AN ABSTRACT OF THE THESIS OF

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The purpose of this study was to identify the management demands that may be unique to science classrooms. The sample consisted of three biology teachers and three language arts teachers from two high schools located within the same school district. To establish a basic framework, two quantitative questions were addressed: (1) What is the frequency of contexts utilized in the two content areas and (2) what is the average amount of time spent in each of the contexts based on the content being presented? For each quantitative question, there are 16 null hypotheses that correspond to specific, predefined classroom contexts. In addition to the two quantitative questions, a qualitative research question was addressed: Are there specific management patterns to be emphasized based on the context and subject matter being presented?

Data from classroom observations were collected and coded utilizing methods described in previous research studies. The coded data were then statistically analyzed. To address the qualitative research question, a systematic qualitative analysis was conducted across the different contexts. The results show that seatwork,

group seatwork, and student presentations occurred with significantly greater ($p<.05$) frequency in language arts classes. In contrast, hands-on activities, non-academic activity, and dead time occurred more frequently in biology classes. In addition, in language arts classes a significantly longer average time in individual seatwork activites was evident; while in biology classes, a significantly greater average time was spent in lecture, tests, and transitions. Qualitative analysis of the data indicated that within any given classroom context, the classroom management behaviors of the teachers were consistent. In general, subject matter differences are not revealed directly in terms of management within a particular context. More importantly the instructional approaches taken within the two subject matter areas were different. The instructional approach was determined by the goals and objectives of the class and how the teacher viewed the subject matter. The instructional approach, in turn, dictated the types of contexts and each context determined the management demands.

Managing Subject Matter: Does It Really Matter?

by

Mark S. Latz

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I understand that my thesis will become part of the permanent collection of Oregon State University libraries. My signature below authorizes release of my thesis to any reader upon request.

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Mark S. Latz, Author

Acknowledgements

When you see a turtle sitting on a post,

you can bet it had a little help getting there.

anonymous

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CHAPTER I

THE PROBLEM

Introduction

The topic of classroom management has been a focus of research for over 20 years, beginning with Kounin's (1970) preliminary research on desist (discipline) events in the classroom. Kounin found that there were no disciplinary actions which were consistently effective across a variety of situations. However, teachers did exhibit a variety of behaviors that could prevent disruptions from occurring. Kounin's findings were significant in that a fundamental distinction was made between management and discipline. Specifically, management is considered much more global than discipline and preventative in nature. Discipline, although it is a subset of management, is prescriptive and focuses on a teacher's response to classroom disruptions.

At the time Kounin's work was published, the process-product research paradigm was becoming established. One of the major goals of this research paradigm was to identify the numerous characteristics associated with effective teaching. (In this case effective teaching was operationally defined in terms of student achievement.) Social concerns surrounding declining student achievement and teacher accountability led to an increased emphasis on student outcomes as a criterion for teacher effectiveness. In an effort to speak to the issues, the National Institute of

Education began to fund large research programs. The effort began with several large-scale, field-based correlational studies conducted at various elementary grade levels. As the research program progressed. the focus expanded to junior high schools and high schools.

As a result of funding, many of the significant works in the area of classroom management allowed researchers to examine relatively large samples (as many as 50 teachers in some cases), utilize numerous individuals for data collection, observe subjects for extended periods of time, and examine as many as 300 variables across different content areas (Emmer, Evertson, & Anderson, 1980; Evertson & Emmer, 1982). Some of the general categories found to be important in classroom management included: classroom arrangement, planning and procedures, consequences, teaching rules and behaviors, beginning of school activities, strategies for problems, monitoring, stopping inappropriate behavior, organizing instruction, student accountability, and instructional clarity. Other studies built upon these results and were extended to junior high school and high school levels (Evertson, Anderson, & Brophy, 1978, cited in Brophy, 1979) and were designed to test hypotheses developed from earlier correlational work (Anderson, Evertson, & Brophy, 1979; Emmer, Sanford, Clements, & Martin, 1982).

As data accumulated, it was recognized that context and presage variables (e.g., student aptitudes, socio-economic status, and teacher grade point average) played an increasingly important role. Subsequent research included variables such as student aptitude (Good & Beckerman, 1978; McGarity & Butts, 1984), the social structure of

the schools (Kilbourn, 1986), prior beliefs of preservice teachers (Hollingsworth, 1989), transitions (Arlin, 1979), and types of instructional settings (Beasley, 1983; Cohen, 1991; Hewitt-Dortch, 1985). The general findings suggest that, although there may be a few universal instructional principles (e.g., matching level of instruction with student abilities), there do not appear to be any universal teaching behaviors (e.g., specific behaviors such as praising or asking higher level questions) that are effective for management in all teaching contexts (Brophy & Evertson, 1976, cited in Brophy, 1978). Therefore, the findings did not easily translate into a comprehensive list of teacher competencies (for a slightly different view, see Gage, 1979). However, the general categories of management behaviors served as a guiding framework with each category having a different emphasis depending on the teaching context.

Utilizing a slightly different theoretical framework, Doyle (1983) introduced the notion that the cognitive demand of instructional tasks placed on students may have an effect on classroom management strategies. As expected, as the cognitive demand of the tasks increased, so did the management demands. The net effect was the creation of an economic system whereby the cognitive level of a task is often reduced in exchange for a reduction in management demands (Doyle, Sanford, Schmidt-French, Clements, & Emmer, 1985; Sanford, 1985). For example, a teacher might provide important information to open-ended problems in exchange for higher rates of student on-task behavior. Consistent with this view, Tobin (1986) found that few tasks were cognitively challenging to the students in high school science classes. Considering

that lower level tasks are easier for the teacher to manage, Tobin's observation was not surprising.

In retrospect, the process-product research paradigm contributed significantly to what is known about the act of teaching. Many of the methodological flaws that plagued early process-product studies (e.g., lack of consideration for the first days of school and student perceptions of classroom events) were often corrected in subsequent research projects. Frequently, the results of studies overlapped and allowed researchers to verify findings. In general, although the studies were correlational, they did provide a valuable empirical base on which "contextual" studies would be built.

Statement of the Problem

The popularity and success of the process-product research paradigm is obvious. The findings contributed significantly to what is known about teaching. Nevertheless, problems still remain. For example, many of the research studies frequently examined a large number of variables. As a result, statistically significant findings are likely to appear simply by chance. In addition, the statistically significant correlational values were often moderate at best and the practical importance of these individual variables was questionable. Another criticism of the process-product research paradigm was that no single teacher exhibited all of the characteristics found to be statistically significant. Consequently, process-product research helped create an "ideal teacher" who did not exist in reality.

Methodologically, process-product research in the area of classroom management is rather strong. However, there were often extended periods of time during data collection when no observations were made. Observers typically gathered data during the first few weeks of school, again half way through the school year, and again at the end of the year. The extended time periods between observations and end of the year achievement data collection maked causal inferences tentative as other significant events could have occurred during the long periods between observations. In addition, teachers' thinking as a context variable was never considered. Therefore, interviews of the teachers might have contributed to, or provided insight into, the actions of teachers in the classroom.

More recently, critics of process-product research have noted a tendency to ignore the specific curriculum or the subject matter being studied (Buchmann, 1982; Shulman, 1986b). Classroom management studies often included samples from different content areas, but the management demands unique to each of the content areas were never delineated. One notable exception was Sanford (1984) who provided a more in-depth examination of the data obtained from the Junior High Management Improvement Study (JMIS) (Emmer, Sanford, Clements, & Martin, 1982). Sanford found that, for the most part, the pattern of teacher and student behavior relationships established in science classes as similar to those reported in other content areas (Emmer, et al., 1982; Evertson & Emmer, 1982). Although differences were recognized, there was no discussion of the activities or specific management demands placed on the teacher in those activities. Perhaps the data collection method was not

refined enough to allow the researcher to identify specific characteristics in each of the categories. Overall, the general goal of much of the research was to identify the characteristics of good managers across content areas, as opposed to distinguishing between the specific management demands particular to each of the content areas.

