Reviewing a Test</td>
</tr>
<tr>
<td>Reviewing Material</td>
</tr>
<tr>
<td>Using Calculators Only</td>
</tr>
<tr>
<td>Using Computers Only</td>
</tr>
<tr>
<td>Both Calcs and Comps</td>
</tr>
<tr>
<td>Student as Manager</td>
</tr>
<tr>
<td>Student as Task Setter</td>
</tr>
<tr>
<td>Student as Explainer</td>
</tr>
<tr>
<td>Student as Consultant</td>
</tr>
<tr>
<td>St Fellow Investigator</td>
</tr>
<tr>
<td>Student as Resource</td>
</tr>
<tr>
<td>Students Passive</td>
</tr>
<tr>
<td>Students Active: Writing</td>
</tr>
<tr>
<td>Students Active: Talking</td>
</tr>
<tr>
<td>Students Didactic</td>
</tr>
<tr>
<td>Students Symbolizing</td>
</tr>
<tr>
<td>Students Investigating</td>
</tr>
<tr>
<td>Students Problem Solving</td>
</tr>
<tr>
<td>Sts Higher Level Thinking</td>
</tr>
<tr>
<td>% of Segments With:</td>
</tr>
<tr>
<td>------------------------------------------</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>Teacher as Manager</td>
</tr>
<tr>
<td>Teacher as Task Setter</td>
</tr>
<tr>
<td>Teacher as Explainer</td>
</tr>
<tr>
<td>Teacher as Consultant</td>
</tr>
<tr>
<td>Tchr Fellow Investigator</td>
</tr>
<tr>
<td>Teacher as Resource</td>
</tr>
<tr>
<td>Exposition</td>
</tr>
<tr>
<td>Exerc, Consolidat, Pract</td>
</tr>
<tr>
<td>Discussion</td>
</tr>
<tr>
<td>Investigation</td>
</tr>
<tr>
<td>Applied Mathematics</td>
</tr>
<tr>
<td>Problem Solving</td>
</tr>
<tr>
<td>Working in Groups</td>
</tr>
<tr>
<td>Single fact or step</td>
</tr>
<tr>
<td>Several facts or steps</td>
</tr>
<tr>
<td>Extend knowledge or skill</td>
</tr>
</tbody>
</table>

Number of Segments: 4 4 0 2 4 2
<table>
<thead>
<tr>
<th></th>
<th>TOTAL</th>
<th>NO TECHNOLOGY</th>
<th>WITH TECHNOLOGY</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>OBSERVER A</td>
<td>B</td>
<td>M</td>
</tr>
<tr>
<td>Tchr Quests (ave/5 min)</td>
<td>3.3</td>
<td>8.5</td>
<td>5.9</td>
</tr>
<tr>
<td>St Quests (ave/5 min)</td>
<td>1.0</td>
<td>1.3</td>
<td>1.1</td>
</tr>
<tr>
<td>% of Segments With:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Homework Review</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Lesson Development</td>
<td>50.0</td>
<td>75.0</td>
<td>62.5</td>
</tr>
<tr>
<td>Guided Practice</td>
<td>50.0</td>
<td>25.0</td>
<td>37.5</td>
</tr>
<tr>
<td>Reviewing a Test</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Reviewing Material</td>
<td>25.0</td>
<td>25.0</td>
<td>25.0</td>
</tr>
<tr>
<td>Using Calculators Only</td>
<td>50.0</td>
<td>75.0</td>
<td>62.5</td>
</tr>
<tr>
<td>Using Computers Only</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Both Calcs and Comps</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Student as Manager</td>
<td>0.0</td>
<td>75.0</td>
<td>37.5</td>
</tr>
<tr>
<td>Student as Task Setter</td>
<td>75.0</td>
<td>75.0</td>
<td>75.0</td>
</tr>
<tr>
<td>Student as Explainer</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Student as Consultant</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>St Fellow Investigator</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Student as Resource</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Students Passive</td>
<td>75.0</td>
<td>100.0</td>
<td>67.5</td>
</tr>
<tr>
<td>Students Active: Writing</td>
<td>75.0</td>
<td>75.0</td>
<td>75.0</td>
</tr>
<tr>
<td>Students Active: Talking</td>
<td>50.0</td>
<td>100.0</td>
<td>75.0</td>
</tr>
<tr>
<td>Students Didactic</td>
<td>100.0</td>
<td>100.0</td>
<td>100.0</td>
</tr>
<tr>
<td>Students Symbolizing</td>
<td>75.0</td>
<td>75.0</td>
<td>75.0</td>
</tr>
<tr>
<td>Students Investigating</td>
<td>75.0</td>
<td>75.0</td>
<td>75.0</td>
</tr>
<tr>
<td>Students Problem Solving</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Sts Higher Level Thinking</td>
<td>0.0</td>
<td>25.0</td>
<td>12.5</td>
</tr>
<tr>
<td>TABLE 34 (cont'd).</td>
<td>TOTAL</td>
<td>NO TECHNOLOGY</td>
<td>WITH TECHNOLOGY</td>
</tr>
<tr>
<td>---------------------</td>
<td>-------</td>
<td>---------------</td>
<td>-----------------</td>
</tr>
<tr>
<td></td>
<td>OBSERVER</td>
<td>A</td>
<td>B</td>
</tr>
<tr>
<td>% of Segments With:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Teacher as Manager</td>
<td>100.0</td>
<td>75.0</td>
<td>87.5</td>
</tr>
<tr>
<td>Teacher as Task Setter</td>
<td>25.0</td>
<td>75.0</td>
<td>50.0</td>
</tr>
<tr>
<td>Teacher as Explainer</td>
<td>100.0</td>
<td>75.0</td>
<td>87.5</td>
</tr>
<tr>
<td>Teacher as Consultant</td>
<td>100.0</td>
<td>75.0</td>
<td>87.5</td>
</tr>
<tr>
<td>Tchr Fellow Investigator</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Teacher as Resource</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Exposition</td>
<td>100.0</td>
<td>75.0</td>
<td>87.5</td>
</tr>
<tr>
<td>Exerc, Consolidat, Pract</td>
<td>0.0</td>
<td>75.0</td>
<td>37.5</td>
</tr>
<tr>
<td>Discussion</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Investigation</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Applied Mathematics</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Problem Solving</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Working in Groups</td>
<td>75.0</td>
<td>75.0</td>
<td>75.0</td>
</tr>
<tr>
<td>Single fact or step</td>
<td>75.0</td>
<td>75.0</td>
<td>75.0</td>
</tr>
<tr>
<td>Several facts or steps</td>
<td>50.0</td>
<td>75.0</td>
<td>62.5</td>
</tr>
<tr>
<td>Extend knowledge or skill</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
</tbody>
</table>

Number of Segments

4 4 2 1 2 3
| TABLE 35. CLASSROOM D/LESSON 3: OBSERVERS' RECORDS |
|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|
| OBSERVER | A       | B       | A       | B       | A       | B       | A       | B       | A       | B       | A       | B       | B       |
| TIME     | 1       | 1       | 1       | 2       | 3       | 3       | 4       | 4       | 5       | 5       | 6       | 6       | 7       |
|          | 2       | 14      | 27      | 1       | 7       | 27      | 7       | 27      | 7       | 27      | 7       | 27      | 7       | 27      |
| TEACHING ACTIV |         |         |         |         |         |         |         |         |         |         |         |         |         |
| DEMAND on STs | 123     | 12      | 12      | 12      |         |         |         |         |         |         |         |         |         |
| #QUESTs by TCHR | 7       | 6       | 6       | 4       |         |         |         |         |         |         |         |         |         |
| #QUESTs by STs | 2       | 1       | 12      | 2       | 1       | 4       | 3       | 1       | 2       | 4       | 2       |         |         |
| HMWK REVIEW |         |         |         |         |         |         |         |         |         |         |         |         |         |
| LESSON DEVELOP | 1       | 1       |         |         |         |         |         |         |         |         |         |         |         |
| GUIDED PRACTICE | 1       | 1       | 1       | 1       | 1       | 1       | 1       | 1       | 1       | 1       | 1       | 1       | 1       |
| CO OVER TEST |         |         |         |         |         |         |         |         |         |         |         |         |         |
| ReVIEW PREV MAT | 1       |         |         |         |         |         |         |         |         |         |         |         |         |
| TECHNOLOGY | 24      | 23      | 24      | 23      | 2       | 2       | 2       | 2       | 12      | 2       | 2       | 2       | 2       |
|            |         |         |         |         |         |         |         |         |         |         |         |         |         |
| MANAGER   | 1       | 1       | 1       | 1       | 1       | 1       | 1       | 1       | 1       | 1       | 1       | 1       | 1       |
| TASK SETTER | 1       | 1       | 1       | 1       | 2       | 1       | 2       | 1       | 2       | 1       | 2       | 1       | 2       |
| EXPLAINER | 1       | 1       | 1       | 1       | 12      | 12      | 12      | 1       | 1       | 1       | 1       | 1       | 1       |
| COUNSELOR | 1       | 1       | 1       | 12      | 1       | 12      | 1       | 1       | 1       | 1       | 1       | 1       | 1       |
| FELLOW INVEST |         |         |         |         |         |         |         |         |         |         |         |         |         |
| RESOURCE  | 45      | 4       | 45      | 4       | 45      | 4       | 45      | 124     | 345     | 14      | 45      | 14      | 45      | 14      |
| STs PASSIVE | 12      | 12      | 123     | 12      | 234     | 34      | 234     | 34      | 234     | 34      | 234     | 34      | 234     |
| STs WRITING |         |         |         |         | 236     | 36      | 6       | 36      | 6       | 366     | 6       | 36      | 6       | 36      |
| STs TALKING | 127     | 12      | 12      | 124     | 157     | 124     | 45      | 1247    | 2       | 124     | 14      | 127     | 14      |         |
| STs DIDACTIC | 12      | 12      | 123     | 12      | 3       | 3       | 3       | 23      | 3       | 123     | 3       | 123     | 3       | 3       |
| STs SYMBLZNG | 4       | 3       |         |         | 3       | 36      | 3       | 36      | 23      | 36      | 3       | 36      | 3       | 36      |
| STs INVESTIG | 3       | 3       |         |         | 3       | 3       | 3       | 3       | 3       | 3       | 3       | 3       | 3       |
| STs PR SOLVNG |         |         |         |         | 1234    | 1234    | 234     | 234     | 234     | 234     |         |         |         |         |
| STs HIGH LEVEL | 2       |         |         |         |         |         |         |         |         |         |         |         |         |         |

276
<table>
<thead>
<tr>
<th>TABLE 35 (cont’d).</th>
<th>CLASSROOM D/LESSON 3: OBSERVERS’ RECORDS</th>
</tr>
</thead>
<tbody>
<tr>
<td>OBSERVER TIME</td>
<td>A   B   A   B   A   B   A   B   A   B</td>
</tr>
<tr>
<td>TEACHNG ACTIV</td>
<td>7  27</td>
</tr>
<tr>
<td>DEMAND on STs</td>
<td>1   12</td>
</tr>
<tr>
<td>#QUESTs by TCHR</td>
<td>1   3   2</td>
</tr>
<tr>
<td>#QUESTs by STs</td>
<td>1   3   2</td>
</tr>
<tr>
<td>HMWK REVIEW</td>
<td>1   1   1</td>
</tr>
<tr>
<td>LESSON DEVELOP</td>
<td>2   2   12</td>
</tr>
<tr>
<td>GUIDED PRACTICE</td>
<td>1   1   1</td>
</tr>
<tr>
<td>GO OVER TEST</td>
<td>1   2   1</td>
</tr>
<tr>
<td>ReVIEW PREV MAT</td>
<td>12  1   1</td>
</tr>
<tr>
<td>TECHNOLOGY</td>
<td>2   2   12</td>
</tr>
<tr>
<td>MANAGER</td>
<td>1   1   1</td>
</tr>
<tr>
<td>TASK SETTER</td>
<td>1   2   1</td>
</tr>
<tr>
<td>EXPLAINER</td>
<td>12  1   1</td>
</tr>
<tr>
<td>COUNSELOR</td>
<td>1   2   1</td>
</tr>
<tr>
<td>FELLOW INVEST</td>
<td>45  4   345</td>
</tr>
<tr>
<td>RESOURCE</td>
<td>234 34</td>
</tr>
<tr>
<td>STs PASSIVE</td>
<td>36  6   356</td>
</tr>
<tr>
<td>STs WRITING</td>
<td>245 12</td>
</tr>
<tr>
<td>STs TALKING</td>
<td>3   123</td>
</tr>
<tr>
<td>STs DIDACTIC</td>
<td>3   3   3   3</td>
</tr>
<tr>
<td>STs SYMBLZNG</td>
<td>3   3   3   3</td>
</tr>
<tr>
<td>STs INVESTIG</td>
<td>3   3   3   3</td>
</tr>
<tr>
<td>STs HIGH LEVEL</td>
<td></td>
</tr>
<tr>
<td>OBSEVER</td>
<td>TOTAL = WITH TECHNOLOGY</td>
</tr>
<tr>
<td>-------------------------------</td>
<td>-------------------------</td>
</tr>
<tr>
<td>Tchr Quests (ave/5 min)</td>
<td></td>
</tr>
<tr>
<td>St Quests (ave/5 min)</td>
<td></td>
</tr>
<tr>
<td>% of Segments With:</td>
<td></td>
</tr>
<tr>
<td>Homework Review</td>
<td></td>
</tr>
<tr>
<td>Lesson Development</td>
<td></td>
</tr>
<tr>
<td>Guided Practice</td>
<td></td>
</tr>
<tr>
<td>Reviewing a Test</td>
<td></td>
</tr>
<tr>
<td>Reviewing Material</td>
<td></td>
</tr>
<tr>
<td>Using Calculators Only</td>
<td></td>
</tr>
<tr>
<td>Using Computers Only</td>
<td></td>
</tr>
<tr>
<td>Both Caics and Comps</td>
<td></td>
</tr>
<tr>
<td>Student as Manager</td>
<td></td>
</tr>
<tr>
<td>Student as Task Setter</td>
<td></td>
</tr>
<tr>
<td>Student as Explainer</td>
<td></td>
</tr>
<tr>
<td>Student as Consultant</td>
<td></td>
</tr>
<tr>
<td>St Fellow Investigator</td>
<td></td>
</tr>
<tr>
<td>Student as Resource</td>
<td></td>
</tr>
<tr>
<td>Students Passive</td>
<td></td>
</tr>
<tr>
<td>Students Active: Writing</td>
<td></td>
</tr>
<tr>
<td>Students Active: Talking</td>
<td></td>
</tr>
<tr>
<td>Students Didactic</td>
<td></td>
</tr>
<tr>
<td>Students Symbolizing</td>
<td></td>
</tr>
<tr>
<td>Students Investigating</td>
<td></td>
</tr>
<tr>
<td>Students Problem Solving</td>
<td></td>
</tr>
<tr>
<td>Sts Higher Level Thinking</td>
<td></td>
</tr>
</tbody>
</table>

| % of Segments With:           |                         |          |     |     |     |     |
| Teacher as Manager            |                         |          | 100.0| 100.0| 100.0| 0.0 |
| Teacher as Task Setter        |                         |          | 100.0| 9.1  | 54.5 | 64.3|
| Teacher as Explainer          |                         |          | 100.0| 100.0| 100.0| 0.0 |
| Teacher as Consultant         |                         |          | 81.8 | 90.9 | 86.4 | 6.4 |
| Tchr Fellow Investigator      |                         |          | 0.0  | 0.0  | 0.0  | 0.0 |
| Teacher as Resource           |                         |          | 0.0  | 63.6 | 31.8 | 45.0|
| Exposition                    |                         |          | 0.0  | 18.2 | 9.1  | 12.9|
| Exerc, Consolidat, Pract      |                         |          | 18.2 | 81.8 | 50.0 | 45.0|
| Discussion                    |                         |          | 0.0  | 0.0  | 0.0  | 0.0 |
| Investigation                 |                         |          | 0.0  | 9.1  | 4.5  | 6.4 |
| Applied Mathematics           |                         |          | 0.0  | 0.0  | 0.0  | 0.0 |
| Problem Solving               |                         |          | 0.0  | 0.0  | 0.0  | 0.0 |
| Working In Groups             |                         |          | 90.9 | 81.8 | 86.4 | 6.4 |
| Single fact or step           |                         |          | 45.5 | 36.4 | 40.9 | 6.4 |
| Several facts or steps        |                         |          | 36.4 | 36.4 | 36.4 | 0.0 |
| Extend knowledge or skill     |                         |          | 9.1  | 0.0  | 4.5  | 6.4 |

Number of Segments 11 11
<table>
<thead>
<tr>
<th>TABLE 36. CLASSROOM D/LESSON 4: OBSERVERS’ RECORDS</th>
</tr>
</thead>
<tbody>
<tr>
<td>TIME</td>
</tr>
<tr>
<td>TEACHNG ACTIV</td>
</tr>
<tr>
<td>DEMAND on STs</td>
</tr>
<tr>
<td>#QUESTs by TCHR</td>
</tr>
<tr>
<td>#QUESTs by STs</td>
</tr>
<tr>
<td>HMWK REVIEW</td>
</tr>
<tr>
<td>LESSON DEVELOP</td>
</tr>
<tr>
<td>GUIDED PRACTICE</td>
</tr>
<tr>
<td>GO OVER TEST</td>
</tr>
<tr>
<td>Review PREV MAT</td>
</tr>
<tr>
<td>TECHNOLOGY</td>
</tr>
<tr>
<td>MANAGER</td>
</tr>
<tr>
<td>TASK SETTER</td>
</tr>
<tr>
<td>EXPLAINER</td>
</tr>
<tr>
<td>COUNSELOR</td>
</tr>
<tr>
<td>FELLOW INVEST</td>
</tr>
<tr>
<td>RESOURCE</td>
</tr>
<tr>
<td>STs PASSIVE</td>
</tr>
<tr>
<td>STs WRITING</td>
</tr>
<tr>
<td>STs TALKING</td>
</tr>
<tr>
<td>STs DIDACTIC</td>
</tr>
<tr>
<td>STs SYMVLZNG</td>
</tr>
<tr>
<td>STs INVESTIG</td>
</tr>
<tr>
<td>STs PR SOLVNG</td>
</tr>
<tr>
<td>STs HIGH LEVEL</td>
</tr>
<tr>
<td>TABLE 36 (cont'd).</td>
</tr>
<tr>
<td>---</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>Tchr Quests (ave/5 min)</td>
</tr>
<tr>
<td>St Quests (ave/5 min)</td>
</tr>
<tr>
<td>% of Segments With:</td>
</tr>
<tr>
<td>Homework Review</td>
</tr>
<tr>
<td>Lesson Development</td>
</tr>
<tr>
<td>Guided Practice</td>
</tr>
<tr>
<td>Reviewing a Test</td>
</tr>
<tr>
<td>Reviewing Material</td>
</tr>
<tr>
<td>Using Calculators Only</td>
</tr>
<tr>
<td>Using Computers Only</td>
</tr>
<tr>
<td>Both Calcs and Comps</td>
</tr>
<tr>
<td>Student as Manager</td>
</tr>
<tr>
<td>Student as Task Setter</td>
</tr>
<tr>
<td>Student as Explainer</td>
</tr>
<tr>
<td>Student as Consultant</td>
</tr>
<tr>
<td>St Fellow Investigator</td>
</tr>
<tr>
<td>Student as Resource</td>
</tr>
<tr>
<td>Students Passive</td>
</tr>
<tr>
<td>Students Active: Writing</td>
</tr>
<tr>
<td>Students Active: Talking</td>
</tr>
<tr>
<td>Students Didactic</td>
</tr>
<tr>
<td>Students Symbolizing</td>
</tr>
<tr>
<td>Students Investigating</td>
</tr>
<tr>
<td>Students Problem Solving</td>
</tr>
<tr>
<td>Sts Higher Level Thinking</td>
</tr>
<tr>
<td>% of Segments With:</td>
</tr>
<tr>
<td>------------------------------------------</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>Teacher as Manager</td>
</tr>
<tr>
<td>Teacher as Task Setter</td>
</tr>
<tr>
<td>Teacher as Explainer</td>
</tr>
<tr>
<td>Teacher as Consultant</td>
</tr>
<tr>
<td>Tchr Fellow Investigator</td>
</tr>
<tr>
<td>Teacher as Resource</td>
</tr>
<tr>
<td>Exposition</td>
</tr>
<tr>
<td>Exerc, Consolidat, Pract</td>
</tr>
<tr>
<td>Discussion</td>
</tr>
<tr>
<td>Investigation</td>
</tr>
<tr>
<td>Applied Mathematics</td>
</tr>
<tr>
<td>Problem Solving</td>
</tr>
<tr>
<td>Working in Groups</td>
</tr>
<tr>
<td>Single fact or step</td>
</tr>
<tr>
<td>Several facts or steps</td>
</tr>
<tr>
<td>Extend knowledge or skill</td>
</tr>
</tbody>
</table>

Number of Segments: 9  9  7  7  2  2
<table>
<thead>
<tr>
<th>Observer</th>
<th>A1</th>
<th>A2</th>
<th>A3</th>
<th>A4</th>
<th>A5</th>
<th>A6</th>
<th>A7</th>
<th>A8</th>
<th>B1</th>
<th>B2</th>
<th>B3</th>
<th>B4</th>
<th>B5</th>
<th>B6</th>
<th>B7</th>
<th>B8</th>
</tr>
</thead>
<tbody>
<tr>
<td>Teaching Activity</td>
<td>17</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>17</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>27</td>
<td>2</td>
<td>27</td>
<td>2</td>
<td>27</td>
<td>2</td>
<td>27</td>
<td>2</td>
</tr>
<tr>
<td>Demand on STs</td>
<td>12</td>
<td>12</td>
<td>12</td>
<td>123</td>
<td>12</td>
<td>12</td>
<td>2</td>
<td>1</td>
<td>1</td>
<td>2</td>
<td>1</td>
<td>2</td>
<td>1</td>
<td>2</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>#Quests by TCHR</td>
<td>2</td>
<td>6</td>
<td>6</td>
<td>3</td>
<td>5</td>
<td>5</td>
<td>1</td>
<td>4</td>
<td>1</td>
<td>4</td>
<td>1</td>
<td>4</td>
<td>1</td>
<td>4</td>
<td>1</td>
<td>4</td>
</tr>
<tr>
<td>#Quests by STs</td>
<td>1</td>
<td>1</td>
<td>2</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>2</td>
<td>5</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>HWK Review</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></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>Lesson Develop</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Guided Practice</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>
<td>1</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Go Over Test</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></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>Review Prev Mat</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></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>Technology</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>12</td>
<td>12</td>
<td>12</td>
<td>12</td>
<td>12</td>
<td>12</td>
<td>12</td>
<td>12</td>
</tr>
<tr>
<td>Manager</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Task Setter</td>
<td>1</td>
<td>2</td>
<td>2</td>
<td>1</td>
<td>2</td>
<td>1</td>
<td>12</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Explainer</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Counselor</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>12</td>
<td>1</td>
<td>12</td>
<td>1</td>
<td>12</td>
<td>1</td>
<td>12</td>
<td>1</td>
<td>12</td>
<td>1</td>
<td>12</td>
<td>1</td>
</tr>
<tr>
<td>Fellow Invest</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></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>Resource</td>
<td>5</td>
<td>5</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>STs Passive</td>
<td>12</td>
<td>12</td>
<td>12</td>
<td>12</td>
<td>12</td>
<td>12</td>
<td>12</td>
<td>12</td>
<td>2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>STs Writing</td>
<td>3</td>
<td>156</td>
<td>156</td>
<td>3</td>
<td>156</td>
<td>13</td>
<td>156</td>
<td>35</td>
<td>356</td>
<td>35</td>
<td>356</td>
<td>35</td>
<td>356</td>
<td>35</td>
<td>356</td>
<td>35</td>
</tr>
<tr>
<td>STs Talking</td>
<td>2</td>
<td>124</td>
<td>2</td>
<td>127</td>
<td>27</td>
<td>1247</td>
<td>27</td>
<td>247</td>
<td>147</td>
<td>147</td>
<td>1247</td>
<td>2</td>
<td>247</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>STs Didactic</td>
<td>123</td>
<td>123</td>
<td>123</td>
<td>123</td>
<td>123</td>
<td>123</td>
<td>123</td>
<td>123</td>
<td>3</td>
<td>123</td>
<td>3</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>STs Symbolizing</td>
<td>2356</td>
<td>2356</td>
<td>2</td>
<td>2356</td>
<td>1</td>
<td>2356</td>
<td>1</td>
<td>2356</td>
<td>1</td>
<td>2356</td>
<td>1</td>
<td>2356</td>
<td>1</td>
<td>2356</td>
<td>1</td>
<td>2356</td>
</tr>
<tr>
<td>STs Investigig</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>STs Pr Solving</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></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>STs High Level</td>
<td>5</td>
<td>2</td>
<td>2</td>
<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>
<td></td>
</tr>
</tbody>
</table>

282
<table>
<thead>
<tr>
<th>TABLE 37 (cont'd).</th>
<th>TOTAL</th>
<th>NO TECHNOLOGY</th>
<th>WITH TECHNOLOGY</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>OBSERVER</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>A</td>
<td>B</td>
<td>M</td>
</tr>
<tr>
<td>Tchr Quests (ave/5 min)</td>
<td>1.9</td>
<td>2.9</td>
<td>2.4</td>
</tr>
<tr>
<td>St Quests (ave/5 min)</td>
<td>0.3</td>
<td>1.5</td>
<td>0.9</td>
</tr>
<tr>
<td>% of Segments With:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Homework Review</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Lesson Development</td>
<td>50.0</td>
<td>50.0</td>
<td>50.0</td>
</tr>
<tr>
<td>Guided Practice</td>
<td>0.0</td>
<td>50.0</td>
<td>25.0</td>
</tr>
<tr>
<td>Reviewing a Test</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Reviewing Material</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Using Calculators Only</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Using Computers Only</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Both Calcs and Comps</td>
<td>50.0</td>
<td>50.0</td>
<td>50.0</td>
</tr>
<tr>
<td>Student as Manager</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Student as Task Setter</td>
<td>12.5</td>
<td>100.0</td>
<td>56.3</td>
</tr>
<tr>
<td>Student as Explainer</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Student as Consultant</td>
<td>37.5</td>
<td>0.0</td>
<td>18.8</td>
</tr>
<tr>
<td>St Fellow Investigator</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Student as Resource</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Students Passive</td>
<td>50.0</td>
<td>62.5</td>
<td>56.3</td>
</tr>
<tr>
<td>Students Active: Writing</td>
<td>87.5</td>
<td>100.0</td>
<td>93.8</td>
</tr>
<tr>
<td>Students Active: Talking</td>
<td>62.5</td>
<td>100.0</td>
<td>81.3</td>
</tr>
<tr>
<td>Students Didactic</td>
<td>50.0</td>
<td>87.5</td>
<td>68.8</td>
</tr>
<tr>
<td>Students Symbolizing</td>
<td>75.0</td>
<td>100.0</td>
<td>87.5</td>
</tr>
<tr>
<td>Students Investigating</td>
<td>62.5</td>
<td>100.0</td>
<td>81.3</td>
</tr>
<tr>
<td>Students Problem Solving</td>
<td>12.5</td>
<td>0.0</td>
<td>6.3</td>
</tr>
<tr>
<td>Sts Higher Level Thinking</td>
<td>12.5</td>
<td>50.0</td>
<td>31.3</td>
</tr>
<tr>
<td>Observer as Manager</td>
<td>TOTAL</td>
<td>NO TECHNOLOGY</td>
<td>WITH TECHNOLOGY</td>
</tr>
<tr>
<td>---------------------</td>
<td>-------</td>
<td>---------------</td>
<td>-----------------</td>
</tr>
<tr>
<td></td>
<td>A</td>
<td>B</td>
<td>M</td>
</tr>
<tr>
<td></td>
<td>100.0</td>
<td>100.0</td>
<td>100.0</td>
</tr>
<tr>
<td>Teacher as Task Setter</td>
<td>37.5</td>
<td>12.5</td>
<td>25.0</td>
</tr>
<tr>
<td>Teacher as Explainer</td>
<td>50.0</td>
<td>50.0</td>
<td>50.0</td>
</tr>
<tr>
<td>Teacher as Consultant</td>
<td>37.5</td>
<td>75.0</td>
<td>56.3</td>
</tr>
<tr>
<td>Tchr Fellow Investigator</td>
<td>0.0</td>
<td>12.5</td>
<td>6.3</td>
</tr>
<tr>
<td>Teacher as Resource</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Exposition</td>
<td>50.0</td>
<td>50.0</td>
<td>50.0</td>
</tr>
<tr>
<td>Exerc. Consolidat. Pract</td>
<td>50.0</td>
<td>50.0</td>
<td>50.0</td>
</tr>
<tr>
<td>Discussion</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Investigation</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Applied Mathematics</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Problem Solving</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Working In Groups</td>
<td>75.0</td>
<td>0.0</td>
<td>37.5</td>
</tr>
<tr>
<td>Single fact or step</td>
<td>37.5</td>
<td>75.0</td>
<td>56.3</td>
</tr>
<tr>
<td>Several facts or steps</td>
<td>50.0</td>
<td>50.0</td>
<td>50.0</td>
</tr>
<tr>
<td>Extend knowledge or skill</td>
<td>12.5</td>
<td>0.0</td>
<td>6.3</td>
</tr>
</tbody>
</table>