The literature dealing with the content-specific nature of classroom management is limited. It is generally believed that the management demands in a science classroom are, at a superficial level, no different than any other content area. Although Sanford (1984) suggested that managing a science classroom may be different from other content areas, no research exists that identifies the particular management skills specific to science instruction.

Current research in the area of pedagogical content knowledge contends that the act of teaching does not occur independently from the content. That is, during the act of teaching, the teacher must be teaching "something." Utilizing similar logic, a science teacher is not only managing a classroom, but is also managing within the context of the content being taught. Considering the dynamic nature of classroom management, as well as the entire classroom setting, it seems reasonable to assume that the content, at least in part, must influence the management of the classroom.

Currently, science teaching is in the midst of a reform movement. One of the major foci has been constructivist teaching approaches (American Association for the Advancement of Science, 1993; Driver, 1985; National Science Teachers Association, 1992; von Glasersfeld, 1989). Although constructivist teaching approaches are not unique to science instruction, science has been a content area on which reformers have

focused due to the similarity between constructivist epistemology and how knowledge is believed to be developed in science. Simply stated, the teaching of science from a constructivist framework closely resembles the mechanisms by which scientific knowledge is developed. In both cases, knowledge is constructed by the integration of experiences (or empirical evidence in the case of science) into the existing network of what is "known" and or believed.

A major implication of the constructivist approach is a deliberate separation of the tasks required to achieve a certain level of performance in a skill area from generating conceptual understanding within a given problem area (von Glasersfeld, 1989). Specifically, science teachers employing a constructivist approach need to change the way they teach; no longer emphasizing facts and terminology to the same degree. For the science teacher, a constructivist teaching approach is a student-centered, inquiry-oriented process that allows students to construct meaning based on their experiences. As a result, constructivist teaching approaches result in a reduction in the amount of content being taught in an effort to foster understanding of a few key concepts that can then be applied to new situations and across content areas. Therefore, if a constructivist approach is instituted by science teachers, the inherent epistemology necessitates a change in teacher behaviors (both instructional and managerial) which may be unique to science teaching. Consequently, it is believed that instituting constructivist teaching approaches into science courses may create management demands unique to science teaching.

The general purpose of this study was to identify the management demands specific (if any) to science classrooms. To date, no study has examined the role content plays in classroom management. Specifically, is there a difference in the types of contexts (or lesson formats) and the amount of time spent in each of the contexts in different subject matter areas? In addition, what are the management demands associated with each of the contexts based on the subject matter being presented? It is generally accepted that classroom management skills apply generically across all content areas. Admittedly, some general management skills are independent of the content being presented (e.g., classroom arrangement, planning and procedures, instructional clarity). However, this view comes from a research base that rarely included the content as a variable and emphasized the management characteristics common among a variety of content areas. Therefore, what is proposed is an examination of classroom management behaviors at a more focused subject matter level, not at the level of "general teaching behaviors" that can apply to all grade levels independent of the content.

Significance of the Study

The findings of this study have both theoretical and practical significance. From a theoretical perspective, the process-product research paradigm contributed a great deal to the knowledge base of teaching, but only at a general level. Most of the classroom management characteristics found to be significant can be applied to almost any subject area. One of the more recent criticisms of educational research in general,

has been the failure to consider the subject matter being taught (Shulman, 1986a). The influence of subject matter on the management of science classrooms has yet to be elucidated. The addition of subject matter (e.g. science), as a contextual variable, into classroom management research may provide a needed focus. Those management skills not found to be significant would tend to support the currently held view that classroom management is a generic teaching skill that varies only with respect to general teaching context. In this case, "context" refers to the format of the lesson, or the types of activities in which students are engaged (e.g., lecture, recitation, or group seatwork).

From a practical standpoint, identifying the management skills unique to, or to be emphasized in, science classrooms would have implications for teacher preparation programs. Currently, most classroom management courses are included in general pedagogy courses designed to meet the needs of students who are planning to teach in a variety of different settings and grade levels. However, the identification of classroom management behaviors specifically influenced by the subject matter being taught, would compel science education departments to emphasize the unique management demands of science classrooms and build upon the general management skills acquired in general pedagogy courses. In addition, subject specific classroom management behaviors would also impact "generic" teacher preparation programs by requiring specific contextually-based classroom management emphasis.

CHAPTER II

REVIEW OF THE LITERATURE

Introduction

Over the past 20 years, a tremendous volume of literature has emerged which focuses on classroom management. Research has shown classroom management to be dynamic and multidimensional in nature (Duke, 1979; Good & Brophy, 1987; Kounin, 1970). As Duke (1979) pointed out, classroom management may be the most complex aspect of the classroom.

In an effort to address management concerns of classroom teachers, numerous research paradigms have existed. The most vigorous of these research paradigms has been process-product and subsequent paradigms which examined mediating variables. The goal of these paradigms was to identify specific behaviors teachers utilized to establish and maintain order in the classroom. It is important to note that classroom management is viewed as more global than discipline. Duke (1979, p. xii) proposed a definition that may be helpful: "Classroom management constitutes the provisions and procedures necessary to establish and maintain an environment in which instruction and learning can occur." In essence, classroom management is more than the supervision of student behavior, but less than everything that goes on in the classroom or the school.

With this definition in mind, the intent of this review is to examine the empirical research associated with the management of science classrooms. However, since many of the general management studies constitute the foundation on which science classroom studies were based, these studies are included in the review as well.

What will be presented is a knowledge base that views the classroom as a system, or more appropriately, several systems. Organizing, managing, and maintaining these systems involves more than a set of independent techniques. The management system is a systematic process where the environment is constructed; complex parts are brought together to create a harmonious unit; and group norms are established, checked, and modified to maintain ongoing classroom life. It is important to note that although the research presented in this review is critical as a foundation, it should not be interpreted as a set of simple prescriptions, teacher behaviors, or even strategies. Rather, it provides evidence of the important factors that must be considered to establish a workable management system. Although management strategies will be provided in the review, the ultimate goal of the review is to present classroom management research as a body of knowledge which can be improved in a systematic manner.

Classroom Management in Elementary School

Kounin's (1970) pioneering work in management was a direct result of a previous study that attempted to examine the effects of "desist" events and the management of overt behaviors.

In the initial study, 30 self-contained classrooms were videotaped continuously for one half of each day during the months of March and April. Only behaviors in academic activities were scored. Tallies of student behaviors were kept separately for seat work and recitation settings. The children selected for coding were chosen from each of four quadrants of the seating arrangement in the room. The behaviors of the child, preselected for coding, were categorized every 10 seconds for the duration of the activity. The behaviors were:

1. Definitely and completely involved in work;
2. Probably involved in work;
3. Definitely not involved in work;
4. Restless;
5. Languishing;
6. Engaged in task related deviancy;
7. Engaged in non-task related deviancy.

In an effort to answer whether desist techniques make a difference in children's reactions to desist events, a scale for desist success was developed as follows:

1. Immediate;
2. Same as #1, but not quite;

3. Ordinary conformity and obedience;
4. Same as #3, but not quite;
5. Resistance shown;
6. Same as #5, but not quite;
7. Open defiance.

Analysis of all variables produced 300 different correlations; 30 teachers times five desist qualities times two measures of the degree of success. The analysis showed that only two correlations were significant at α=0.05. Such a result could be attributed to chance alone. The remaining 298 were not significant. Kounin concluded that there was no relationship between the qualities of a teacher's desist technique and the degree of success in handling a deviancy.

Although Kounin's initial study may have been presented in a less than adequate manner, the fact remained that the behavior of the children in the classrooms studied (to him) seemed to differ in significant ways. There seemed to be some unanticipated variables associated with the control of the classroom. There was a wide range in the levels of work involvement, deviancy, and spreading of deviancy. What produced these differences? More importantly, is it possible to delineate what it is that teachers do that makes a difference in how children behave?

A reanalysis of the first group of videotapes showed that there were specific categories of teacher behaviors that correlated with managerial success as measured by work involvement, deviancy rate, contagion of misbehavior, and effectiveness of desists. However, there were no values given for these correlations. Some of these

dimensions were termed by the researcher as being: withitness (demonstrating that she knew what was going on); overlapping (attending to two issues at once); transition smoothness; and programing for learning-related variety in seat work. In an effort to expand on these ideas and arrive at some definitive conclusions, a second videotape study was obtained.

In the second study, 50 first and second grade classrooms were videotaped for a full day each. Twenty-four classrooms were located in a predominantly middle class suburb and 26 were located in an urban setting. One of the classes was eliminated for technical reasons.

In order to score the behavior of the children, an activity map was made for each classroom prior to coding. The map included a description of the activity or activities, starting and finishing times of each activity, transition points, and transition phases. The individuals mapping the classroom day also made a schematic diagram of the seating arrangement for all the different activities. The sample of children to be scored was selected by the project director from diagrams of the seating arrangement for each academic setting. The diagram for each setting was divided into four quadrants and one boy and one girl from each quadrant were pre-selected for scoring. Each child, preselected for scoring, was coded for work involvement and for deviancy every 12 seconds for the duration of the specific academic session. The time of twelve seconds was selected to accommodate the timing device on the videotape playback machine. Work involvement was coded by categorizing the behavior of a child as follows: (a) Definitely in the assigned work, (b) Probably in the assigned

work, (c) Definitely out of the assigned work. Deviancy was coded by categorizing the behavior of a child for each 12 second interval as (a) not misbehaving, (b) engaging in mild misbehavior, or (c) engaging in serious misbehavior.

The product-moment correlations between the measures of teacher style and managerial success were calculated. For the remaining discussion of this particular study (Kounin, 1970), r=.276 was significant at .05 level. The results showed that both withitness and overlapping were related to managerial success. In recitation settings, the correlation of withitness with work involvement was r=0.62 while the correlation of withitness with freedom from deviancy rate was r=0.53. In seat work settings, withitness correlated r=0.31 with work involvement and r=0.51 with freedom from deviancy rate.

Overlapping had a positive correlation of r=0.46 with work involvement and a correlation of r=0.36 with freedom from deviancy in recitation settings. In seat work settings, overlapping correlated r=0.38 with freedom from deviancy and a correlation of r=0.26 with work involvement. Based on these results, the author concluded that overlapping discourages deviancy in both recitation and seat work settings, but relates to work involvement in recitation settings only.

In an effort to separate the contribution of each of the teaching styles, partial correlational analyses were conducted (Hypothetically giving all teachers the same score for withitness, then doing the same for overlapping). The results indicated that withitness by itself has more of a relationship with managerial success than does overlapping by itself. The correlation of r=0.62 between work involvement and

withitness in recitation settings was reduced to $\underline{r}$=0.48 when the effect of overlapping was removed. In contrast, the correlation of $\underline{r}$=0.46 between overlapping and work involvement in recitation settings became $\underline{r}$=0.14 when the contribution of withitness was removed.

A second general category, activity flow and movement, refers to the initiation, sustaining, and termination of activities. The following were defined as subcategories of activity flow/movement:

A. Jerkiness (Anti-smoothness);

B. Stimulus-boundness (maintaining a focus);

C. Thrusts ("bursting in" with an order, statement, or question);

D. Dangles (when a teacher was in some activity and then left it "hanging" by going of to some other activity);

E. Truncations (same as a dangle, except that the teacher does not resume the dropped activity);

F. Flip-flops (when a teacher terminates one activity, starts another, then starts a return to the activity that had been terminated). They differ from dangles in that they are coded only during transitions.

The other category of movement management was "slow-downs" or "anti-movement." This category was further divided into two other categories referred to as overdwelling and fragmentation.

A. Overdwelling (when a teacher dwells on an issue that goes beyond what is necessary)

1.) Behavior overdwelling ("Nagging");

2.) Actone overdwelling (concentrating on a sub-part);

3.) Prop overdwelling (overemphasizing props such as pencils, books, paper, crayons etc.);

4.) Task overdwelling (same as behavior overdwelling, but is applied to the task rather than the behavior);

B. Fragmentation (slowdown produced by a teacher breaking down an activity into sub-parts when the activity could be performed as a single unit.)

1.) Group fragmentation (when a teacher had a member of a group do something that the whole group could be doing as a unit.)

2.) Prop or actone fragmentation (when the teacher fragments a meaningful unit and focuses on these sub-parts when the behavior could be performed as a single sequence.)

In recitation settings, momentum (the absence of slowdowns) correlated with both work involvement (r=0.66) and freedom from deviancy (r=0.64). In seat work settings, momentum correlated with freedom from deviancy (r=0.49), but not with work involvement (r=0.20). In general, according to Kounin, momentum may be said to be more highly associated with children's behavior in recitation settings than in seat work settings. Avoiding behaviors that impede movement in recitation settings tended to be the highest single determinant of successful behavior management.

Smoothness, by itself, was significantly associated with student behavior in both recitation and seat work settings. In recitation settings, smoothness correlated

with both work involvement (r=0.60) and freedom from deviancy (r=0.49). In seat work settings, smoothness correlated with work involvement (r=0.38) and with freedom from deviancy (r=0.42). As was the case for momentum, the correlations tended to be higher for recitations than for seat work settings.

As was the case for withitness and overlapping, smoothness and momentum also correlated significantly with each other (r=0.75). Teachers who engaged in behaviors that produced jerky movement, also engaged in behaviors that slowed down movement. As a result of the high correlations between smoothness and momentum behaviors, a partial correlational analysis was conducted (Hypothetically giving all teachers the same score for smoothness).

In recitation settings, the partialing out of smoothness lowered the correlation between momentum and student behavior. Momentum correlated with work involvement (r=0.39) and with freedom from deviancy (r=0.48). However, removing the effects of momentum from smoothness, or when the scores for momentum were held constant, smoothness correlated with freedom from deviancy (r=0.02) and with work involvement (r=0.20) in recitation settings. By itself, then, momentum was more highly associated with children's behavior in recitation settings than smoothness by itself.

Group focus related to many kinds of events throughout all recitation sessions: the sequence of reciters, the manner in which reciters are called on, the number of reciters called on, the degree to which the teacher goes out to listen, what non-reciters are supposed to be doing while another child is reciting, and a variety of other teacher

techniques and manners. Scores were based upon particular periods of time rather than specific events. In this case, 30 second intervals were used. Three general categories were as follows:

Group alerting: the degree to which a teacher attempts to involve non-reciting children;

Accountability: holding members of the group accountable;

Format: (degree of participation required of non-participants), differs from group alerting in that it centers around the formal setup of the classroom.

Group alerting was significantly related to student behavior. In recitation settings, the correlation of group alerting with work involvement was $r=0.60$ and $r=0.42$ with freedom from deviancy. In seat work, group alerting was weakly correlated ($r=0.29$) and with freedom from deviancy only. Therefore, teachers who maintained a group focus by engaging in behaviors that keep children alert and on their toes, tend to be more successful in inducing work involvement, particularly in recitation settings.