Number of Segments | 8 | 8 | 4 | 4 | 4 | 4
<p>| TIME | 1 | 1 | 2 | 2 | 3 | 3 | 4 | 4 | 5 | 5 | 6 | 6 | 7 | 7 | 8 | 8 | 9 | 9 |
|------|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| TEACHING ACTIV | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| DEMAND on STs | 1 | 1 | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 12 |
| #QUESTs by TCHR | 2 | 1 | 7 | 7 | 12 | 8 | 10 | 7 | 13 | 11 | 14 | 11 | 6 | 8 | 6 | 8 | 6 | 8 | 7 | 3 |
| #QUESTs by STs | 5 | 1 | 4 | 2 | 5 | 2 | 2 | 2 | 3 | 2 | 4 | 2 | 7 | 3 | 8 | 5 | 2 | 5 |   |
| HMWK REVIEW | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |   |
| LESSON DEVELOP |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |
| GUIDED PRACTICE | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| GO OVER TEST |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |
| REVIEW PREV MAT | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |   |
| TECHNOLOGY | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 13 | 3 | 3 | 3 | 3 | 3 | 3 | 3 |   |
| MANAGER | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |   |
| TASK SETTER | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |   |
| EXPLAINER | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |   |
| COUNSELOR | 1 | 1 |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |
| FELLOW INVEST |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |
| RESOURCE | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 35 |   |   |   |   |   |   |   |   |   |
| STs PASSIVE | 2 | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 12 |
| STs WRITING |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |
| STs TALKING | 124 | 127 | 124 | 12 | 12 | 127 | 127 | 127 | 127 | 12 | 127 | 127 | 127 | 127 | 127 | 127 | 127 | 127 | 127 |
| STs DIDACTIC | 12 | 12 | 12 | 12 | 12 | 123 | 12 | 123 | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 12 |
| STs SYMBLZNG | 1 | 1 | 1 | 1 | 1 | 1 | 2 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |   |
| STs INVESTIG | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 |   |
| STs PR SOLVNG |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |
| STs HIGH LEVEL | 2 | 2 | 2 |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |</p>
<table>
<thead>
<tr>
<th>TABLE 38 (cont'd).</th>
<th>TOTAL</th>
<th>NO TECHNOLOGY</th>
<th>WITH TECHNOLOGY</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>OBSERVER</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>A</td>
<td>B</td>
<td>M</td>
</tr>
<tr>
<td>Tchr Quests (ave/5 min)</td>
<td>8.6</td>
<td>7.1</td>
<td>7.8</td>
</tr>
<tr>
<td>St Quests (ave/5 min)</td>
<td>4.4</td>
<td>2.7</td>
<td>3.6</td>
</tr>
<tr>
<td>% of Segments With:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Homework Review</td>
<td>77.8</td>
<td>77.8</td>
<td>77.8</td>
</tr>
<tr>
<td>Lesson Development</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Guided Practice</td>
<td>0.0</td>
<td>77.8</td>
<td>38.9</td>
</tr>
<tr>
<td>Reviewing a Test</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Reviewing Material</td>
<td>22.2</td>
<td>100.0</td>
<td>61.1</td>
</tr>
<tr>
<td>Using Calculators Only</td>
<td>11.1</td>
<td>0.0</td>
<td>5.6</td>
</tr>
<tr>
<td>Using Computers Only</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Both Calcs and Comps</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Student as Manager</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Student as Task Setter</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Student as Explainer</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Student as Consultant</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>St Fellow Investigator</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Student as Resource</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Students Passive</td>
<td>100.0</td>
<td>100.0</td>
<td>100.0</td>
</tr>
<tr>
<td>Students Active: Writing</td>
<td>11.1</td>
<td>22.2</td>
<td>16.7</td>
</tr>
<tr>
<td>Students Active: Talking</td>
<td>100.0</td>
<td>100.0</td>
<td>100.0</td>
</tr>
<tr>
<td>Students Didactic</td>
<td>100.0</td>
<td>100.0</td>
<td>100.0</td>
</tr>
<tr>
<td>Students Symbolizing</td>
<td>11.1</td>
<td>88.9</td>
<td>50.0</td>
</tr>
<tr>
<td>Students Investigating</td>
<td>0.0</td>
<td>88.9</td>
<td>44.4</td>
</tr>
<tr>
<td>Students Problem Solving</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Sts Higher Level Thinking</td>
<td>0.0</td>
<td>33.3</td>
<td>16.7</td>
</tr>
<tr>
<td>TABLE 38 (cont'd).</td>
<td>TOTAL</td>
<td>NO TECHNOLOGY</td>
<td>WITH TECHNOLOGY</td>
</tr>
<tr>
<td>--------------------</td>
<td>-------</td>
<td>---------------</td>
<td>----------------</td>
</tr>
<tr>
<td>% of Segments With:</td>
<td>A</td>
<td>B</td>
<td>M</td>
</tr>
<tr>
<td>Teacher as Manager</td>
<td>100.0</td>
<td>100.0</td>
<td>100.0</td>
</tr>
<tr>
<td>Teacher as Task Setter</td>
<td>100.0</td>
<td>55.6</td>
<td>77.8</td>
</tr>
<tr>
<td>Teacher as Explainer</td>
<td>100.0</td>
<td>100.0</td>
<td>100.0</td>
</tr>
<tr>
<td>Teacher as Consultant</td>
<td>22.2</td>
<td>66.7</td>
<td>44.4</td>
</tr>
<tr>
<td>Tchr Fellow Investigator</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Teacher as Resource</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Exposition</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Exerc, Consolidat, Pract</td>
<td>100.0</td>
<td>100.0</td>
<td>100.0</td>
</tr>
<tr>
<td>Discussion</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Investigation</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Applied Mathematics</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Problem Solving</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Working in Groups</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Single fact or step</td>
<td>100.0</td>
<td>100.0</td>
<td>100.0</td>
</tr>
<tr>
<td>Several facts or steps</td>
<td>88.9</td>
<td>77.8</td>
<td>83.3</td>
</tr>
<tr>
<td>Extend knowledge or skill</td>
<td>11.1</td>
<td>0.0</td>
<td>5.6</td>
</tr>
<tr>
<td>Number of Segments</td>
<td>9</td>
<td>9</td>
<td>8</td>
</tr>
<tr>
<td>TABLE 39. CLASSROOM E/LESSON 1: OBSERVERS’ RECORDS</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>------------------</td>
<td>------------------</td>
<td>------------------</td>
<td>------------------</td>
</tr>
<tr>
<td>OBSERVER</td>
<td>A 1</td>
<td>B 1</td>
<td>A 2</td>
</tr>
<tr>
<td>TIME</td>
<td>1</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>Teaching Activ</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Demand on STs</td>
<td>3</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>#Quests by TCHR</td>
<td>4</td>
<td>4</td>
<td>1</td>
</tr>
<tr>
<td>#Quests by STs</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>HWMK REVIEW</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lesson Develop</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Guided Practice</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Go over Test</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Review Prev Mat</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Technology</td>
<td>35</td>
<td>5</td>
<td>3</td>
</tr>
<tr>
<td>Manager</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Task Setter</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Explainer</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Counselor</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fellow Invest</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Resource</td>
<td>5</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>STs Passive</td>
<td>12</td>
<td>12</td>
<td>12</td>
</tr>
<tr>
<td>STs Writing</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>STs Talking</td>
<td>1</td>
<td>17</td>
<td>1</td>
</tr>
<tr>
<td>STs Didactic</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>STs Symbolizing</td>
<td>4</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>STs Investigating</td>
<td>3</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>STs Problem Solving</td>
<td>36</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>STs High Level</td>
<td>1</td>
<td>23</td>
<td>2</td>
</tr>
<tr>
<td>TABLE 39 (cont'd).</td>
<td>TOTAL = NO TECHNOLOGY</td>
<td></td>
<td></td>
</tr>
<tr>
<td>-------------------</td>
<td>-----------------------</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>OBSERVER</strong></td>
<td>A</td>
<td>B</td>
<td>M</td>
</tr>
<tr>
<td>Tchr Quests (ave/5 mn)</td>
<td>3.0</td>
<td>4.2</td>
<td>3.6</td>
</tr>
<tr>
<td>St Quests (ave/5 mn)</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td><strong>% of Segments With:</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Homework Review</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Lesson Development</td>
<td>80.0</td>
<td>100.0</td>
<td>90.0</td>
</tr>
<tr>
<td>Guided Practice</td>
<td>0.0</td>
<td>20.0</td>
<td>10.0</td>
</tr>
<tr>
<td>Reviewing a Test</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Reviewing Material</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Using Calculators Only</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Using Computers Only</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Both Caics and Comps</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Student as Manager</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Student as Task Setter</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Student as Explainer</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Student as Consultant</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>St Fellow Investigator</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Student as Resource</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Students Passive</td>
<td>100.0</td>
<td>100.0</td>
<td>100.0</td>
</tr>
<tr>
<td>Students Active: Writing</td>
<td>40.0</td>
<td>60.0</td>
<td>50.0</td>
</tr>
<tr>
<td>Students Active: Talking</td>
<td>60.0</td>
<td>80.0</td>
<td>70.0</td>
</tr>
<tr>
<td>Students Didactic</td>
<td>100.0</td>
<td>100.0</td>
<td>100.0</td>
</tr>
<tr>
<td>Students Symbolizing</td>
<td>20.0</td>
<td>60.0</td>
<td>40.0</td>
</tr>
<tr>
<td>Students Investigating</td>
<td>60.0</td>
<td>60.0</td>
<td>60.0</td>
</tr>
<tr>
<td>Students Problem Solving</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Sts Higher Level Thinking</td>
<td>20.0</td>
<td>60.0</td>
<td>40.0</td>
</tr>
<tr>
<td><strong>OBSERVER</strong></td>
<td>A</td>
<td>B</td>
<td>M</td>
</tr>
<tr>
<td>% of Segments With:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Teacher as Manager</td>
<td>100.0</td>
<td>100.0</td>
<td>100.0</td>
</tr>
<tr>
<td>Teacher as Task Setter</td>
<td>40.0</td>
<td>80.0</td>
<td>60.0</td>
</tr>
<tr>
<td>Teacher as Explainer</td>
<td>80.0</td>
<td>100.0</td>
<td>90.0</td>
</tr>
<tr>
<td>Teacher as Consultant</td>
<td>0.0</td>
<td>20.0</td>
<td>10.0</td>
</tr>
<tr>
<td>Tchr Fellow Investigator</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Teacher as Resource</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Exposition</td>
<td>100.0</td>
<td>100.0</td>
<td>100.0</td>
</tr>
<tr>
<td>Exerc, Consolidat, Pract</td>
<td>20.0</td>
<td>0.0</td>
<td>10.0</td>
</tr>
<tr>
<td>Discussion</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Investigation</td>
<td>0.0</td>
<td>20.0</td>
<td>10.0</td>
</tr>
<tr>
<td>Applied Mathematics</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Problem Solving</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Working in Groups</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Single fact or step</td>
<td>20.0</td>
<td>60.0</td>
<td>40.0</td>
</tr>
<tr>
<td>Several facts or steps</td>
<td>40.0</td>
<td>60.0</td>
<td>50.0</td>
</tr>
<tr>
<td>Extend knowledge or skill</td>
<td>40.0</td>
<td>20.0</td>
<td>30.0</td>
</tr>
<tr>
<td><strong>Number of Segments</strong></td>
<td>5</td>
<td>5</td>
<td></td>
</tr>
<tr>
<td>Table 40. Classroom E/lesson 2: Observers' Records</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>-----------------------------------------------</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Observer</strong></td>
<td>A</td>
<td>B</td>
<td>A</td>
</tr>
<tr>
<td><strong>Time</strong></td>
<td>1</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>Teaching Act.</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Demand on STs</td>
<td>12</td>
<td>1</td>
<td>12</td>
</tr>
<tr>
<td>#Quests by TCHR</td>
<td>2</td>
<td>3</td>
<td>9</td>
</tr>
<tr>
<td>#Quests by STs</td>
<td>2</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Hmwk Review</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Lesson Develop</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Guided Practice</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Go Over Test</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Review Prev Mat</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Technology</td>
<td>3</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>Manager</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Task Setter</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Explaner</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Counselor</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Fellow Invest</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Resource</td>
<td>5</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>STs Passive</td>
<td>12</td>
<td>12</td>
<td>12</td>
</tr>
<tr>
<td>STs Writing</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>STs Talking</td>
<td>2</td>
<td>2</td>
<td>12</td>
</tr>
<tr>
<td>STs Didactic</td>
<td>12</td>
<td>12</td>
<td>12</td>
</tr>
<tr>
<td>STs Symbolizing</td>
<td>1</td>
<td>14</td>
<td>14</td>
</tr>
<tr>
<td>STs Investigating</td>
<td>3</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>STs Pr Solving</td>
<td>34</td>
<td>234</td>
<td>25</td>
</tr>
</tbody>
</table>

290
<table>
<thead>
<tr>
<th></th>
<th>TOTAL</th>
<th>NO TECHNOLOGY</th>
<th>WITH TECHNOLOGY</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>OBSERVER</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>A</td>
<td>B</td>
<td>M</td>
</tr>
<tr>
<td>Tchr Quests (ave/5 min)</td>
<td>12.9</td>
<td>9.4</td>
<td>11.1</td>
</tr>
<tr>
<td>Stt Quests (ave/5 min)</td>
<td>1.5</td>
<td>1.3</td>
<td>1.4</td>
</tr>
<tr>
<td>% of Segments With:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Homework Review</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Lesson Development</td>
<td>100.0</td>
<td>100.0</td>
<td>100.0</td>
</tr>
<tr>
<td>Guided Practice</td>
<td>0.0</td>
<td>75.0</td>
<td>37.5</td>
</tr>
<tr>
<td>Reviewing a Test</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Reviewing Material</td>
<td>0.0</td>
<td>25.0</td>
<td>12.5</td>
</tr>
<tr>
<td>Using Calculators Only</td>
<td>12.5</td>
<td>12.5</td>
<td>12.5</td>
</tr>
<tr>
<td>Using Computers Only</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Both Calcs and Comps</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Student as Manager</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Student as Task Setter</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Student as Explanier</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Student as Consultant</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Stt Fellow Investigator</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Student as Resource</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Students Passive</td>
<td>100.0</td>
<td>100.0</td>
<td>100.0</td>
</tr>
<tr>
<td>Students Active: Writing</td>
<td>100.0</td>
<td>100.0</td>
<td>100.0</td>
</tr>
<tr>
<td>Students Active: Talking</td>
<td>100.0</td>
<td>100.0</td>
<td>100.0</td>
</tr>
<tr>
<td>Students Didactic</td>
<td>100.0</td>
<td>100.0</td>
<td>100.0</td>
</tr>
<tr>
<td>Students Symbolizing</td>
<td>25.0</td>
<td>100.0</td>
<td>62.5</td>
</tr>
<tr>
<td>Students Investigating</td>
<td>25.0</td>
<td>100.0</td>
<td>62.5</td>
</tr>
<tr>
<td>Students Problem Solving</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Sts Higher Level Thinking</td>
<td>0.0</td>
<td>100.0</td>
<td>50.0</td>
</tr>
<tr>
<td>TABLE 40 (cont'd).</td>
<td>TOTAL</td>
<td>NO TECHNOLOGY</td>
<td>WITH TECHNOLOGY</td>
</tr>
<tr>
<td>--------------------</td>
<td>-------</td>
<td>---------------</td>
<td>-----------------</td>
</tr>
<tr>
<td></td>
<td>A</td>
<td>B</td>
<td>M</td>
</tr>
<tr>
<td>% of Segments With:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Teacher as Manager</td>
<td>100.0</td>
<td>100.0</td>
<td>100.0</td>
</tr>
<tr>
<td>Teacher as Task Setter</td>
<td>100.0</td>
<td>100.0</td>
<td>100.0</td>
</tr>
<tr>
<td>Teacher as Explainer</td>
<td>100.0</td>
<td>100.0</td>
<td>100.0</td>
</tr>
<tr>
<td>Teacher as Consultant</td>
<td>12.5</td>
<td>25.0</td>
<td>18.8</td>
</tr>
<tr>
<td>Tchr Fellow Investigator</td>
<td>0.0</td>
<td>12.5</td>
<td>6.3</td>
</tr>
<tr>
<td>Teacher as Resource</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Exposition</td>
<td>100.0</td>
<td>100.0</td>
<td>100.0</td>
</tr>
<tr>
<td>Exerc, Consolidat, Pract</td>
<td>0.0</td>
<td>25.0</td>
<td>12.5</td>
</tr>
<tr>
<td>Discussion</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Investigation</td>
<td>0.0</td>
<td>87.5</td>
<td>43.8</td>
</tr>
<tr>
<td>Applied Mathematics</td>
<td>0.0</td>
<td>25.0</td>
<td>12.5</td>
</tr>
<tr>
<td>Problem Solving</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Working in Groups</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Single fact or step</td>
<td>100.0</td>
<td>100.0</td>
<td>100.0</td>
</tr>
<tr>
<td>Several facts or steps</td>
<td>100.0</td>
<td>87.5</td>
<td>93.8</td>
</tr>
<tr>
<td>Extend knowledge or skill</td>
<td>25.0</td>
<td>37.5</td>
<td>31.3</td>
</tr>
</tbody>
</table>