Accountability was also associated with student behavior. Two types of scores were recorded. One consisted of global judgments based on specific behavioral cues (Circulating among students, requesting demonstrations of performance, etc.). The second was a count of the different reciters. The only one used was the number of reciters per minute. The correlations between accountability and student behavior were found to be significant in recitation settings only. Specifically, the correlations were $r=0.49$ for work involvement and $r=0.39$ for freedom from deviancy. In

recitation settings, it made a difference whether teachers demonstrated to the group that they knew what the children were doing about the ongoing task.

Format scores did not correlate significantly with either work involvement or deviancy in either recitation or seat work settings. It should be emphasized that format scores were based upon the official, formal setup of the various recitation sessions and were not based upon how the teacher went about actually conducting the session. As a result, the session did, or did not, have props which non-performing children were to be engaged with while a reciter performed, or the format called for a combination of recitation and lecture, or did not.

The correlation between accountability and group alerting was also found to be significant. Teachers who engaged in behaviors comprising the group alerting score also tended to manifest the behaviors of accountability.

Of the two, group alerting appeared to be the more significant aspect of group focus. The correlation between group alerting and children's behavior was not only higher, but remained significant when the effects of accountability were removed by partial correlation analysis. The results of the analysis showed the correlation between group alerting and student behavior remained significant at α=0.05, $\underline{r}$=0.48 with work involvement reduced from $\underline{r}$=0.60 and $\underline{r}$=0.31, with freedom from deviancy reduced from $\underline{r}$=0.44. When the contribution of group alerting was removed, the correlation between accountability and work involvement was reduced from $\underline{r}$=0.49 to $\underline{r}$=0.28 and the correlation with freedom from deviancy became statistically insignificant with

$\underline{r}$=0.21, which was reduced from $\underline{r}$=0.39. Therefore, it seems more important to keep the students "on their toes" than it is to check on them.

Programing to avoid satiation refers to the nature of the activities programed in the classrooms. That is, what activities are the teacher moving the students into and out of? The initial videotape studies distinguished two gross kinds of academic activities (recitation and seat work), and that the students' behaviors differed in each of the settings.

Valence and challenge arousal refer to what teachers do about satiation management in terms of attempting to enhance the attraction or challenge of classroom activities. These attempts usually occurred during transitions and may have been done in a number of ways: (a) showing genuine zest and enthusiasm, (b) making a statement pointing out that the activity possess a positive valence, (c) making a statement pointing out that the activity possesses some special intellectual challenge. The efforts to maintain positive valence for academic activities were somewhat successful at increasing work involvement and reducing deviancy in both recitation and seat work settings. The correlations between scores in valence and challenge arousal and children's behavior were considered low, ranging from $\underline{r}$=0.31 to $\underline{r}$=0.37, but were still statistically significant.

Kounin also attempted to approach the issue of variety. It was thought that since satiation means "doing something over and over," variety should relate to the rate of satiation or the greater the variety, the slower the process of satiation.

Seat work variety correlated with behavior in seat work and with work involvement (r=0.52) and with freedom from deviancy (r=0.28). In fact, seat work variety correlated higher with work involvement in seat work more than any other single dimension of teacher style. In addition, an analysis by means of partial correlations revealed that the correlation between seat work variety and work involvement in seat work was not reduced when the effects of any of the other dimensions of teacher style were eliminated.

Programmed variety did not correlate with behavior in recitation settings. It would seem that variety in recitation settings was overshadowed by the effects of other dimensions of teacher management style such as questioning and withitness.

Although the significance of Kounin's comprehensive study is difficult to argue, there were, nevertheless, some problems. The first problem is of a practical nature. Kounin reported that, with a sample size of 49, correlations of r=0.28 were significant at α=.05. Although the correlations may be statistically significant, the value may not be of any practical importance. Devore & Peck (1986) have suggested that correlational values of less than r=0.50 be considered weak relationships (r^2=0.25). If the coefficient of determination is considered, a value of r^2=0.08 is obtained from r=0.28. As a result, all values with a proportion of variation greater than 7.6% were considered significant by Kounin. Such rather small values, from a practical point of view, seem insignificant.

The methodology used by Kounin to score withitness is also questionable. A teacher's score was obtained by dividing the total number of desists by the number of

mistake-free desists. The fewer the proportions of the desists that contained either target or timing mistakes, the higher the score for withitness. Considering the method of calculating withitness, it is difficult to see how the more "withit" teacher obtained a higher score. If, for example, a teacher had 15 desists and five were error free, the teacher would receive a score of 3 or 15/5. If another teacher had 15 desists and three were error free, a score of five would be derived; a higher withitness score than three, and based on the same total number of desists. Such a coding system would seem to result in a higher score for less "withit" teachers.

Other researchers have attempted to examine how good management practices become established in the classroom. Emmer, Evertson, & Anderson (1980) examined management at the beginning of the school year. The major goal of the project was to learn how teachers, who are effective managers, begin the year and to determine what basic principles of management guide their teaching.

The sample consisted of 27 third grade teachers in eight elementary schools. The chief source of data was the narrative record. Each observer recorded as much information as possible about classroom processes. The list of characteristics the observers focused on was rather extensive and included: room arrangement, materials, assignments, introductions, classroom rules, consequences of misbehavior, initiation of activities, transitions, delays, student reactions, grouping patterns, the nature of individual work and organizational procedures, desired student activities, problems, response to inappropriate behavior, consistency of teacher responses, systems for contacting students, procedures for various teacher and pupil activities, the nature of

group work, monitoring, feedback systems, reward and punishment systems, and teacher cues.

Another source of information was the Student Engagement Rating (SER). At 15 minute intervals the observer counted the number of students who were on task and noted the subject and activity. Finally, a set of ratings called the Component Ratings were used. The Component Ratings consisted of 34 rated variables and checklist items, completed at the end of each observation. The component ratings were used to compare groups of teachers based on specific characteristics. The five general categories were behavior management, responses to disruptive behaviors, instructional management, meeting student concerns, personal characteristics, and student engagement rates.

All teachers were observed at least once during the first two days. During the first three weeks each teacher was observed on 8 to 10 occasions. Observations were discontinued after three weeks but were resumed in November with less intensity for the remainder of the year. During this time each teacher was observed once every three weeks by observers who were usually different from those who observed the teacher during the first three weeks. The teachers were also interviewed twice; once in October and again at the end of the year to collect information about planning and other unobservable characteristics. No specifics about how the interviews were conducted were provided.

After the data were collected, reliability checks among the observers were made and the teachers were classified into groups. The goal of the classification was

to identify two groups of teachers who had initially comparable classes, but who differed in their management practices. The selection process resulted in two groups of seven teachers each. The two groups were equal with respect to their initial class mean reading scores and were distributed evenly across schools. On the other hand, the groups were different with respect to several measures of pupil and teacher behavior obtained during the end of the year of data collection. In general, the group of teachers ranked as being effective managers had higher rates of student engagement and lower average rates of student off-task behavior, and the average residual reading achievement showed greater gain than the gain for less effective managers.

The beginning of the year activities of the more effective and less effective managers were compared statistically by t-tests of the narrative ratings of management areas, the student engagement and off-task variables, and the instructional component rating. Since 28 different t-tests were conducted, listing all of the categories and their scores served little purpose. However, 21 of the contrasts were statistically significant at either $p<.05$ or $p<.01$. In addition to the statistical treatment of the data, narrative records from the first three weeks were analyzed according to each of the management areas in order to describe the behaviors and activities of the two groups of teachers.

The results were organized around the narrative summary ratings in each of the categories of the component ratings. In the category of behavior management, the two groups showed marked differences in management styles. Both groups of teachers had rules and procedures for their classes. However, the more effective managers were able to integrate the rules and procedures into a workable system and were more

effective at teaching the system to the students. The rules and selected procedures were explained clearly with examples and reasons. More importantly, the children were taught what they needed to know about using the room, but were not overloaded with information.

The more effective managers were also found to work more with the total group, monitor activities closely, and introduced procedures and content gradually. If inappropriate behavior occurred, it was stopped promptly. Evidence for better monitoring behavior was found in higher scores for eye contact for the better managers. The major distinguishing characteristic of the more effective managers was that they monitored students carefully and when disruptive behavior occurred, it was stopped promptly. In short, the more effective managers clearly established themselves as classroom leaders. They worked on the rules and procedures until the children learned them. The teaching of the content was important for these teachers, but they stressed, initially, socialization into the classroom system.

In terms of instructional management, those teachers who were better at behavior management were also better at managing instruction. In general, these teachers managed time well, with smoother, shorter transitions. Typically, if the students had finished an activity, there were other activities to keep them busy. Essentially, these teachers had identified or used systems for managing instruction that avoided problems. In addition, directions and instructions were given clearly and written on the board, and the routines were established early. Directions and routines were often taught step-by-step, with the teacher monitoring to verify that each step

was done correctly. Students were also held accountable for their work by the teacher's persistent monitoring during seat work and keeping track of their assignments. The effective managers also displayed evidence of instructional effectiveness. The more effective managers were rated as being better in describing objectives clearly, using a variety of effective materials, having the materials ready, and giving clear directions.

The third general category examined in this study was student concerns or the degree to which the management system accommodates student concerns. Student concerns were considered to be met when several conditions were satisfied. First, the classroom did not pose an apparent threat to the children's well being. In addition, the children received fair treatment from the teacher, had an opportunity to be successful, and received recognition for it. Also, enough information was available for the children to make productive use of time in the classroom. Essentially, the more effective managers seemed to have a sense of how children perceive the classroom. The teachers' awareness to students' perceptions was suggested by the way procedures were introduced and taught. For example, the first procedures were usually related to the students' immediate needs: where to put the lunch box and clothing, how to use the bathroom, and how to get a drink. The organization made the classroom a haven of security.

More effective managers were also rated higher in considering attention span in lesson design, pupil interest, and background. They provided different instructional

activities and assignments, reasonable work standards, and activities in which pupils were able to achieve a high degree of success.

The fourth general category dealt with constraints and room arrangement. A constraint was defined as any condition in the school, room, or environment that could interfere with the teacher's conduct of the class. More effective managers in this group were judged to have better arranged rooms and to have coped more effectively with their constraints than the less effective managers. Some examples included: late arriving students, parents, school personnel, calls over the intercom, missing books and supplies, and small rooms. In short, effective teachers had procedures for dealing with these constraints.

A second characteristic of more effective managers was that they were more effective planners. They thought about their potential problems before the year began and made some preparations. Finally, the teachers did not allow the constraints to interfere with the attention they gave their students. As a result, there was limited opportunity for the teacher's leadership role to be interrupted.

The final category was that of the personal characteristics of the teachers. Differences in personal characteristics were not generally evident when the narratives from the first three weeks were searched. However, more effective teachers did exhibit better affective skills, received higher scores on both listening and expressing feelings.

Realizing that the study was correlational in nature suggests only possible causal relationships; the authors were careful to point out that further research was

necessary to verify the results. However, they did feel that it was reasonable to conclude that effective classroom management during the year could be predicted from the first several weeks of school.

Although this study seems to establish some basic groundwork, there were some difficulties for consideration. First of all, nothing was stated about how many observers were utilized or how the observers were trained prior to the data collection. Secondly, there did not seem to be any attempt to establish interrater agreement before collection of the data occurred. Establishing interrater agreement may have been part of the training process. However, without specifics on the training process, this point cannot be assumed. The final estimate of interrater agreement was established by calculating interclass correlations between observer pairs on each scale during the first three weeks of observation and during the remainder of the year of observations. Those scales that were not significantly correlated, were removed. As a result, significant categories may have been retained if agreement was established before data collection. There was also some question as to the ability of the observers to keep a record of all 34 initial variables for half of a school day. Managing 34 variables for half of school day would have been quite an accomplishment for a single person.

In terms of the observation instrument, "Component Ratings," nothing was stated about how these variables were derived or if they were part of some other instrument. In other words, it is not clear what led the researchers to believe that any of the variables were related to the establishment of effective management.

The initial treatment of the data attempted to establish the stability of the data and gave some indication of interrater agreement. Correlating the observations of different raters observing the same teacher on different days also provided some sense of stability, but it also assumed that the teacher behaved in the same manner on both days. Conceivably, the observers recorded similar information by watching different teacher behaviors.

Finally, there was no consideration of the cumulative error rate. Since there were 28 variables used in the final analysis, it is possible that some of the variables could be statistically significant simply by chance.

Up to this point, most of the work has been correlational in nature. In an experimental study conducted by Anderson, Evertson, and Brophy (1979), an attempt was made to verify some of the earlier correlational work by the experimental testing of principles of instruction and to determine how effective a treatment was in promoting a change in teachers' behaviors.

In this case, the treatment was an instructional model made up of 22 principles believed to be effective in small groups in early grades. A brief manual describing these principles was given to 17 first-grade teachers who agreed to implement the instructional model. Ten other teachers served as a control group. Ten of the treatment teachers and all of the control group teachers were observed regularly throughout the year to obtain information on the teachers' implementation of the instructional model. The remaining seven teachers were not observed in order to assess the treatment effect due to the observations. As a result, there were two

treatment groups and one control. At the end of the year the reading achievement of all the students was measured, and the scores were adjusted for entering readiness.

All the classes were in predominantly middle-class, Anglo schools, with all female teachers. In each of the nine schools, all first-grade teachers participating in the study were assigned to either the control or experimental group. As a result, treatment was confounded with the school. However, it was believed to be less of a problem than the "contamination" that might occur if the treatment and control groups were in the same school.

The instructional model consisted of 22 principles (many with subcategories) developed from the integration of research and knowledge about how young children function in the classroom. The model was made up of two parts. The first part dealt with management of the group as a whole (principles 1-16) and the second part emphasized the feedback teachers gave in response to students answers.

In the materials given to each of the teachers, each principle was explained, along with a rationale and several examples. Principles 1 and 2 stressed the importance of getting and maintaining the childrens' attention at the beginning of the lesson. Principles 3 through 6 were concerned with introducing the lesson and new material. They were based on the idea that an introduction should prepare the students for the lesson by getting their attention and making sure that the students know what to do in the activities. Principles 7 through 12 dealt with calling on individual students in the group, asking questions of individuals during the lesson and at the same time keeping the entire group alert. Principles 13 through 16 were concerned

with meeting individual learning needs in a group setting. These techniques suggested breaking the group up, using a child as a model for the group and arranging for tutorial help for students who were not meeting learning objectives. Principles 17 through 22 were considered to be the second part of the model, and were concerned with the teacher's role in dealing with the responses of individual students in the group. These principles focused on feedback, but they also distinguished among the types of questions and types of student answers. In general, principles 17-22 were based on the idea that any type of response could be turned into a pleasant learning experience if the proper feedback is utilized.

Two sets of measures were utilized as data sources for the study: an observation system to record implementation of the principles, and the tests used to measure student readiness and reading achievement.

The observation system had two components. The first part dealt with descriptions of the teacher's interactions with the group as a whole. The second part dealt with the teacher's interactions with individual students.

Observations were made about once a week in 10 treatment classes and 10 control classes. Observations started in November and continued through April. Before working alone, three observers worked in pairs and achieved 80% agreement on the individual sections of the observation system. Each teacher was then seen by two observers who alternated visits to the class.