Number of Segments: 8  8  7  7  1  1
<p>| TABLE 41. CLASSROOM E:LESSON 3: OBSERVERS' RECORDS |
|-------------------|--------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| TIME              | 1  | 1  | 2  | 2  | 2  | 2  | 2  | 2  | 2  | 2  | 2  | 2  | 2  | 26 | 2  | 167 | 2  | 127 | 2  | 235 | 2  |   |   |   |
| TEACHING ACTIV    | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 3  | 3  |
| DEMAND on STs     | 4  | 7  | 19 | 22 | 7  | 10 | 11 | 16 | 7  | 11 | 6  | 9  | 3  | 7  | 1  | 1  |   |   |   |   |   |   |   |   |   |
| #QUESTs by TCHR   | 2  | 2  | 1  | 1  | 1  | 1  | 1  | 1  | 1  | 1  | 1  | 1  | 1  | 1  | 1  | 1  |   |   |   |   |   |   |   |   |   |
| #QUESTs by STs    | 4  | 7  | 19 | 22 | 7  | 10 | 11 | 16 | 7  | 11 | 6  | 9  | 3  | 7  | 1  | 1  |   |   |   |   |   |   |   |   |   |
| HMWK REVIEW       | 1  | 1  | 1  | 1  | 1  | 1  | 1  | 1  | 1  | 1  | 1  | 1  | 1  | 1  | 1  | 1  |   |   |   |   |   |   |   |   |   |
| LESSON DEVELOP    | 1  | 1  | 1  | 1  | 1  | 1  | 1  | 1  | 1  | 1  | 1  | 1  | 1  | 1  | 1  | 1  |   |   |   |   |   |   |   |   |   |
| GUIDED PRACTICE   | 1  | 1  | 1  | 1  | 1  | 1  | 1  | 1  | 1  | 1  | 1  | 1  | 1  | 1  | 1  | 1  |   |   |   |   |   |   |   |   |   |
| GO OVER TEST      | 1  | 1  | 1  | 1  | 1  | 1  | 1  | 1  | 1  | 1  | 1  | 1  | 1  | 1  | 1  | 1  |   |   |   |   |   |   |   |   |   |
| REVIEW PREV MAT   | 3  | 3  | 3  | 3  | 3  | 13 | 3  | 3  | 3  | 13 | 13 | 13 | 13 | 13 | 13 | 13 |   |   |   |   |   |   |   |   |   |
| TECHNOLOGY        | 3  | 3  | 3  | 3  | 3  | 13 | 3  | 3  | 3  | 13 | 13 | 13 | 13 | 13 | 13 | 13 |   |   |   |   |   |   |   |   |   |
| MANAGER           | 1  | 1  | 1  | 1  | 1  | 1  | 1  | 1  | 1  | 1  | 1  | 1  | 1  | 1  | 1  | 1  |   |   |   |   |   |   |   |   |   |
| TASK SETTER       | 1  | 1  | 12 | 1  | 1  | 1  | 12 | 1  | 1  | 1  | 12 | 1  | 1  | 1  | 12 | 1  | 1  | 1  | 1  | 1  | 1  | 1  | 1  | 1  |
| EXPLAINER         | 1  | 1  | 1  | 1  | 1  | 1  | 1  | 1  | 1  | 1  | 1  | 1  | 1  | 1  | 1  | 1  |   |   |   |   |   |   |   |   |   |
| COUNSELOR         | 1  | 1  | 1  | 1  | 1  | 1  | 1  | 1  | 1  | 1  | 1  | 1  | 1  | 1  | 1  | 1  |   |   |   |   |   |   |   |   |   |
| FELLOW INVEST     | 1  | 1  | 1  | 1  | 1  | 1  | 1  | 1  | 1  | 1  | 1  | 1  | 1  | 1  | 1  | 1  |   |   |   |   |   |   |   |   |   |
| RESOURCE          | 5  | 5  | 5  | 35 | 35 | 5  | 5  | 5  | 35 | 35 | 35 | 35 | 3  | 3  | 5  | 5  |   |   |   |   |   |   |   |   |   |
| STs PASSIVE       | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 12 |
| STs WRITING       | 35 | 5  | 1  | 13 | 5  | 5  | 5  | 5  | 5  | 5  | 5  | 5  | 5  | 5  | 5  | 5  |   |   |   |   |   |   |   |   |   |
| STs TALKING       | 12 | 24 | 27 | 2  | 12 | 2  | 27 | 2  | 2  | 28 | 246 | 2  | 247 | 2  | 46 | 1  |   |   |   |   |   |   |   |   |   |
| STs DIDACTIC      | 123| 123| 123| 123| 123| 123| 123| 123| 123| 123| 123| 123| 123| 123| 123| 123| 123| 123| 123| 123| 123| 123| 123|
| STs SYMMLZNG      | 1  | 25 | 2  | 1  | 1  | 12 | 2  | 2  | 2  | 2  | 2  | 2  | 2  | 2  | 2  | 2  |   |   |   |   |   |   |   |   |   |
| STs INVESTIG      | 3  | 3  | 23 | 3  | 3  | 3  | 3  | 3  | 3  | 3  | 3  | 3  | 3  | 3  | 3  | 3  |   |   |   |   |   |   |   |   |   |
| STs PR SOLVNG     | 12 | 1234|   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |
| STs HIGH LEVEL    | 2  | 25 | 1  | 1  | 1  | 2  |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |</p>
<table>
<thead>
<tr>
<th>TABLE 41 (cont'd).</th>
<th>TOTAL</th>
<th>NO TECHNOLOGY</th>
<th>WITH TECHNOLOGY</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>OBSERVER</td>
<td>A</td>
<td>B</td>
</tr>
<tr>
<td>Tchr Quests (ave/5 min)</td>
<td>7.3</td>
<td>10.4</td>
<td>8.8</td>
</tr>
<tr>
<td>St Quests (ave/5 min)</td>
<td>0.4</td>
<td>0.0</td>
<td>0.2</td>
</tr>
<tr>
<td>% of Segments With:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Homework Review</td>
<td>50.0</td>
<td>50.0</td>
<td>50.0</td>
</tr>
<tr>
<td>Lesson Development</td>
<td>50.0</td>
<td>50.0</td>
<td>50.0</td>
</tr>
<tr>
<td>Guided Practice</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Reviewing a Test</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Reviewing Material</td>
<td>37.5</td>
<td>0.0</td>
<td>18.8</td>
</tr>
<tr>
<td>Using Calculators Only</td>
<td>25.0</td>
<td>37.5</td>
<td>31.3</td>
</tr>
<tr>
<td>Using Computers Only</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Both Calcs and Comps</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Student as Manager</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Student as Task Setter</td>
<td>37.5</td>
<td>0.0</td>
<td>18.8</td>
</tr>
<tr>
<td>Student as Explaner</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Student as Consultant</td>
<td>12.5</td>
<td>0.0</td>
<td>6.3</td>
</tr>
<tr>
<td>St Fellow Investigator</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Student as Resource</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Students Passive</td>
<td>87.5</td>
<td>100.0</td>
<td>95.8</td>
</tr>
<tr>
<td>Students Active: Writing</td>
<td>50.0</td>
<td>50.0</td>
<td>50.0</td>
</tr>
<tr>
<td>Students Active: Talking</td>
<td>100.0</td>
<td>100.0</td>
<td>100.0</td>
</tr>
<tr>
<td>Students Didactic</td>
<td>87.5</td>
<td>100.0</td>
<td>93.8</td>
</tr>
<tr>
<td>Students Symbolizing</td>
<td>75.0</td>
<td>37.5</td>
<td>56.3</td>
</tr>
<tr>
<td>Students Investigating</td>
<td>100.0</td>
<td>50.0</td>
<td>75.0</td>
</tr>
<tr>
<td>Students Problem Solving</td>
<td>12.5</td>
<td>12.5</td>
<td>12.5</td>
</tr>
<tr>
<td>Sts Higher Level Thinking</td>
<td>62.5</td>
<td>0.0</td>
<td>31.3</td>
</tr>
<tr>
<td>TABLE 41 (cont'd).</td>
<td>TOTAL</td>
<td>NO TECHNOLOGY</td>
<td>WITH TECHNOLOGY</td>
</tr>
<tr>
<td>--------------------</td>
<td>-------</td>
<td>---------------</td>
<td>-----------------</td>
</tr>
<tr>
<td></td>
<td>OBSERVER</td>
<td>A</td>
<td>B</td>
</tr>
<tr>
<td>% of Segments With:</td>
<td>Teacher as Manager</td>
<td>100.0</td>
<td>100.0</td>
</tr>
<tr>
<td></td>
<td>Teacher as Task Setter</td>
<td>100.0</td>
<td>100.0</td>
</tr>
<tr>
<td></td>
<td>Teacher as Explainer</td>
<td>100.0</td>
<td>100.0</td>
</tr>
<tr>
<td></td>
<td>Teacher as Consultant</td>
<td>37.5</td>
<td>25.0</td>
</tr>
<tr>
<td></td>
<td>Tchr Fellow Investigator</td>
<td>12.5</td>
<td>0.0</td>
</tr>
<tr>
<td></td>
<td>Teacher as Resource</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td></td>
<td>Exposition</td>
<td>25.0</td>
<td>0.0</td>
</tr>
<tr>
<td></td>
<td>Exerc, Consolidat, Pract</td>
<td>87.5</td>
<td>100.0</td>
</tr>
<tr>
<td></td>
<td>Discussion</td>
<td>12.5</td>
<td>0.0</td>
</tr>
<tr>
<td></td>
<td>Investigation</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td></td>
<td>Applied Mathematics</td>
<td>12.5</td>
<td>0.0</td>
</tr>
<tr>
<td></td>
<td>Problem Solving</td>
<td>25.0</td>
<td>0.0</td>
</tr>
<tr>
<td></td>
<td>Working in Groups</td>
<td>25.0</td>
<td>0.0</td>
</tr>
<tr>
<td></td>
<td>Single fact or step</td>
<td>87.5</td>
<td>87.5</td>
</tr>
<tr>
<td></td>
<td>Several facts or steps</td>
<td>75.0</td>
<td>87.5</td>
</tr>
<tr>
<td></td>
<td>Extend knowledge or skill</td>
<td>75.0</td>
<td>25.0</td>
</tr>
</tbody>
</table>

Number of Segments: 8 8 6 5 2 3
### TABLE 42. CLASSROOM E/LESSON 4: OBSERVERS’ RECORDS

<table>
<thead>
<tr>
<th>OBSERVER</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>
</tr>
</thead>
<tbody>
<tr>
<td>TEACHNG ACTIV</td>
<td>15</td>
<td>15</td>
<td>15</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>12</td>
<td>12</td>
</tr>
<tr>
<td>DEMAND on STs</td>
<td>1</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>12</td>
<td>12</td>
<td>123</td>
<td>123</td>
</tr>
<tr>
<td>#QUESTs by TCHR</td>
<td>1</td>
<td>4</td>
<td>2</td>
<td>5</td>
<td>4</td>
<td>16</td>
<td>15</td>
<td>14</td>
</tr>
<tr>
<td>#QUESTs by STs</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>HMWK REVIEW</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>LESSON DEVELOP</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>GUIDED PRACTICE</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>GO OVER TEST</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>ReVIEW PREV MAT</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>TECHNOLOGY</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>MANAGER</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>TASK SETTER</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>EXPLAINER</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>COUNSELOR</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>FELLOw INVEST</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>RESOURCE</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>STs PASSIVE</td>
<td>12</td>
<td>12</td>
<td>12</td>
<td>12</td>
<td>12</td>
<td>12</td>
<td>124</td>
<td>123</td>
</tr>
<tr>
<td>STs WRITING</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>STs TALKING</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>STs DIDACTIC</td>
<td>1</td>
<td>1</td>
<td>123</td>
<td>123</td>
<td>13</td>
<td>123</td>
<td>12</td>
<td>123</td>
</tr>
<tr>
<td>STs SYM BLZNG</td>
<td>1</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>25</td>
<td>25</td>
<td>25</td>
<td>25</td>
</tr>
<tr>
<td>STs INVESTIG</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>STs PR SOLVNG</td>
<td>3</td>
<td>2</td>
<td>1</td>
<td>3</td>
<td>23</td>
<td>235</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>STs HIGH LEVEL</td>
<td>3</td>
<td>2</td>
<td>1</td>
<td>3</td>
<td>23</td>
<td>235</td>
<td>2</td>
<td>1</td>
</tr>
</tbody>
</table>

296
<table>
<thead>
<tr>
<th>TABLE 42 (cont'd).</th>
<th>TOTAL</th>
<th>NO TECHNOLOGY</th>
<th>WITH TECHNOLOGY</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>OBSERVER</td>
<td></td>
<td>A</td>
</tr>
<tr>
<td>Tchr Quests (ave/5 min)</td>
<td></td>
<td></td>
<td>7.6</td>
</tr>
<tr>
<td>St Quests (ave/5 min)</td>
<td></td>
<td></td>
<td>0.5</td>
</tr>
<tr>
<td>% of Segments With:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Homework Review</td>
<td></td>
<td></td>
<td>0.0</td>
</tr>
<tr>
<td>Lesson Development</td>
<td></td>
<td></td>
<td>62.5</td>
</tr>
<tr>
<td>Guided Practice</td>
<td></td>
<td></td>
<td>50.0</td>
</tr>
<tr>
<td>Reviewing a Test</td>
<td></td>
<td></td>
<td>0.0</td>
</tr>
<tr>
<td>Reviewing Material</td>
<td></td>
<td></td>
<td>0.0</td>
</tr>
<tr>
<td>Using Calculators Only</td>
<td></td>
<td></td>
<td>25.0</td>
</tr>
<tr>
<td>Using Computers Only</td>
<td></td>
<td></td>
<td>0.0</td>
</tr>
<tr>
<td>Both Cals and Comps</td>
<td></td>
<td></td>
<td>0.0</td>
</tr>
<tr>
<td>Student as Manager</td>
<td></td>
<td></td>
<td>0.0</td>
</tr>
<tr>
<td>Student as Task Setter</td>
<td></td>
<td></td>
<td>12.5</td>
</tr>
<tr>
<td>Student as Explainer</td>
<td></td>
<td></td>
<td>0.0</td>
</tr>
<tr>
<td>Student as Consultant</td>
<td></td>
<td></td>
<td>0.0</td>
</tr>
<tr>
<td>St Fellow Investigator</td>
<td></td>
<td></td>
<td>0.0</td>
</tr>
<tr>
<td>Student as Resource</td>
<td></td>
<td></td>
<td>0.0</td>
</tr>
<tr>
<td>Students Passive</td>
<td></td>
<td></td>
<td>100.0</td>
</tr>
<tr>
<td>Students Active: Writing</td>
<td></td>
<td></td>
<td>37.5</td>
</tr>
<tr>
<td>Students Active: Talking</td>
<td></td>
<td></td>
<td>87.5</td>
</tr>
<tr>
<td>Students Didactic</td>
<td></td>
<td></td>
<td>100.0</td>
</tr>
<tr>
<td>Students Symbolizing</td>
<td></td>
<td></td>
<td>25.0</td>
</tr>
<tr>
<td>Students Investigating</td>
<td></td>
<td></td>
<td>62.5</td>
</tr>
<tr>
<td>Students Problem Solving</td>
<td></td>
<td></td>
<td>0.0</td>
</tr>
<tr>
<td>Sts Higher Level Thinking</td>
<td></td>
<td></td>
<td>50.0</td>
</tr>
<tr>
<td><strong>TABLE 42 (cont'd).</strong></td>
<td><strong>TOTAL</strong></td>
<td>( \text{% of Segments With:} )</td>
<td><strong>NO TECHNOLOGY</strong></td>
</tr>
<tr>
<td>------------------------</td>
<td>-----------</td>
<td>----------------</td>
<td>------------------</td>
</tr>
<tr>
<td><strong>OBSERVER</strong></td>
<td><strong>A</strong></td>
<td><strong>B</strong></td>
<td><strong>M</strong></td>
</tr>
<tr>
<td>Teacher as Manager</td>
<td>100.0</td>
<td>100.0</td>
<td>100.0</td>
</tr>
<tr>
<td>Teacher as Task Setter</td>
<td>87.5</td>
<td>50.0</td>
<td>68.8</td>
</tr>
<tr>
<td>Teacher as Copartner</td>
<td>75.0</td>
<td>100.0</td>
<td>87.5</td>
</tr>
<tr>
<td>Teacher as Consultant</td>
<td>0.0</td>
<td>37.5</td>
<td>18.8</td>
</tr>
<tr>
<td>Tchr Fellow Investigat</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Teacher as Resource</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Exposition</td>
<td>62.5</td>
<td>75.0</td>
<td>68.8</td>
</tr>
<tr>
<td>Exerc, Consolldt, Pract</td>
<td>62.5</td>
<td>25.0</td>
<td>43.8</td>
</tr>
<tr>
<td>Discussion</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Investigation</td>
<td>0.0</td>
<td>12.5</td>
<td>6.3</td>
</tr>
<tr>
<td>Applied Mathematics</td>
<td>25.0</td>
<td>12.5</td>
<td>18.8</td>
</tr>
<tr>
<td>Problem Solving</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Working in Groups</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Single fact or step</td>
<td>87.5</td>
<td>62.5</td>
<td>75.0</td>
</tr>
<tr>
<td>Several facts or steps</td>
<td>75.0</td>
<td>62.5</td>
<td>68.8</td>
</tr>
<tr>
<td>Extend knowledge or skil</td>
<td>37.5</td>
<td>37.5</td>
<td>37.5</td>
</tr>
</tbody>
</table>