At the beginning of the school year, all first-grade students were given the Metropolitan Readiness Tests. The total readiness score was used as a covariate to

adjust final achievement scores. At the end of the year the experimenters administered the reading subtests of the Metropolitan Achievement Tests to all students. Several data analyses were performed. In the original technical report, over 500 variables were derived from the observation system. However, 55 variables were presented in this study because, according to the authors, they most directly measured implementation of the model or other important aspects of instruction.

Based on these data, three questions were addressed: Did the treatment have an effect on students' achievement? Did the treatment have an effect on teachers' behavior? Were the process-product relationships those that were predicted on the basis of past research.

To determine treatment effects on students' achievement, linear regression models were compared. To adjust for differences in entering skills, the total readiness score was used as a covariate. For these results, test scores were computed as class means with the class (n=27) being used as the unit of analysis.

Main effects were tested, using a series of regression models, to determine whether the adjusted achievement scores of one of the three groups was significantly higher or lower than the scores of the other groups. A treatment effect was found (R^2=.12, p=.05), and paired comparisons confirmed that the two treatment groups did have significantly higher adjusted achievement scores than the control group. In addition, there were no significant differences between the two treatment groups. Based on this analysis, the author concluded that the treatment did have an effect and

that there was little, if any, effect that could be attributed to the presence of the observers.

To determine what effect the instructional model had on the teachers' behaviors, the author's first step was to compare the observational data of the treatment group and the control group. It was predicted that the treatment teachers would exhibit more behaviors described in the model than would the control teachers. In addition to comparing the implementation of the model, the researchers examined other behaviors not directly related to the model. The results indicated that certain parts of the treatment were used significantly more by the treatment teachers, while other parts were not. However, there were also differences between the groups that could not be attributed directly to the model.

The data were analyzed with the use of one-way analysis of variance for 55 variables that directly measured implementation of the treatment or that suggested other ways in which the groups could have differed. The mean scores of the control group were used to establish the baseline rates for each of the behaviors. These scores were then compared to the mean scores of the treatment teachers.

Due to the large number of variables, a brief summary concerning the treatment effects on teacher behaviors is presented. In general, the results did not lead to a definitive answer to the question of whether the treatment had an effect on teachers' behaviors. Several group differences were present that were directly attributable to the content of the instructional model, such as the use of ordered turns to select students and sustaining feedback. Other group differences, such as more efficient transitions in

the treatment group, can be related to the treatment, but only indirectly. Parts of the instructional model apparently had no effect, since the use of the instructional model by the treatment group was at about the same level as the control group. The absence of such differences occurred because of high levels of use by the control group or because of low use by both groups. The components of the model that showed the highest treatment effect were the principles that were not new to the teachers, but were not likely to be used frequently by most teachers without encouragement and without a rationale.

Other group differences not attributed to the model were present. They suggested that some school effects may have been operating, in spite of the initial assumption that random assignment of school to treatment groups prevented such effects. Some of these group differences may have been due to a "Hawthorne" effect. That is, the teachers in the treatment group may have been trying harder because they were expected to do better.

To summarize the major results, there was a significant difference in student achievement; the treatment groups had higher adjusted scores. The group differences in implementation matched the process-product data; the treatment teachers exhibited more of those behaviors that were associated with achievement. However, not all of the principles were implemented by the teachers in the treatment groups. Such a finding would tend to support the idea that if change is to be encouraged in teacher behavior, the behaviors must be consistent with the teachers' current belief system, should be specific, and they must be efficient in terms of time and energy.

In terms of the process-product relationships, four principles were found to be valuable in fostering student achievement. First, students achieved more when they were given greater opportunity to learn. In this study, the more efficient teachers spent more time with the group and as a result covered more material. Second, in the group, it was important that students be given opportunities to practice skills being taught so that the teacher was able to monitor their understanding and provide feedback. Third, the teacher provided considerable information about the structure of the skills involved, rather than focusing on the memorization of rules or labels. Finally, good classroom management supported all the other principles and maked it possible to implement them during instruction. In the well-managed classroom, students used efficient routines for carrying out daily tasks, and worked without distraction in a calm, pleasant environment. The teacher prevented behavior problems and the students concentrated on the tasks at hand. In this study, evidence of good management was found for such variables as transition time and behavior corrections.

Although this report was taken from another, much larger technical report, some of the following problems noted may have actually been addressed in the original document. The first of these problems concerned the development of the instructional model. Although the authors stated that each of the principles were researched-based, there were no citations that indicated the origin of any of the principles. In addition, there was no mention if validity of the instructional model had been established. Presumably, validity was based on the intimate connection to the research base. However, the connection can only be assumed.

The lack of validity and reliability measures were also common problems for the Metropolitan Readiness Tests and Metropolitan Achievement Test. These standardized tests seemed to be widely used. Nevertheless, the mention of validity and reliability are important factors that would contribute to the significance of the study.

The original report dealt with 500 variables that were derived from the observation instrument. Use of an observation system utilizing 55 variables was remarkable. Unfortunately, the derivation of these variables was never discussed. Also, considering the large number of variables, the cumulative error rate needed to be considered. Based on chance, there was a high probability that some of the statistically significant variables were the result of random chance.

Classroom Management Studies in Junior High School

To determine what effective managers in junior high school do at the beginning of the year, Evertson and Emmer (1982) modeled a previous study that was done at the elementary school level (Emmer, Evertson, & Anderson, 1980). The data presented were taken from a larger study that collected data throughout the year. The smaller study focused on a subgroup of teachers identified as more effective and less effective managers in junior high math and English classes.

The initial data set consisted of a series of year long observations made in two classes each of 26 mathematics teachers and 25 English teachers in 11 junior high

schools. The teachers were volunteers and consisted of both experienced and first-year teachers.

The study sample was randomly selected after stratifying by subject taught and years of teaching experience. At the beginning of the year, each teacher was observed in one class on the first, second, and fourth day, and three or four more times during the second and third weeks of class. Each teacher was also observed on four or five occasions in a second class during the second and third weeks. During the remainder of the school year, each teacher was observed once in each class every three to four weeks.

Training for 18 observers was conducted for one week prior to the beginning of the school year. Observation data were obtained using several procedures providing broad assessment and description of classroom behaviors and activities. The data sources included:

Classroom narrative records described the activities and behaviors in the classroom. The focus for the notes was on management-related activities, and secondly on instructional events.

Time use logs were constructed showing the amount of time spent in each of the activities and formats.

Student Engagement Rates (SER) were frequency counts of student behaviors. The categories included on task, off task (definitely or probably), academic or procedural activities, sanctioned or unsanctioned

(if off task), and dead time (no specific activity, waiting). The rates were converted to proportions and averaged within periods.

Ratings of teacher and student behavior or Component Ratings (CR) were used after each observation. The observer rated on five point scales selected managerial, instructional and behavioral characteristics (e.g., amount of disruptive behavior, clarity of directions, student success).

Narrative Ratings (NR) were compiled. Project staff read the set of narratives for a teacher's first three weeks for a given class and made summary ratings of 29 behaviors and characteristics. The procedures used to rate these narratives were based on those used in the elementary study.

Student data were collected from the school district in the form of California Achievement Test (CAT) scores obtained during its annual testing program the preceding year. These data were used to stratify the sample based on entering achievement levels and class means were used as a predictor when computing residual achievement. The project staff then constructed and administered, in early May, achievement tests. The achievement tests were admitted to have limited content validity. Student perceptions were assessed just prior to the testing. A 15-item questionnaire, Student Ratings of the Teacher (SRT), assessed student

reactions to the teacher, the teacher's conduct of instruction, management of the class and the student's interest in the course.