**Number of Segments**

<table>
<thead>
<tr>
<th><strong>TOTAL</strong></th>
<th><strong>A</strong></th>
<th><strong>B</strong></th>
<th><strong>M</strong></th>
<th><strong>SD</strong></th>
<th><strong>A</strong></th>
<th><strong>B</strong></th>
<th><strong>M</strong></th>
<th><strong>SD</strong></th>
<th><strong>A</strong></th>
<th><strong>B</strong></th>
<th><strong>M</strong></th>
<th><strong>SD</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>8</td>
<td>8</td>
<td>6</td>
<td>6</td>
<td>2</td>
<td>2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>TIME</td>
<td>A</td>
<td>B</td>
<td>A</td>
<td>B</td>
<td>A</td>
<td>B</td>
<td>A</td>
<td>B</td>
<td>A</td>
<td>B</td>
<td>A</td>
<td>B</td>
</tr>
<tr>
<td>------</td>
<td>---</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>1</td>
<td>1</td>
<td>1</td>
<td>2</td>
<td>2</td>
<td>1</td>
<td>2</td>
<td>13</td>
<td>24</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>14</td>
</tr>
<tr>
<td>2</td>
<td>123</td>
<td>1</td>
<td>123</td>
<td>12</td>
<td>12</td>
<td>12</td>
<td>123</td>
<td>12</td>
<td>12</td>
<td>12</td>
<td>123</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>8</td>
<td>3</td>
<td>123</td>
<td>8</td>
<td>10</td>
<td>6</td>
<td>135</td>
<td>11</td>
<td>12</td>
<td>8</td>
<td>12</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>5</td>
<td>4</td>
<td>4</td>
<td>3</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>4</td>
<td>1</td>
<td>22</td>
<td>1</td>
</tr>
<tr>
<td>5</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>6</td>
<td>3</td>
<td>3</td>
<td>13</td>
<td>13</td>
<td>13</td>
<td>13</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>13</td>
</tr>
<tr>
<td>7</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>8</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>9</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>10</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>11</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>12</td>
<td>12</td>
<td>12</td>
<td>12</td>
<td>12</td>
<td>12</td>
<td>12</td>
<td>12</td>
<td>12</td>
<td>12</td>
<td>12</td>
<td>12</td>
<td>12</td>
</tr>
<tr>
<td>13</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>14</td>
<td>12</td>
<td>1247</td>
<td>27</td>
<td>2</td>
<td>1247</td>
<td>12</td>
<td>127</td>
<td>124</td>
<td>12</td>
<td>12</td>
<td>12</td>
<td>1267</td>
</tr>
<tr>
<td>15</td>
<td>12</td>
<td>2</td>
<td>123</td>
<td>12</td>
<td>123</td>
<td>123</td>
<td>12</td>
<td>12</td>
<td>123</td>
<td>12</td>
<td>123</td>
<td></td>
</tr>
<tr>
<td>16</td>
<td>1</td>
<td>2</td>
<td>14</td>
<td>2</td>
<td>4</td>
<td>4</td>
<td>14</td>
<td>14</td>
<td>15</td>
<td>15</td>
<td>15</td>
<td></td>
</tr>
<tr>
<td>17</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>123</td>
</tr>
</tbody>
</table>

**TABLE 43. CLASSROOM E/LESSON 5: OBSERVERS' RECORDS**
<table>
<thead>
<tr>
<th></th>
<th>TOTAL</th>
<th>NO TECHNOLOGY</th>
<th>WITH TECHNOLOGY</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>OBSERVER</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tchr Questions (ave/5 min)</td>
<td>29.5</td>
<td>8.0</td>
<td>18.8</td>
</tr>
<tr>
<td>St Questions (ave/5 min)</td>
<td>6.0</td>
<td>1.7</td>
<td>3.8</td>
</tr>
<tr>
<td>% of Segments With:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Homework Review</td>
<td>16.7</td>
<td>0.0</td>
<td>8.3</td>
</tr>
<tr>
<td>Lesson Development</td>
<td>33.3</td>
<td>33.3</td>
<td>33.3</td>
</tr>
<tr>
<td>Guided Practice</td>
<td>0.0</td>
<td>0.0</td>
<td>16.7</td>
</tr>
<tr>
<td>Reviewing a Test</td>
<td>66.7</td>
<td>66.7</td>
<td>66.7</td>
</tr>
<tr>
<td>Reviewing Material</td>
<td>0.0</td>
<td>0.0</td>
<td>16.7</td>
</tr>
<tr>
<td>Using Calculators Only</td>
<td>33.3</td>
<td>50.0</td>
<td>41.7</td>
</tr>
<tr>
<td>Using Computers Only</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Both Calcs and Comps</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Student as Manager</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Student as Task Setter</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Student as Explaner</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Student as Consultant</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>St Fellow Investigator</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Student as Resource</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Students Passive</td>
<td>100.0</td>
<td>100.0</td>
<td>100.0</td>
</tr>
<tr>
<td>Students Active: Writing</td>
<td>66.7</td>
<td>83.3</td>
<td>75.0</td>
</tr>
<tr>
<td>Students Active: Talking</td>
<td>100.0</td>
<td>100.0</td>
<td>100.0</td>
</tr>
<tr>
<td>Students Didactic</td>
<td>100.0</td>
<td>100.0</td>
<td>100.0</td>
</tr>
<tr>
<td>Students Symbolizing</td>
<td>33.3</td>
<td>100.0</td>
<td>66.7</td>
</tr>
<tr>
<td>Students Investigating</td>
<td>33.3</td>
<td>50.0</td>
<td>41.7</td>
</tr>
<tr>
<td>Students Problem Solving</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Sts Higher Level Thinking</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>TABLE 43 (cont'd).</td>
<td>TOTAL</td>
<td>NO TECHNOLOGY</td>
<td>WITH TECHNOLOGY</td>
</tr>
<tr>
<td>--------------------</td>
<td>-------</td>
<td>---------------</td>
<td>-----------------</td>
</tr>
<tr>
<td></td>
<td>OBSERVER</td>
<td>A</td>
<td>B</td>
</tr>
<tr>
<td>% of Segments With:</td>
<td>Teacher as Manager</td>
<td>100.0</td>
<td>100.0</td>
</tr>
<tr>
<td></td>
<td>Teacher as Task Setter</td>
<td>100.0</td>
<td>100.0</td>
</tr>
<tr>
<td></td>
<td>Teacher as Explainer</td>
<td>100.0</td>
<td>83.3</td>
</tr>
<tr>
<td></td>
<td>Teacher as Consultant</td>
<td>33.3</td>
<td>0.0</td>
</tr>
<tr>
<td></td>
<td>Tchr Fellow Investigator</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td></td>
<td>Teacher as Resource</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td></td>
<td>Exposition</td>
<td>100.0</td>
<td>33.3</td>
</tr>
<tr>
<td></td>
<td>Exerc, Consolidat, Pract</td>
<td>0.0</td>
<td>66.7</td>
</tr>
<tr>
<td></td>
<td>Discussion</td>
<td>16.7</td>
<td>0.0</td>
</tr>
<tr>
<td></td>
<td>Investigation</td>
<td>0.0</td>
<td>33.3</td>
</tr>
<tr>
<td></td>
<td>Applied Mathematics</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td></td>
<td>Problem Solving</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td></td>
<td>Working in Groups</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td></td>
<td>Single fact or step</td>
<td>100.0</td>
<td>83.3</td>
</tr>
<tr>
<td></td>
<td>Several facts or steps</td>
<td>100.0</td>
<td>66.7</td>
</tr>
<tr>
<td></td>
<td>Extend knowledge or skill</td>
<td>66.7</td>
<td>0.0</td>
</tr>
</tbody>
</table>

| Number of Segments | 6 | 6 | 4 | 3 | 2 | 3 |
| TABLE 44. CLASSROOM E/LESSON 6: OBSERVERS' RECORDS |
|-----------------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|
|               | A      | B      | A      | B      | A      | B      | A      | B      | A      | B      | A      | B      | A      | B      |
| TIME           | 1      | 1      | 2      | 2      | 3      | 3      | 4      | 4      | 5      | 5      | 6      | 6      | 7      | 7      |
| TEACHNG ACTIV  | 14     | 1      | 14     | 1      | 17     | 1      | 17     | 1      | 12     | 1      | 2      | 1      | 2      | 1      |
| DEMAND on STs  | 123    | 12     | 123    | 12     | 12     | 12     | 13     | 12     | 3      | 123    | 12     | 12     | 13     | 1      |
| #QUESTs by TCHR| 7      | 10     | 5      | 12     | 2      | 9      | 2      | 11     | 5      | 11     | 5      | 8      | 3      | 1      |
| #QUESTs by STs | 1      | 1      | 4      | 4      | 1      | 1      | 1      | 1      | 6      | 1      | 1      | 1      | 1      | 2      |
| HMWK REVIEW    |        |        |        |        |        |        |        |        |        |        |        |        |        |        |
| LESSON DEVELOP | 1      | 1      | 1      | 1      | 1      | 1      | 1      | 1      | 1      | 1      | 1      | 1      |        |        |
| GUIDED PRACTICE|        |        |        |        |        |        |        |        |        |        |        |        |        |        |
| GO OVER TEST   |        |        |        |        |        |        |        |        |        |        |        |        |        |        |
| ReVIEW PREV MAT|       |        |        |        |        |        |        |        |        |        |        |        |        |        |
| TECHNOLOGY     | 3      | 3      | 13     | 13     | 13     | 13     | 13     | 13     | 13     | 13     | 3      | 3      | 3      | 3      |
| MANAGER        | 1      | 1      | 1      | 1      | 1      | 1      | 1      | 1      | 1      | 1      | 1      | 1      | 1      | 1      |
| TASK SETTER    | 1      | 1      | 1      | 1      | 1      | 1      | 1      | 1      | 1      | 1      | 1      | 1      | 1      | 1      |
| EXPLAINER      | 1      | 1      | 1      | 1      | 1      | 1      | 1      | 1      | 1      | 1      | 12     | 1      |        |        |
| COUNSELOR      | 1      | 1      | 1      |        |        |        |        |        |        |        |        |        |        |        |
| FELLOW INVEST  |        |        |        |        |        |        |        |        |        |        |        |        |        |        |
| RESOURCE       | 3      | 3      | 3      | 3      | 3      | 3      | 3      | 3      | 3      | 3      |        |        |        |        |
| STs PASSIVE    | 123    | 12     | 123    | 12     | 12     | 12     | 12     | 12     | 12     | 12     | 12     | 12     | 12     | 12     |
| STs WRITING    | 1      | 5      | 5      | 5      | 5      | 5      | 4      | 5      | 4      | 4      | 4      | 4      | 4      | 4      |
| STs TALKING    | 2      | 124    | 2      | 12     | 124    | 1      | 12     | 2      | 12     | 2      | 125    | 1      | 124    |        |
| STs DIDACTIC   | 12     | 12     | 123    | 123    | 123    | 12     | 1      | 12     | 1      | 12     | 13     | 123    | 123    | 123    |
| STs SYMBLZNG   | 1      | 2      | 2      | 2      | 2      | 2      | 2      | 1      | 14     | 1      | 14     |        |        |        |
| STs INVESTIG   | 3      | 3      | 3      | 23     | 23     |        | 123    | 123    | 123    | 123    | 123    | 123    |        |        |
| STs PR SOLVNG  | 4      | 2      | 2      | 1      | 1      |        |        |        |        |        |        |        |        |        |
| STs HIGH LEVEL |        |        |        |        |        |        |        |        |        |        |        |        |        |        |

302
<table>
<thead>
<tr>
<th>TABLE 44 (cont’d).</th>
<th>TOTAL</th>
<th>NO TECHNOLOGY</th>
<th>WITH TECHNOLOGY</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>OBSERVER</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>A</td>
<td>B</td>
<td>M</td>
</tr>
<tr>
<td>Tchr Quests (ave/5 min)</td>
<td>4.1</td>
<td>8.9</td>
<td>6.5</td>
</tr>
<tr>
<td>St Quests (ave/5 min)</td>
<td>0.9</td>
<td>2.1</td>
<td>1.5</td>
</tr>
<tr>
<td>% of Segments With:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Homework Review</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Lesson Development</td>
<td>42.9</td>
<td>100.0</td>
<td>71.4</td>
</tr>
<tr>
<td>Guided Practice</td>
<td>71.4</td>
<td>42.9</td>
<td>57.1</td>
</tr>
<tr>
<td>Reviewing a Test</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Reviewing Material</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Using Calculators Only</td>
<td>57.1</td>
<td>57.1</td>
<td>57.1</td>
</tr>
<tr>
<td>Using Computers Only</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Both Calcs and Comp</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Student as Manager</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Student as Task Setter</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Student as Explainer</td>
<td>0.0</td>
<td>14.3</td>
<td>7.1</td>
</tr>
<tr>
<td>Student as Consultant</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>St Fellow Investigator</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Student as Resource</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Students Passive</td>
<td>100.0</td>
<td>100.0</td>
<td>100.0</td>
</tr>
<tr>
<td>Students Active: Writing</td>
<td>100.0</td>
<td>85.7</td>
<td>92.9</td>
</tr>
<tr>
<td>Students Active: Talking</td>
<td>71.4</td>
<td>100.0</td>
<td>85.7</td>
</tr>
<tr>
<td>Students Didactic</td>
<td>57.1</td>
<td>100.0</td>
<td>78.6</td>
</tr>
<tr>
<td>Students Symbolizing</td>
<td>85.7</td>
<td>85.7</td>
<td>85.7</td>
</tr>
<tr>
<td>Students Investigating</td>
<td>100.0</td>
<td>28.6</td>
<td>64.3</td>
</tr>
<tr>
<td>Students Problem Solving</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Sts Higher Level Thinking</td>
<td>71.4</td>
<td>0.0</td>
<td>35.7</td>
</tr>
<tr>
<td>% of Segments With:</td>
<td>TOTAL</td>
<td></td>
<td></td>
</tr>
<tr>
<td>---------------------</td>
<td>--------</td>
<td>----------</td>
<td>----------</td>
</tr>
<tr>
<td></td>
<td>OBSERVER</td>
<td>A</td>
<td>B</td>
</tr>
<tr>
<td>Teacher as Manager</td>
<td>100.0</td>
<td>100.0</td>
<td>100.0</td>
</tr>
<tr>
<td>Teacher as Task Setter</td>
<td>85.7</td>
<td>100.0</td>
<td>92.9</td>
</tr>
<tr>
<td>Teacher as Explainer</td>
<td>71.4</td>
<td>100.0</td>
<td>85.7</td>
</tr>
<tr>
<td>Teacher as Consultant</td>
<td>71.4</td>
<td>0.0</td>
<td>35.7</td>
</tr>
<tr>
<td>Tchr Fellow Investigator</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Teacher as Resource</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Exposition</td>
<td>71.4</td>
<td>100.0</td>
<td>85.7</td>
</tr>
<tr>
<td>Exerc, Consolidat, Pract</td>
<td>42.9</td>
<td>0.0</td>
<td>21.4</td>
</tr>
<tr>
<td>Discussion</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Investigation</td>
<td>28.6</td>
<td>0.0</td>
<td>14.3</td>
</tr>
<tr>
<td>Applied Mathematics</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Problem Solving</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Working In Groups</td>
<td>28.6</td>
<td>0.0</td>
<td>14.3</td>
</tr>
<tr>
<td>Single fact or step</td>
<td>85.7</td>
<td>100.0</td>
<td>92.9</td>
</tr>
<tr>
<td>Several facts or steps</td>
<td>57.1</td>
<td>85.7</td>
<td>71.4</td>
</tr>
<tr>
<td>Extend knowledge or skill</td>
<td>71.4</td>
<td>14.3</td>
<td>42.9</td>
</tr>
</tbody>
</table>