Reliability checks of the observation variables were performed using both inter-observer agreement and between-periods stability coefficients. Variables were identified as reliable using intraclass correlations at a statistically significant level ($p<.05$) for inter-observer reliability check and/or between-periods stability. The reliability of the achievement and attitude measures was determined using internal consistency coefficients. Both the pilot testing and the study data indicated high reliability of these measures. However, no reliability values were reported. Residual achievement scores were moderately stable across classes and within teachers. Approximately one-half of the variance in class mean residual achievement in math and English was attributable to the teacher effect. A somewhat higher percentage of variance in class mean SRTs was attributable to the teacher.

Correlations were computed among class mean residual achievement, SRT, and several management process variables averaged across observations throughout the year. The SRT and residual achievement means were not significantly related.

In math, indicators of effective management were positively correlated with residual achievement. Indicators of management problems were negatively correlated with residual achievement. Management variables were not significantly correlated with SRT means for math classes ($p=.05$).

For English, the management-achievement correlations were in the same direction as in math, but were not significant. Management variables were

significantly correlated with SRT means. Most of the significant correlations were in the .30 to .45 range.

To determine management practices that were effective at the beginning of the year, a subsample of teachers was selected. The procedure utilized all of the data obtained throughout the year with the exception of the first three weeks. The criteria included: average percent of students coded as unsanctioned off task, the average percent of students coded as on task in academic activities, a management effectiveness score derived from observer end of the year ratings, and the end of the year adjusted class mean achievement. This procedure resulted in the selection of six more effective and six less effective managers in math, and seven more effective and seven less effective teachers in English. The groups of teachers taught classes that had similar average achievement levels.

SERs of more and less effective manager groups were compared using a two-way analysis of variance. The results of the tests indicated that more effective managers, during the first three weeks of the year, had higher on-task rates ($F=3.76$, $p<.10$), lower off-task rates ($F=4.40$, $p<.05$), lower unsanctioned behavior rates ($F=3.21$, $p<.10$), and less dead time ($F=3.05$, $p<10$).

A series of two-way ANOVAs was conducted on the average rating on each variable of the CRs. The results showed that more effective managers were rated higher than less effective managers on several variables. These variables included: clarity in giving directions and information, stating desired attitudes and behavior more frequently, providing activities and assignments with higher levels of student success,

presenting clear expectations for work standards, and consistency of response for appropriate and inappropriate behavior.

More effective managers were also rated as having less disruptive behavior in their classes. Once disruptive behavior occurred, more effective managers were rated as stopping it sooner and ignoring it less often than less effective managers. More effective managers also used their classroom rules and procedures more frequently to deal with such behavior. More effective managers were rated higher on the use of listening skills and their classes have a task-oriented focus.

More effective English teachers (but not math) were rated higher on variables of describing objectives clearly, using materials that effectively supported instruction, and encouraging analytic processes. More effective managers in English were rated as maintaining better eye contact than less effective managers. More effective managers in math were also higher on this variable though the difference was not as great.

Narrative ratings were made by readers after they read and summarized the narrative records for each teacher's first three weeks. Twenty-nine variables were defined to supplement information obtained from other data sources. The average ratings of these groups were compared using a series of two-way ANOVAs. Many differences between the more and less effective managers were identified. For this review, some of the main clusters of variables found to be significant included: rules and procedures, monitoring of student compliance and following through with consequences, establishing a system of student responsibility or accountability for

work, skills for communicating information, and skills in organizing instructional activities.

A series of supplemental analyses were performed to address several questions. The first question was whether the differences in classroom behavior were due to differences in teacher behavior or due to initial differences in student behavior. To address the question, class mean disruptive behaviors were compared during the first week of class and during week two and three. The statistic used for comparison was not given. The results showed that there was no significant difference between the classes during the first week of class. However, a significant difference existed between the two groups during the second and third week of class. This result indicated that both groups of teachers had initially comparable classes, but over time there was a deterioration in student behavior in the less effective teachers' classrooms.

A second analysis was done to allow the researchers to more correctly interpret the results involving the composite management scores. That is, could differences be attributed to just one of the criteria? In order to check this second question, correlations were computed between each selection variable and the NR and CR variables. An examination of the pattern of the correlations showed consistency across the four criteria. That is, in most cases, if a CR or NR variable showed a relationship with one criterion, then a similar relationship with one of the other criteria was also obtained. This result indicated that no single criterion dominated the differences identified between more and less effective managers.

A final supplementary analysis addressed the question of whether the more or less effective managers tended to score high or low on all the variables that discriminated between the two groups. To accomplish this, the researchers examined the pattern of intercorrelations among the NR and CR variables. The median intercorrelation for variables that had produced significant differences between more and less effective groups was $\underline{r}$=.53. The median value of all other intercorrelations was $\underline{r}$=.25. Consequently, the data reflected a tendency for teachers to score either high or low on the set of variables that distinguished between the two groups. Such a result would seem to make intuitive sense since a natural interdependence among the various management behaviors is expected. For example, better monitoring assists in stoping inappropriate behavior.

In general, this study was well done with no glaring problems. However, some minor details needed to be provided. For example, high reliabilites were reported for the observation variables, but no values were provided. In addition, the statistical procedure used to compare the average percent of off task behavior in more and less effective manager's classes would have added clarity.

Given the quality of the study, generalizing the results to all grade levels and content areas must be done with caution. The results were descriptive in nature and attempted only to identify variables. The behaviors identified as basic to good management were conditions that existed in the classroom at the time. As a result, the factors cannot be concluded as causal.

The Junior High Management Improvement Study or JMIS (Emmer, Sanford, Clements, & Martin, 1982) involved two urban school districts in two southwestern cities during the 1981-82 school year. The focus was based on previous research conducted by Evertson and Emmer (1982). In this field experiment on classroom management, experimental group teachers (n=18) and control group teachers (n=20) in four content areas received a manual and attended workshops at the beginning of the school year. The content areas were selected from the academic core and included mathematics (n=15), English (n=13), science (n=13), and social studies (n=7).

The main population of teachers eligible to participate in the study were those with two or fewer years of prior teaching experience. In addition, since one of the research questions in the study was whether more experienced teachers (who had a history of management problems) were helped by the experimental treatment, a second group of 10 teachers was added to the sample. These teachers were identified by the principal in each of the schools. Therefore, the total number of teachers used in the study was 48.

Teachers were randomly assigned to experimental and control groups. To maintain a balance between treatment and control groups on relevant variables such as teaching experience, subjects taught, and grade level, teachers were paired as closely as possible before random assignment to treatment or control. The assignment procedure resulted in 24 teachers being assigned to the experimental group and 24 assigned to the control group. Attrition for various reasons resulted in 18 teachers in the experimental group and 20 teachers in the control group.

The specific research questions to be addressed were as follows:

1. Are the management training workshops effective for teachers who were relatively experienced, but who have experienced problems in the area of classroom management?

2. Will the teacher behavior and activities associated with effective management in earlier research also be associated with effective management in the present study?

3. How are the management outcomes affected by the contextual features of classroom such as (a) subject areas, (b) composition of the class, and (c) student entering ability?

In addition to these questions, two hypotheses were presented as follows:

1. Teachers who are provided at the beginning of the school year with a manual and workshops describing effective management behaviors, will subsequently exhibit more such behaviors than will teachers not receiving the manual and workshops.

2. Teachers provided with the manual and workshops at the beginning of the school year will establish and maintain better managed classes than will teachers not receiving the manual and workshops.

Treatment consisted of teachers in the experimental group utilizing a management manual entitled "Organizing and Managing Junior High Classrooms." The manual was based upon previous research conducted in the project (Evertson & Emmer, 1982). The manual was organized around nine chapters with four chapters

focusing on planning a good system of management at the beginning of the school year. Three chapters presented information on establishing and maintaining a well managed classroom. The final two chapters presented information on instructional management.