Number of Segments | 7  | 7  | 3  | 3  | 4  | 4  |
<table>
<thead>
<tr>
<th>TABLE 45. CLASSROOM F/LESSON 1: OBSERVERS' RECORDS</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>TIME</strong></td>
</tr>
<tr>
<td><strong>TEACHNG ACTIV</strong></td>
</tr>
<tr>
<td><strong>DEMAND on STs</strong></td>
</tr>
<tr>
<td><strong>#QUESTs by TCHR</strong></td>
</tr>
<tr>
<td><strong>#QUESTs by STs</strong></td>
</tr>
<tr>
<td><strong>HMWK REVIEW</strong></td>
</tr>
<tr>
<td><strong>LESSON DEVELOP</strong></td>
</tr>
<tr>
<td><strong>GUIDED PRACTICE</strong></td>
</tr>
<tr>
<td><strong>GO OVER TEST</strong></td>
</tr>
<tr>
<td><strong>ReVIEW PREV MAT</strong></td>
</tr>
<tr>
<td><strong>TECHNOLOGY</strong></td>
</tr>
<tr>
<td><strong>MANAGER</strong></td>
</tr>
<tr>
<td><strong>TASK SETTER</strong></td>
</tr>
<tr>
<td><strong>EXPLAINER</strong></td>
</tr>
<tr>
<td><strong>COUNSELOR</strong></td>
</tr>
<tr>
<td><strong>FELLOW INVEST</strong></td>
</tr>
<tr>
<td><strong>RESOURCE</strong></td>
</tr>
<tr>
<td><strong>STs PASSIVE</strong></td>
</tr>
<tr>
<td><strong>STs WRITING</strong></td>
</tr>
<tr>
<td><strong>STs TALKING</strong></td>
</tr>
<tr>
<td><strong>STs DIDACTIC</strong></td>
</tr>
<tr>
<td><strong>STs SYMBLZNG</strong></td>
</tr>
<tr>
<td><strong>STs INVESTIG</strong></td>
</tr>
<tr>
<td><strong>STs PR SOLVNG</strong></td>
</tr>
<tr>
<td><strong>STs HIGH LEVEL</strong></td>
</tr>
</tbody>
</table>

305
<table>
<thead>
<tr>
<th>TABLE 45 (cont'd).</th>
<th>TOTAL</th>
<th>NO TECHNOLOGY</th>
<th>WITH TECHNOLOGY</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>OBSERVER</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>A</td>
<td>B</td>
<td>M</td>
</tr>
<tr>
<td>Tchr Quests (ave/5 min)</td>
<td>4.3</td>
<td>2.2</td>
<td>3.3</td>
</tr>
<tr>
<td>St Quests (ave/5 min)</td>
<td>1.8</td>
<td>1.2</td>
<td>1.5</td>
</tr>
<tr>
<td>% of Segments With:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Homework Review</td>
<td>0.0</td>
<td>44.4</td>
<td>22.2</td>
</tr>
<tr>
<td>Lesson Development</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Guided Practice</td>
<td>22.2</td>
<td>100.0</td>
<td>61.1</td>
</tr>
<tr>
<td>Reviewing a Test</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Reviewing Material</td>
<td>77.8</td>
<td>77.8</td>
<td>77.8</td>
</tr>
<tr>
<td>Using Calculators Only</td>
<td>33.3</td>
<td>44.4</td>
<td>38.9</td>
</tr>
<tr>
<td>Using Computers Only</td>
<td>0.0</td>
<td>22.2</td>
<td>11.1</td>
</tr>
<tr>
<td>Both Calcs and Comps</td>
<td>11.1</td>
<td>22.2</td>
<td>16.7</td>
</tr>
<tr>
<td>Student as Manager</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Student as Task Setter</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Student as Explaner</td>
<td>0.0</td>
<td>11.1</td>
<td>5.6</td>
</tr>
<tr>
<td>Student as Consultant</td>
<td>0.0</td>
<td>33.3</td>
<td>16.7</td>
</tr>
<tr>
<td>St Fellow Investigator</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Student as Resource</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Students Passive</td>
<td>100.0</td>
<td>100.0</td>
<td>100.0</td>
</tr>
<tr>
<td>Students Active: Writing</td>
<td>77.8</td>
<td>98.9</td>
<td>83.3</td>
</tr>
<tr>
<td>Students Active: Talking</td>
<td>100.0</td>
<td>100.0</td>
<td>100.0</td>
</tr>
<tr>
<td>Students Didactic</td>
<td>100.0</td>
<td>88.9</td>
<td>94.4</td>
</tr>
<tr>
<td>Students Symbolizing</td>
<td>77.8</td>
<td>100.0</td>
<td>88.9</td>
</tr>
<tr>
<td>Students Investigating</td>
<td>77.8</td>
<td>100.0</td>
<td>88.9</td>
</tr>
<tr>
<td>Students Problem Solving</td>
<td>22.2</td>
<td>22.2</td>
<td>22.2</td>
</tr>
<tr>
<td>Sts Higher Level Thinking</td>
<td>0.0</td>
<td>55.6</td>
<td>27.8</td>
</tr>
<tr>
<td>% of Segments With:</td>
<td>TOTAL</td>
<td></td>
<td></td>
</tr>
<tr>
<td>--------------------------------------------</td>
<td>-------</td>
<td>--------</td>
<td>--------</td>
</tr>
<tr>
<td></td>
<td>A</td>
<td>B</td>
<td>M</td>
</tr>
<tr>
<td>% of Segments With:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Teacher as Manager</td>
<td>100.0</td>
<td>100.0</td>
<td>100.0</td>
</tr>
<tr>
<td>Teacher as Task Setter</td>
<td>100.0</td>
<td>77.8</td>
<td>88.9</td>
</tr>
<tr>
<td>Teacher as Explainer</td>
<td>100.0</td>
<td>77.8</td>
<td>88.9</td>
</tr>
<tr>
<td>Teacher as Consultant</td>
<td>0.0</td>
<td>44.4</td>
<td>22.2</td>
</tr>
<tr>
<td>Tchr Fellow Investigator</td>
<td>0.0</td>
<td>22.2</td>
<td>11.1</td>
</tr>
<tr>
<td>Teacher as Resource</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Exposition</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Exerc, Consolidat, Pract</td>
<td>100.0</td>
<td>100.0</td>
<td>100.0</td>
</tr>
<tr>
<td>Discussion</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Investigation</td>
<td>0.0</td>
<td>100.0</td>
<td>50.0</td>
</tr>
<tr>
<td>Applied Mathematics</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Problem Solving</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Working In Groups</td>
<td>0.0</td>
<td>11.1</td>
<td>5.6</td>
</tr>
<tr>
<td>Single fact or step</td>
<td>77.8</td>
<td>77.8</td>
<td>77.8</td>
</tr>
<tr>
<td>Several facts or steps</td>
<td>55.6</td>
<td>44.4</td>
<td>50.0</td>
</tr>
<tr>
<td>Extend knowledge or skill</td>
<td>22.2</td>
<td>0.0</td>
<td>11.1</td>
</tr>
<tr>
<td>Number of Segments</td>
<td>9</td>
<td>9</td>
<td>5</td>
</tr>
<tr>
<td>TABLE 46.  CLASSROOM F/LESSON 2: OBSERVERS' RECORDS</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>-----------------------------------------------</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>TIME</td>
<td>1</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>TEACHNG ACTIV</td>
<td>12</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>DEMAND on STs</td>
<td>12</td>
<td>13</td>
<td>12</td>
</tr>
<tr>
<td>#QUESTs by TCHR</td>
<td>3</td>
<td>5</td>
<td>2</td>
</tr>
<tr>
<td>#QUESTs by STs</td>
<td>2</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>HMWK REVIEW</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>LESSON DEVELOP</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>GUIDED PRACTICE</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>GO OVER TEST</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>REVIEW PREV MAT</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>TECHNOLOGY</td>
<td>13</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>MANAGER</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>TASK SETTER</td>
<td>12</td>
<td>1</td>
<td>12</td>
</tr>
<tr>
<td>EXPLAINER</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>COUNSELOR</td>
<td>2</td>
<td>12</td>
<td>1</td>
</tr>
<tr>
<td>FELLOW INVEST</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>RESOURCE</td>
<td>5</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>STs PASSIVE</td>
<td>12</td>
<td>12</td>
<td>12</td>
</tr>
<tr>
<td>STs WRITING</td>
<td>45</td>
<td>1</td>
<td>35</td>
</tr>
<tr>
<td>STs TALKING</td>
<td>125</td>
<td>127</td>
<td>127</td>
</tr>
<tr>
<td>STs DIDACTIC</td>
<td>1</td>
<td>2</td>
<td>23</td>
</tr>
<tr>
<td>STs SYMBLZNG</td>
<td>2</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>STs INVESTIG</td>
<td>3</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>STs PR SOLVNG</td>
<td>234</td>
<td></td>
<td></td>
</tr>
<tr>
<td>STs HIGH LEVEL</td>
<td>15</td>
<td></td>
<td></td>
</tr>
<tr>
<td>TABLE 46 (cont’d).</td>
<td>TOTAL</td>
<td>NO TECHNOLOGY</td>
<td>WITH TECHNOLOGY</td>
</tr>
<tr>
<td>--------------------</td>
<td>-------</td>
<td>---------------</td>
<td>-----------------</td>
</tr>
<tr>
<td></td>
<td>OBSERVER</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>A</td>
<td>B</td>
<td>M</td>
</tr>
<tr>
<td>Tchr Quests (ave/5 min)</td>
<td>3.2</td>
<td>7.8</td>
<td>5.5</td>
</tr>
<tr>
<td>St Quests (ave/5 min)</td>
<td>0.9</td>
<td>1.7</td>
<td>1.3</td>
</tr>
<tr>
<td>% of Segments With:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Homework Review</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Lesson Development</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Guided Practice</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Reviewing a Test</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Reviewing Material</td>
<td>100.0</td>
<td>100.0</td>
<td>100.0</td>
</tr>
<tr>
<td>Using Calculators Only</td>
<td>11.1</td>
<td>33.3</td>
<td>22.2</td>
</tr>
<tr>
<td>Using Computers Only</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Both Calcs and Comp</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Student as Manager</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Student as Task Setter</td>
<td>22.2</td>
<td>0.0</td>
<td>11.1</td>
</tr>
<tr>
<td>Student as Explainer</td>
<td>11.1</td>
<td>0.0</td>
<td>5.6</td>
</tr>
<tr>
<td>Student as Consultant</td>
<td>44.4</td>
<td>0.0</td>
<td>22.2</td>
</tr>
<tr>
<td>St Fellow Investigator</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Student as Resource</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Students Passive</td>
<td>88.9</td>
<td>100.0</td>
<td>94.4</td>
</tr>
<tr>
<td>Students Active: Writing</td>
<td>55.6</td>
<td>88.9</td>
<td>72.2</td>
</tr>
<tr>
<td>Students Active: Talking</td>
<td>100.0</td>
<td>100.0</td>
<td>100.0</td>
</tr>
<tr>
<td>Students Didactic</td>
<td>77.8</td>
<td>100.0</td>
<td>88.9</td>
</tr>
<tr>
<td>Students Symbolizing</td>
<td>55.6</td>
<td>33.3</td>
<td>44.4</td>
</tr>
<tr>
<td>Students Investigating</td>
<td>88.9</td>
<td>88.9</td>
<td>88.9</td>
</tr>
<tr>
<td>Students Problem Solving</td>
<td>0.0</td>
<td>11.1</td>
<td>5.6</td>
</tr>
<tr>
<td>Sts Higher Level Thinking</td>
<td>11.1</td>
<td>0.0</td>
<td>5.6</td>
</tr>
<tr>
<td>% of Segments With:</td>
<td>TOTAL A</td>
<td>B</td>
<td>M</td>
</tr>
<tr>
<td>------------------------------------------</td>
<td>--------</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>Teacher as Manager</td>
<td>100.0</td>
<td>100.0</td>
<td>100.0</td>
</tr>
<tr>
<td>Teacher as Task Setter</td>
<td>66.7</td>
<td>100.0</td>
<td>83.3</td>
</tr>
<tr>
<td>Teacher as Explainer</td>
<td>77.8</td>
<td>100.0</td>
<td>88.9</td>
</tr>
<tr>
<td>Teacher as Consultant</td>
<td>77.8</td>
<td>22.2</td>
<td>50.0</td>
</tr>
<tr>
<td>Tchr Fellow Investigator</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Teacher as Resource</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Exposition</td>
<td>11.1</td>
<td>66.7</td>
<td>38.9</td>
</tr>
<tr>
<td>Exerc, Consolidat, Pract</td>
<td>100.0</td>
<td>100.0</td>
<td>100.0</td>
</tr>
<tr>
<td>Discussion</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Investigation</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Applied Mathematics</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Problem Solving</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Working in Groups</td>
<td>22.2</td>
<td>0.0</td>
<td>11.1</td>
</tr>
<tr>
<td>Single fact or step</td>
<td>88.9</td>
<td>100.0</td>
<td>94.4</td>
</tr>
<tr>
<td>Several facts or steps</td>
<td>44.4</td>
<td>77.8</td>
<td>61.1</td>
</tr>
<tr>
<td>Extend knowledge or skill</td>
<td>0.0</td>
<td>55.6</td>
<td>27.8</td>
</tr>
</tbody>
</table>

Number of Segments:  9  9  8  6  1  3
| TABLE 47. CLASSROOM F/LESSON 3: OBSERVERS’ RECORDS |
|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|
| TIME     | 1 | 1 | 2 | 2 | 3 | 3 | 4 | 4 | 5 | 5 | 6 | 6 | 7 | 7 | 8 | 8 | 9 | 9 | 10 | 10 | 11 | 11 | 12 | 12 |
| TEACHNG ACTIV | 12 | 2 | 127 | 2 | 12 | 24 | 1 | 24 | 127 | 24 | 12 | 24 | 2 | 24 | 23 | 23 |
| DEMAND on STs | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 12 |
| #QUESTs by TCHR | 6 | 7 | 4 | 6 | 15 | 12 | 4 | 5 | 3 | 5 | 5 | 5 | 5 | 5 | 7 | 3 | 2 |
| #QUESTs by STs | 2 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| HMWK REVIEW | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| LESSON DEVELOP | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| GUIDED PRACTICE | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| GO OVER TEST | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| ReVIEW PREV MAT | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| TECHNOLOGY | 3 | 13 | 13 | 3 | 13 | 3 | 13 | 3 | 13 | 3 | 13 | 3 | 13 | 3 | 13 | 3 | 13 | 3 |
| MANAGER | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| TASK SETTER | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| EXPLAINER | 2 | 1 | 12 | 1 | 1 | 1 | 1 | 1 | 1 | 12 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| COUNSELOR | 1 | 1 | 1 | 1 | 12 | 1 | 12 | 1 | 12 | 1 | 12 | 1 | 12 | 1 | 12 | 1 | 12 |
| FELLOW INVEST | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| RESOURCE | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 |
| STs PASSIVE | 2 | 12 | 4 | 34 | 12 | 12 | 12 | 123 | 25 | 23 | 12 | 12 | 12 | 12 | 12 | 12 |
| STs WRITING | 13 | 3 | 345 | 35 | 5 | 345 | 5 | 5 | 35 | 25 | 5 | 35 | 25 | 5 | 35 | 25 |
| STs TALKING | 25 | 2 | 25 | 125 | 2 | 2 | 2 | 12 | 2 | 2 | 25 | 2 | 278 | 128 | 125 | 12 |
| STs DIDACTIC | 1 | 123 | 23 | 12 | 123 | 12 | 23 | 1 | 23 | 12 | 123 | 12 | 123 | 12 | 123 | 1 |
| STs SYMBLZNG | 1 | 1 | 12 | 15 | 15 | 12 | 15 | 15 | 12 | 15 | 15 | 12 | 15 | 15 | 15 | 15 |
| STs INVESTIG | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 |
| STs PR SOLVNG | 34 | | | | | | | | | | | | | | | |
| STs HIGH LEVEL | 2 | 27 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |

p.686
<table>
<thead>
<tr>
<th>TABLE 47 (cont'd).</th>
<th>TOTAL</th>
<th>NO TECHNOLOGY</th>
<th>WITH TECHNOLOGY</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>OBSERVER</td>
<td>A</td>
<td>B</td>
</tr>
<tr>
<td>Tchr Quests (ave/5 min)</td>
<td>5.6</td>
<td>6.1</td>
<td>5.9</td>
</tr>
<tr>
<td>St Quests (ave/5 min)</td>
<td>0.9</td>
<td>0.6</td>
<td>0.8</td>
</tr>
<tr>
<td>% of Segments With:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Homework Review</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Lesson Development</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Guided Practice</td>
<td>87.5</td>
<td>100.0</td>
<td>93.8</td>
</tr>
<tr>
<td>Reviewing a Test</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Reviewing Material</td>
<td>100.0</td>
<td>100.0</td>
<td>100.0</td>
</tr>
<tr>
<td>Using Calculators Only</td>
<td>50.0</td>
<td>62.5</td>
<td>56.3</td>
</tr>
<tr>
<td>Using Computers Only</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Both Calcs and Comps</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Student as Manager</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Student as Task Setter</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Student as Explainer</td>
<td>37.5</td>
<td>0.0</td>
<td>18.8</td>
</tr>
<tr>
<td>Student as Consultant</td>
<td>25.0</td>
<td>0.0</td>
<td>12.5</td>
</tr>
<tr>
<td>St Fellow Investigator</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Student as Resource</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Students Passive</td>
<td>87.5</td>
<td>100.0</td>
<td>93.8</td>
</tr>
<tr>
<td>Students Active: Writing</td>
<td>50.0</td>
<td>75.0</td>
<td>62.5</td>
</tr>
<tr>
<td>Students Active: Talking</td>
<td>100.0</td>
<td>100.0</td>
<td>100.0</td>
</tr>
<tr>
<td>Students Didactic</td>
<td>87.5</td>
<td>100.0</td>
<td>93.8</td>
</tr>
<tr>
<td>Students Symbolizing</td>
<td>50.0</td>
<td>87.5</td>
<td>68.8</td>
</tr>
<tr>
<td>Students Investigating</td>
<td>87.5</td>
<td>100.0</td>
<td>93.8</td>
</tr>
<tr>
<td>Students Problem Solving</td>
<td>12.5</td>
<td>0.0</td>
<td>6.3</td>
</tr>
<tr>
<td>Sts Higher Level Thinking</td>
<td>25.0</td>
<td>50.0</td>
<td>37.5</td>
</tr>
<tr>
<td>% of Segments With:</td>
<td>TOTAL</td>
<td>NO TECHNOLOGY</td>
<td>WITH TECHNOLOGY</td>
</tr>
<tr>
<td>-------------------------------------</td>
<td>-------</td>
<td>---------------</td>
<td>-----------------</td>
</tr>
<tr>
<td></td>
<td>A</td>
<td>B</td>
<td>M</td>
</tr>
<tr>
<td>Teacher as Manager</td>
<td>100.0</td>
<td>100.0</td>
<td>100.0</td>
</tr>
<tr>
<td>Teacher as Task Setter</td>
<td>75.0</td>
<td>100.0</td>
<td>87.5</td>
</tr>
<tr>
<td>Teacher as Explainor</td>
<td>75.0</td>
<td>87.5</td>
<td>81.3</td>
</tr>
<tr>
<td>Teacher as Consultant</td>
<td>87.5</td>
<td>12.5</td>
<td>50.0</td>
</tr>
<tr>
<td>Tchr Fellow Investigator</td>
<td>0.0</td>
<td>12.5</td>
<td>6.3</td>
</tr>
<tr>
<td>Teacher as Resource</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Exposition</td>
<td>75.0</td>
<td>0.0</td>
<td>37.5</td>
</tr>
<tr>
<td>Exerc, Consolidat, Pract</td>
<td>87.5</td>
<td>100.0</td>
<td>93.8</td>
</tr>
<tr>
<td>Discussion</td>
<td>12.5</td>
<td>12.5</td>
<td>12.5</td>
</tr>
<tr>
<td>Investigation</td>
<td>0.0</td>
<td>62.5</td>
<td>31.3</td>
</tr>
<tr>
<td>Applied Mathematics</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Problem Solving</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Working in Groups</td>
<td>25.0</td>
<td>0.0</td>
<td>12.5</td>
</tr>
<tr>
<td>Single fact or step</td>
<td>100.0</td>
<td>100.0</td>
<td>100.0</td>
</tr>
<tr>
<td>Several facts or steps</td>
<td>87.5</td>
<td>75.0</td>
<td>81.3</td>
</tr>
<tr>
<td>Extend knowledge or skill</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
</tbody>
</table>

Number of Segments: 8 8 4 3 4 5
<table>
<thead>
<tr>
<th></th>
<th>A</th>
<th>B</th>
<th>A</th>
<th>B</th>
<th>A</th>
<th>B</th>
<th>A</th>
<th>B</th>
<th>A</th>
<th>B</th>
<th>A</th>
<th>B</th>
<th>A</th>
<th>B</th>
<th>A</th>
<th>B</th>
</tr>
</thead>
<tbody>
<tr>
<td>TIME</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td>7</td>
<td>8</td>
<td>9</td>
<td>10</td>
<td>11</td>
<td>12</td>
<td>13</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>TEACHING ACTIV</td>
<td>2</td>
<td>12</td>
<td>2</td>
<td>12</td>
<td>2</td>
<td>12</td>
<td>1</td>
<td>12</td>
<td>4</td>
<td>14</td>
<td>2</td>
<td>124</td>
<td>2</td>
<td>124</td>
<td>2</td>
<td>14</td>
</tr>
<tr>
<td>DEMAND on STs</td>
<td>12</td>
<td>1</td>
<td>12</td>
<td>12</td>
<td>12</td>
<td>12</td>
<td>12</td>
<td>12</td>
<td>13</td>
<td>123</td>
<td>123</td>
<td>123</td>
<td>123</td>
<td>123</td>
<td>123</td>
<td></td>
</tr>
<tr>
<td>#QUESTs by TCHR</td>
<td>13</td>
<td>20</td>
<td>10</td>
<td>11</td>
<td>7</td>
<td>8</td>
<td>9</td>
<td>5</td>
<td>11</td>
<td>10</td>
<td>13</td>
<td>12</td>
<td>11</td>
<td>10</td>
<td></td>
<td></td>
</tr>
<tr>
<td>#QUESTs by STs</td>
<td>3</td>
<td>2</td>
<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>
<td></td>
<td></td>
</tr>
<tr>
<td>HMWK REVIEW</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>LESSON DEVELOP</td>
<td></td>
<td></td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>GUIDED PRACTICE</td>
<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>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>GO OVER TEST</td>
<td>1</td>
<td>1</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>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Review Prev Mat</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></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>TECHNOLOGY</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>MANAGER</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>TASK SETTER</td>
<td>1</td>
<td>2</td>
<td>1</td>
<td>12</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>12</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>EXPLAINER</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>COUNSELOR</td>
<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>
<td>1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>FELLOW INVEST</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></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>RESOURCE</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></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>STs PASSIVE</td>
<td>12</td>
<td>12</td>
<td>12</td>
<td>12</td>
<td>12</td>
<td>12</td>
<td>12</td>
<td>12</td>
<td>12</td>
<td>12</td>
<td>12</td>
<td>12</td>
<td>12</td>
<td>12</td>
<td>12</td>
<td>12</td>
</tr>
<tr>
<td>STs WRITING</td>
<td>1</td>
<td>1</td>
<td></td>
<td>34</td>
<td>3</td>
<td>4</td>
<td>3</td>
<td>4</td>
<td>3</td>
<td>4</td>
<td>13</td>
<td>34</td>
<td>3</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>STs TALKING</td>
<td>12</td>
<td>245</td>
<td>12</td>
<td>12</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>127</td>
<td>127</td>
<td>127</td>
<td>127</td>
<td>127</td>
<td>127</td>
<td>127</td>
<td>127</td>
</tr>
<tr>
<td>STs DIDACTIC</td>
<td>12</td>
<td>123</td>
<td>123</td>
<td>123</td>
<td>123</td>
<td>123</td>
<td>123</td>
<td>123</td>
<td>123</td>
<td>123</td>
<td>123</td>
<td>123</td>
<td>123</td>
<td>123</td>
<td>123</td>
<td>123</td>
</tr>
<tr>
<td>STs SYMNLZNG</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>14</td>
<td>14</td>
<td>14</td>
<td>14</td>
<td>14</td>
<td>14</td>
<td>14</td>
<td>14</td>
<td>14</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>STs INVESTIG</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>STs PR SOLVNG</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></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>STs HIGH LEVEL</td>
<td>7</td>
<td>2</td>
<td>2</td>
<td>23</td>
<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>TABLE 48 (cont’d).</td>
<td>TOTAL = NO TECHNOLOGY</td>
<td>OBSERVER</td>
<td>A</td>
<td>B</td>
<td>M</td>
<td>SD</td>
<td>OBSERVER</td>
<td>A</td>
<td>B</td>
<td>M</td>
<td>SD</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>-------------------</td>
<td>-----------------------</td>
<td>----------</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>----</td>
<td>----------</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>----</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tchr Quests (ave/5 min)</td>
<td>10.6</td>
<td>10.9</td>
<td>10.7</td>
<td>0.2</td>
<td>% of Segments With:</td>
<td>Teacher as Manager</td>
<td>100.0</td>
<td>100.0</td>
<td>100.0</td>
<td>0.0</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>St Quests (ave/5 min)</td>
<td>1.1</td>
<td>0.7</td>
<td>0.9</td>
<td>0.3</td>
<td>Teacher as Task Setter</td>
<td>100.0</td>
<td>71.4</td>
<td>85.7</td>
<td>20.2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>% of Segments With:</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Teacher as Explainer</td>
<td>100.0</td>
<td>100.0</td>
<td>100.0</td>
<td>0.0</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Homework Review</td>
<td>71.4</td>
<td>42.9</td>
<td>57.1</td>
<td>20.2</td>
<td>Teacher as Consultant</td>
<td>14.3</td>
<td>0.0</td>
<td>7.1</td>
<td>10.1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lesson Development</td>
<td>0.0</td>
<td>71.4</td>
<td>35.7</td>
<td>50.5</td>
<td>Tchr Fellow Investigator</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Guided Practice</td>
<td>28.6</td>
<td>42.9</td>
<td>35.7</td>
<td>10.1</td>
<td>Teacher as Resource</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Reviewing a Test</td>
<td>28.6</td>
<td>28.6</td>
<td>28.6</td>
<td>0.0</td>
<td>Exposition</td>
<td>0.0</td>
<td>100.0</td>
<td>50.0</td>
<td>70.7</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Reviewing Material</td>
<td>0.0</td>
<td>28.6</td>
<td>14.3</td>
<td>20.2</td>
<td>Exerc, Consolidat, Pract</td>
<td>100.0</td>
<td>57.1</td>
<td>78.6</td>
<td>30.3</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Using Calculators Only</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>Discussion</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Using Computers Only</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>Investigation</td>
<td>0.0</td>
<td>57.1</td>
<td>28.6</td>
<td>40.4</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Both Calcs and Comps</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>Applied Mathematics</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Student as Manager</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>Problem Solving</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Student as Task Setter</td>
<td>0.0</td>
<td>42.9</td>
<td>21.4</td>
<td>30.3</td>
<td>Working in Groups</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Student as Explainer</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>Single fact or step</td>
<td>100.0</td>
<td>100.0</td>
<td>100.0</td>
<td>0.0</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Student as Consultant</td>
<td>0.0</td>
<td>14.3</td>
<td>7.1</td>
<td>10.1</td>
<td>Several facts or steps</td>
<td>100.0</td>
<td>85.7</td>
<td>92.9</td>
<td>10.1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>St Fellow Investigator</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>Extend knowledge or skill</td>
<td>28.6</td>
<td>28.6</td>
<td>28.6</td>
<td>0.0</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Student as Resource</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>Number of Segments</td>
<td>7</td>
<td>7</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Students Passive</td>
<td>100.0</td>
<td>100.0</td>
<td>100.0</td>
<td>0.0</td>
<td></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>Students Active: Writing</td>
<td>71.4</td>
<td>71.4</td>
<td>71.4</td>
<td>0.0</td>
<td></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>Students Active: Talking</td>
<td>100.0</td>
<td>100.0</td>
<td>100.0</td>
<td>0.0</td>
<td></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>Students Didactic</td>
<td>100.0</td>
<td>100.0</td>
<td>100.0</td>
<td>0.0</td>
<td></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>Students Symbolizing</td>
<td>14.3</td>
<td>100.0</td>
<td>57.1</td>
<td>60.6</td>
<td></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>Students Investigating</td>
<td>0.0</td>
<td>100.0</td>
<td>50.0</td>
<td>70.7</td>
<td></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>Students Problem Solving</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td></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>Sts Higher Level Thinking</td>
<td>0.0</td>
<td>85.7</td>
<td>42.9</td>
<td>60.6</td>
<td></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>TABLE 49. CLASSROOM F/LESSON 5: OBSERVERS' RECORDS</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></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>-------------------------------</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</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>OBSERVER</td>
<td>A</td>
<td>B</td>
<td>A</td>
<td>B</td>
<td>A</td>
<td>B</td>
<td>A</td>
<td>B</td>
<td>A</td>
<td>B</td>
<td>A</td>
<td>B</td>
<td>A</td>
<td>B</td>
<td>A</td>
<td></td>
</tr>
<tr>
<td>TIME</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></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>TEACHING ACTIV</td>
<td>2</td>
<td>2</td>
<td>234</td>
<td>2</td>
<td>24</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>25</td>
<td>2</td>
<td>246</td>
<td>2</td>
<td>26</td>
<td>2</td>
<td>26</td>
<td></td>
</tr>
<tr>
<td>DEMAND on STs</td>
<td>1</td>
<td>12</td>
<td>12</td>
<td>12</td>
<td>12</td>
<td>12</td>
<td>12</td>
<td>12</td>
<td>12</td>
<td>12</td>
<td>12</td>
<td>12</td>
<td>12</td>
<td>12</td>
<td>12</td>
<td></td>
</tr>
<tr>
<td>#QUESTs by TCHR</td>
<td>2</td>
<td>4</td>
<td>11</td>
<td>16</td>
<td>3</td>
<td>5</td>
<td>3</td>
<td>3</td>
<td>5</td>
<td>8</td>
<td>4</td>
<td>8</td>
<td>6</td>
<td>6</td>
<td>4</td>
<td>6</td>
</tr>
<tr>
<td>#QUESTs by STs</td>
<td>1</td>
<td>2</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>2</td>
<td>4</td>
<td></td>
<td>1</td>
<td>1</td>
<td>2</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>HMWK REVIEW</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></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>LESSON DEVELOP</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></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>GUIDED PRACTICE</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>GO OVER TEST</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></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>ReVIEW PREV MAT</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>TECHNOLOGY</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>13</td>
<td>13</td>
<td>13</td>
<td>1</td>
<td>1</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>13</td>
<td>13</td>
<td>13</td>
</tr>
<tr>
<td>MANAGER</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>TASK SETTER</td>
<td>12</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>EXPLAINER</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>COUNSELOR</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>12</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>FELLOW INVEST</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></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>RESOURCE</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>3</td>
<td>5</td>
<td>3</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>3</td>
<td>5</td>
<td>3</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>STs PASSIVE</td>
<td>12</td>
<td>12</td>
<td>12</td>
<td>12</td>
<td>12</td>
<td>12</td>
<td>12</td>
<td>12</td>
<td>12</td>
<td>12</td>
<td>12</td>
<td>12</td>
<td>12</td>
<td>12</td>
<td>12</td>
<td>12</td>
</tr>
<tr>
<td>STs WRITING</td>
<td>134</td>
<td>5</td>
<td>25</td>
<td>5</td>
<td>25</td>
<td>34</td>
<td>4</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>STs TALKING</td>
<td>127</td>
<td>127</td>
<td>125</td>
<td>12</td>
<td>2</td>
<td>12</td>
<td>4</td>
<td>124</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>27</td>
<td>12</td>
<td>2</td>
<td>12</td>
<td></td>
</tr>
<tr>
<td>STs DIDACTIC</td>
<td>12</td>
<td>12</td>
<td>123</td>
<td>12</td>
<td>123</td>
<td>123</td>
<td>13</td>
<td>3</td>
<td>13</td>
<td>12</td>
<td>12</td>
<td>12</td>
<td>123</td>
<td>123</td>
<td>123</td>
<td>123</td>
</tr>
<tr>
<td>STs SYMBLZNG</td>
<td>1</td>
<td>12</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>STs INVESTIG</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>STs PR SOLVNG</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></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>STs HIGH LEVEL</td>
<td>2</td>
<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>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

316
<table>
<thead>
<tr>
<th>TABLE 49 (cont’d).</th>
<th>TOTAL</th>
<th>NO TECHNOLOGY</th>
<th>WITH TECHNOLOGY</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>OBSERVER</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>A</td>
<td>B</td>
<td>M</td>
</tr>
<tr>
<td>Tchr Quests (ave/5 min)</td>
<td>4.8</td>
<td>7.0</td>
<td>5.9</td>
</tr>
<tr>
<td>St Quests (ave/5 min)</td>
<td>0.5</td>
<td>0.7</td>
<td>0.0</td>
</tr>
<tr>
<td>% of Segments With:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Homework Review</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Lesson Development</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Guided Practice</td>
<td>0.0</td>
<td>50.0</td>
<td>25.0</td>
</tr>
<tr>
<td>Reviewing a Test</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Reviewing Material</td>
<td>100.0</td>
<td>50.0</td>
<td>75.0</td>
</tr>
<tr>
<td>Using Calculators Only</td>
<td>50.0</td>
<td>50.0</td>
<td>50.0</td>
</tr>
<tr>
<td>Using Computers Only</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Both Calcs and Comps</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Student as Manager</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Student as Task Setter</td>
<td>12.5</td>
<td>0.0</td>
<td>6.3</td>
</tr>
<tr>
<td>Student as Explainer</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Student as Consultant</td>
<td>12.5</td>
<td>0.0</td>
<td>6.3</td>
</tr>
<tr>
<td>St Fellow Investigator</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Student as Resource</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Students Passive</td>
<td>100.0</td>
<td>87.5</td>
<td>93.8</td>
</tr>
<tr>
<td>Students Active: Writing</td>
<td>75.0</td>
<td>62.5</td>
<td>68.8</td>
</tr>
<tr>
<td>Students Active: Talking</td>
<td>87.5</td>
<td>100.0</td>
<td>93.8</td>
</tr>
<tr>
<td>Students Didactic</td>
<td>100.0</td>
<td>100.0</td>
<td>100.0</td>
</tr>
<tr>
<td>Students Symbolizing</td>
<td>75.0</td>
<td>62.5</td>
<td>68.8</td>
</tr>
<tr>
<td>Students Investigating</td>
<td>100.0</td>
<td>62.5</td>
<td>81.3</td>
</tr>
<tr>
<td>Students Problem Solving</td>
<td>37.5</td>
<td>0.0</td>
<td>18.8</td>
</tr>
<tr>
<td>Sts Higher Level Thinking</td>
<td>50.0</td>
<td>0.0</td>
<td>25.0</td>
</tr>
<tr>
<td>Observer Type</td>
<td>TOTAL</td>
<td>NO TECHNOLOGY</td>
<td>WITH TECHNOLOGY</td>
</tr>
<tr>
<td>-------------------------------------</td>
<td>-------</td>
<td>---------------</td>
<td>-----------------</td>
</tr>
<tr>
<td></td>
<td>A</td>
<td>B</td>
<td>M</td>
</tr>
<tr>
<td>% of Segments With:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Teacher as Manager</td>
<td>100.0</td>
<td>100.0</td>
<td>100.0</td>
</tr>
<tr>
<td>Teacher as Task Setter</td>
<td>100.0</td>
<td>100.0</td>
<td>100.0</td>
</tr>
<tr>
<td>Teacher as Explainer</td>
<td>75.0</td>
<td>100.0</td>
<td>87.5</td>
</tr>
<tr>
<td>Teacher as Consultant</td>
<td>87.5</td>
<td>25.0</td>
<td>56.3</td>
</tr>
<tr>
<td>Tchr Fellow Investigator</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Teacher as Resource</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Exposition</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Exerc, Consolidat, Pract</td>
<td>100.0</td>
<td>100.0</td>
<td>100.0</td>
</tr>
<tr>
<td>Discussion</td>
<td>12.5</td>
<td>0.0</td>
<td>6.3</td>
</tr>
<tr>
<td>Investigation</td>
<td>37.5</td>
<td>0.0</td>
<td>18.8</td>
</tr>
<tr>
<td>Applied Mathematics</td>
<td>12.5</td>
<td>0.0</td>
<td>6.3</td>
</tr>
<tr>
<td>Problem Solving</td>
<td>37.5</td>
<td>0.0</td>
<td>18.8</td>
</tr>
<tr>
<td>Working in Groups</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Single fact or step</td>
<td>100.0</td>
<td>100.0</td>
<td>100.0</td>
</tr>
<tr>
<td>Several facts or steps</td>
<td>75.0</td>
<td>87.5</td>
<td>81.3</td>
</tr>
<tr>
<td>Extend knowledge or skill</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
</tbody>
</table>

Number of Segments: 8 8 4 4 4 4
<table>
<thead>
<tr>
<th>TABLE 50. CLASSROOM F/LESSON 6: OBSERVERS' RECORDS</th>
</tr>
</thead>
<tbody>
<tr>
<td>OBSERVER</td>
</tr>
<tr>
<td>TIME</td>
</tr>
<tr>
<td>Teaching Activ.</td>
</tr>
<tr>
<td>Demand on STs</td>
</tr>
<tr>
<td>#Quests by TCHR</td>
</tr>
<tr>
<td>#Quests by STs</td>
</tr>
<tr>
<td>Homework Review</td>
</tr>
<tr>
<td>Lesson Develop</td>
</tr>
<tr>
<td>Guided Practice</td>
</tr>
<tr>
<td>Go Over Test</td>
</tr>
<tr>
<td>Review Prev Mat</td>
</tr>
<tr>
<td>Technology</td>
</tr>
<tr>
<td>Manager</td>
</tr>
<tr>
<td>Task Setter</td>
</tr>
<tr>
<td>Explaner</td>
</tr>
<tr>
<td>Counselor</td>
</tr>
<tr>
<td>Fellow Invest</td>
</tr>
<tr>
<td>Resource</td>
</tr>
<tr>
<td>Sts Passive</td>
</tr>
<tr>
<td>Sts Writing</td>
</tr>
<tr>
<td>Sts Talking</td>
</tr>
<tr>
<td>Sts Didactic</td>
</tr>
<tr>
<td>Sts Symboling</td>
</tr>
<tr>
<td>Sts Investig</td>
</tr>
<tr>
<td>Sts Pr Solving</td>
</tr>
</tbody>
</table>


| TABLE 50 (cont’d) | TOTAL | | | | NO TECHNOLOGY | | | | WITH TECHNOLOGY | | |
|-------------------|-------|---|---|---|-------|---|---|---|-------|---|---|---|
| | OBSERVER | A | B | M | SD | A | B | M | SD | A | B | M | SD |
| Tchr Quests (ave/5 min) | | 2.3 | 3.3 | 2.8 | 0.7 | 3.0 | 4.3 | 3.6 | 0.9 | 1.0 | 1.5 | 1.3 | 0.4 |
| St Quests (ave/5 min) | | 0.2 | 0.3 | 0.3 | 0.1 | 0.3 | 0.3 | 0.3 | 0.0 | 0.0 | 0.5 | 0.3 | 0.4 |
| % of Segments With: | | | | | | | | | | | | | |
| Homework Review | | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Lesson Development | | 100.0 | 100.0 | 100.0 | 0.0 | 100.0 | 100.0 | 100.0 | 0.0 | 100.0 | 100.0 | 100.0 | 0.0 |
| Guided Practice | | 0.0 | 33.3 | 16.7 | 23.6 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 50.0 | 70.7 |
| Reviewing a Test | | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Reviewing Material | | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Using Calculators Only | | 33.3 | 33.3 | 33.3 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 100.0 | 100.0 | 100.0 | 0.0 |
| Using Computers Only | | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Both Calcs and Comps | | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Student as Manager | | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Student as Task Setter | | 33.3 | 0.0 | 16.7 | 23.6 | 0.0 | 0.0 | 0.0 | 0.0 | 100.0 | 0.0 | 50.0 | 70.7 |
| Student as Explainer | | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Student as Consultant | | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| St Fellow Investigator | | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Student as Resource | | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Students Passive | | 100.0 | 100.0 | 100.0 | 0.0 | 100.0 | 100.0 | 100.0 | 0.0 | 100.0 | 100.0 | 100.0 | 0.0 |
| Students Active: Writing | | 33.3 | 33.3 | 33.3 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 100.0 | 100.0 | 100.0 | 0.0 |
| Students Active: Talking | | 83.3 | 100.0 | 91.7 | 11.8 | 100.0 | 100.0 | 100.0 | 0.0 | 50.0 | 100.0 | 75.0 | 35.4 |
| Students Didactic | | 100.0 | 100.0 | 100.0 | 0.0 | 100.0 | 100.0 | 100.0 | 0.0 | 100.0 | 100.0 | 100.0 | 0.0 |
| Students Symbolizing | | 83.3 | 100.0 | 91.7 | 11.8 | 75.0 | 100.0 | 87.5 | 17.7 | 100.0 | 100.0 | 100.0 | 0.0 |
| Students Investigating | | 16.7 | 100.0 | 58.3 | 58.9 | 0.0 | 100.0 | 50.0 | 70.7 | 50.0 | 100.0 | 75.0 | 35.4 |
| Students Problem Solving | | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Sts Higher Level Thinking | | 16.7 | 66.7 | 41.7 | 35.4 | 0.0 | 100.0 | 50.0 | 70.7 | 0.0 | 0.0 | 0.0 | 0.0 |
| % of Segments With:                          | TOTAL A | B | M | SD | NO TECHNOLOGY A | B | M | SD | WITH TECHNOLOGY A | B | M | SD |
|---------------------------------------------|---------|---|---|----|-----------------|---|---|----|-----------------|---|---|----|    |
| Teacher as Manager                         | 100.0   | 100.0 | 100.0 | 0.0 | 100.0          | 100.0 | 100.0 | 0.0 | 100.0          | 100.0 | 100.0 | 0.0 |
| Teacher as Task Setter                     | 66.7    | 33.3 | 50.0 | 23.6 | 50.0           | 0.0 | 25.0 | 35.4 | 100.0          | 100.0 | 100.0 | 0.0 |
| Teacher as Explainer                       | 100.0   | 100.0 | 100.0 | 0.0 | 100.0          | 100.0 | 100.0 | 0.0 | 100.0          | 100.0 | 100.0 | 0.0 |
| Teacher as Consultant                      | 33.3    | 16.7 | 25.0 | 11.8 | 0.0            | 0.0 | 0.0 | 0.0 | 100.0          | 50.0 | 75.0 | 35.4 |
| Tchr Fellow Investigator                   | 0.0     | 0.0 | 0.0 | 0.0 | 0.0            | 0.0 | 0.0 | 0.0 | 0.0            | 0.0 | 0.0 | 0.0 |
| Teacher as Resource                        | 83.3    | 0.0 | 41.7 | 58.9 | 100.0          | 0.0 | 50.0 | 70.7 | 50.0           | 0.0 | 25.0 | 35.4 |
| Exposition                                 | 100.0   | 83.3 | 91.7 | 11.8 | 100.0          | 100.0 | 100.0 | 0.0 | 100.0          | 50.0 | 75.0 | 35.4 |
| Exerc, Consolidat, Pract                   | 0.0     | 33.3 | 16.7 | 23.6 | 0.0            | 0.0 | 0.0 | 0.0 | 0.0            | 100.0 | 50.0 | 70.7 |
| Discussion                                 | 0.0     | 0.0 | 0.0 | 0.0 | 0.0            | 0.0 | 0.0 | 0.0 | 0.0            | 0.0 | 0.0 | 0.0 |
| Investigation                              | 0.0     | 83.3 | 41.7 | 58.9 | 0.0            | 100.0 | 50.0 | 70.7 | 0.0            | 50.0 | 25.0 | 35.4 |
| Applied Mathematics                         | 16.7    | 0.0 | 8.3 | 11.8 | 0.0            | 0.0 | 0.0 | 0.0 | 0.0            | 50.0 | 0.0 | 25.0 | 35.4 |
| Problem Solving                            | 0.0     | 0.0 | 0.0 | 0.0 | 0.0            | 0.0 | 0.0 | 0.0 | 0.0            | 0.0 | 0.0 | 0.0 |
| Working in Groups                          | 33.3    | 0.0 | 16.7 | 23.6 | 0.0            | 0.0 | 0.0 | 0.0 | 100.0          | 0.0 | 50.0 | 70.7 |
| Single fact or step                         | 83.3    | 33.3 | 58.3 | 35.4 | 100.0          | 25.0 | 62.5 | 53.0 | 50.0           | 50.0 | 50.0 | 0.0 |
| Several facts or steps                      | 33.3    | 83.3 | 58.3 | 35.4 | 25.0           | 100.0 | 62.5 | 53.0 | 50.0           | 50.0 | 50.0 | 0.0 |
| Extend knowledge or skill                   | 16.7    | 16.7 | 16.7 | 0.0 | 25.0           | 25.0 | 25.0 | 0.0 | 0.0            | 0.0 | 0.0 | 0.0 |

Number of Segments: 6, 6, 4, 4, 2, 2
APPENDIX C

SAMPLE INSTRUCTIONS FOR TEACHERS
Month Day, 1989

Teacher's Name
School
School Address
City, State Zip Code

Dear Teacher:

Thank you for joining our phase of the C²PC project. Your assistance in producing videotape recordings of 10 successive days of lessons in one of your C²PC classes will be valuable to us as we try to revise the materials and inservice workshops. In addition, you will be assisting me as I try to describe to others the teaching and learning activities that occur during the normal course of events in a C²PC classroom.

Enclosed are 10 120-minute blank videocassette tapes. Although the tapes are much longer than you will need for one class period, please tape only one class period per tape. I think this will reduce the possibility of taping over an already recorded section of tape.

If you teach more than one section of C²PC per day, please tape your earliest class of the day. Mark each cassette with the date and number (1 through 10) in succession.

After taping on the first day, please view at least part of the tape to check the quality of the video and the sound. It has been my experience that fairly good quality tapes can be made with very little effort, but should there be any problems picking up the boardwork or teacher and student voices, please see if another camera position can be found that would work better. Perhaps taping for a day before beginning the 10 days in succession would help work out any bugs and get the students used to the idea of a camera in the room. However, in the several classrooms with which we have used videotaping previously, students are not as distracted by the camera as we in the "Pre-VCR" generation would expect.

If you have access to student audiovisual assistants, they could be utilized to run the camera and make some adjustments to the camera viewing angle to record the students' activities as well as the teacher’s. However, this is not absolutely necessary, and if the teacher or students happen to move out of view of a stationary camera, as long as the sound is of good quality, we will be able to make sense of the classroom action.

I have also enclosed 12 blank "journal" pages. For each taped class session, please make a note of the date, text section, pages, and topic for that class.
session. Please note any other characteristics of that session, such as whether it is review or new material, whether there is a special shortened schedule in school that day, or any other information that you think would be helpful to someone observing the class.

There are more than 10 of these pages in case you have any testing days during the course of taping. Please DO NOT TAPE TESTING SESSIONS, but simply mark one of the journal pages with the date, text sections being tested, and please attach a copy of the test.

I am also sending enough postage (in stamps) for you to return the videotapes to me once you have completed taping. My address is:

    Ann M. Farrell
    Arps Hall 257
    Ohio State University
    1945 N. High Street
    Columbus, Ohio   43210-1172

Thank you for agreeing to be a part of this phase of the project. If you have any questions, please call any time. My number at school is 614/292-8032 or leave a message with the secretaries at 614/292-2185. My home number is 614/****-**** and you can call me collect any evening.

Sincerely,

Ann M. Farrell
C²PC Videotaped Lesson

Date of Lesson__________________________

Lesson Number being Taped___________

Time Period Began______________ Time Period Ended______________

Text Section(s)_____________________

Text Pages__________________________

Lesson Topic__________________________

Lesson was Review___________ or New___________ material.

Any other comments that you think would be relevant to someone observing the lesson:
LIST OF REFERENCES


Erickson, F. (1986). Qualitative methods in research on teaching. In M. C. Wittrock (Ed.), *Handbook of research on teaching* (3rd ed.) (pp. 119-161). New York: Macmillan.