Teachers in the experimental group received the manual during a workshop conducted before the beginning of the school year. A second workshop was conducted during the third week of school. The workshops were conducted to support the use of the manual and provide instruction directly related to the information from the manual. Teachers in the control group did not receive the manual or the workshops during the study. They were informed of the purpose of the study when they were contacted for participation. At that time they were told that they would receive manuals and be invited to a workshop at the end of the data collection process.

Classroom observations were made by 20 trained observers including six staff members and 14 temporary or part time employees (mostly graduate students). Training activities included reliability checks and practice with videotapes of classroom instruction.

Each teacher was observed in two classes beginning in August and extending through February. Emphasis was given to the first eight weeks of school. Teachers were observed on the first day of class and on two or three occasions during the first week in one class. During weeks two through eight teachers were observed one time per week. From January through February each teacher was observed four more times in both classes. Observers were assigned to teachers so a minimum of two different

observers saw each teacher on several occasions. To prevent further bias, the observers were blind as to which group a particular teacher belonged, nor were they provided with the manuals or workshop materials.

Numerous instruments were used to collect data for the study. The first included narrative records that provided data about the classroom activities and behaviors of both the teacher and the students. A second instrument was the Student Engagement Rates (SER) which measured on-task rates and the amounts of unsanctioned, off-task student behavior. The variables composing this instrument included: average success rating; definitely on-task, academic; probably on-task, academic; definitely on-task, procedural; off-task, sanctioned; off-task unsanctioned; dead time; on-task, academic; on-task, procedural; and on-task.

The third observation instrument was the Observers Ratings of the Teacher (ORT). The purpose of the ratings was to gather information about teaching behaviors and activities that required several observations to assess behaviors expected to occur relatively less frequently than most of the variables assessed on the Component Ratings (CR).

Two additional instruments in the study were the Component Ratings and the Addendum Component Ratings (AdCR). After each observation, the CR scales were used by the observer to assess teacher and student behavior on 52 variables. Therefore, comparisons of the CR scales between treatment and control teachers provided tests of implementation of the treatment. The AdCR was utilized in the same manner, but contained six variables specific to the first week of school.

Because each teacher was seen by two or more observers, an estimate of agreement between observers was obtained by comparing the observers' ratings. Each observer's CR scores were averaged across the observations made of the teacher. The averages were then compared using intraclass correlations for each variable. It is also important to note that the correlation coefficients represented both the reliability of the observers as well as stability over time. The data indicated that 51 of the 58 CR variables were reliable ($p<.05$). Those variables that did not exhibit significant reliabilities were not used in tests of hypotheses between treatment and control groups.

Finally, a narrative assessment form was developed for use by readers of the narratives in order to provide quantitative summaries of relevant management variables. The assessment form also helped to document the information available in the qualitative database provided by the narratives. Items were chosen for inclusion in the narrative assessment form either because they represented variables of interest in comparing the experimental and control groups in the study or because they represented important dimensions of classroom management not adequately assessed using the other instruments. Each teacher's narrative set was read by two readers out of a pool of eight. Reader reliability was determined by using interclass correlations of ratings made by pairs of readers. All 32 variables on this form achieved significant ($p<.05$) reliability. Several other types of data were collected in this study which were intended for use in understanding the teacher's perceptions of the treatments and about the classroom context in which the teacher taught. The first additional source of data was a management manual questionnaire. All of the teachers in the experimental

group completed a questionnaire assessing their perceptions of the usefulness of each of the sections and the degree to which the teacher reported reading and studying each section.

Another source of data included teacher interviews. After all observations in classrooms were completed and all workshops had been conducted, each teacher was interviewed. The purpose was to gather information about the impact of the study on the teacher, perceptions of the teacher regarding management issues in general, their reactions to events during the year, and their perceptions and reports of their experiences during the year in the area of classroom management.

The results pertaining to the first hypothesis were derived from the data obtained from four of the instruments: Component Ratings (CR), Addendum Component Rating (AdCR), Observer Ratings of Teacher (ORT), and Narrative Reader Rating (NRR). The variables were grouped into one of the nine management areas described in the manual. Analysis was accomplished using a one-way analysis of variance. The results were limited to treatment and control group differences. The results pertaining to hypothesis number one, which focused on the implementation of management strategies by the teacher, are presented by management area.

1. Room Arrangement. None of the three indicator variables in this area were significant ($p>.05$). Therefore, no evidence existed for implementation in this area.

2. Rules and Procedures. Of the 17 variables in this area, 11 were significant ($p<.05$) and two others approached significance. In general, the treatment group had more appropriate and efficient classroom procedures and fewer problems with students.

3. Procedures for Student Accountability. Of the 11 variables in this area, seven produced significant differences in favor of the treatment group ($p<.05$). The experimental group monitored student progress more closely, enforced work standards more consistently, and had better routines for communicating assignments to students.

4. Consequences. The experimental group had more effective consequence systems, were more consistent in their use of penalties, and rewarded appropriate behavior more than teachers in the control group. Of the six variables in this area, three were significant ($p<.05$).

5. Activities for the First Week. Of the nine tests of group differences, two were found to be significant ($p<.05$). Teachers in the experimental group taught the rules and procedures more effectively and provided more review and feedback to the students than did control group teachers.

6. Maintaining Skills. Eight of the nine indicator variables in this area showed significant differences in favor of the experimental group ($p<.05$). Teachers in the experimental group were better at monitoring student behavior, were more consistent in their management behaviors and stopped inappropriate student behavior more quickly. They were less likely to ignore misbehavior and more apt to cite their rules and procedures when dealing with inappropriate behavior.

7. Instructional Clarity. Of the seven variables in this area, two showed significant differences between the experimental and control group ($p<.05$). Experimental teachers were rated as being more likely to wait for student attention before giving instructions and to monitor student's understanding during presentations.

8. Organizing Instruction. Treatment teachers conducted more efficient transitions, were more likely to have enough work for students, and had fewer problems associated with running out of things for the students to do. Of the 10 variables in this area, six showed differences in favor of the experimental group ($p<.05$).

9. Adjusting Instruction for Special Groups. No treatment effect could be identified in this area. Of the three indicators none were found to be significant.

Several interview questions attempted to assess the impact of the treatment on the experimental teachers. Teachers in the treatment group gave a greater number of positive responses to the interview question that asked them whether they had made changes in their behavior, activities, or procedures.

Responses to the question, "To what extent are these changes the result of participation in the study," were higher for the experimental group. When compared to the control group, the treatment group tended to perceive improved student behavior in their classes during the study with a greater number of positive responses to the question, "Are your classes running better or worse this year compared to last year--or if it was the teachers first year, compared to what you expected?" In addition, the teachers also tended to associate their classes' improved behavior to participation in the study.

Hypothesis two: (teachers provided with the manual and workshops at the beginning of the year will establish and maintain better managed classes than will teachers not receiving the manual and workshops), was tested using several student

behavior variables as indicators of management effectiveness. Three of these variables were taken from the CR ratings: disruptive behavior, inappropriate behavior, and task orientation. Two additional variables were obtained from the SER instrument and were based on frequency counts of students on-and off-task: proportion of students who were off-task--unsanctioned and proportion of students who were on-task during each observation.

To check for change across time, the data were grouped separately for observations in week 1, weeks 2 through 4, and weeks 4 through 8. The data were analyzed using a group-by-time repeated measures ANOVA. Group effects favoring the experimental group were found for the off-task, on-task, and task-orientation assessment variables. The significance test for inappropriate behavior approached significance, while the means for disruptive behavior, although favoring the experimental group, were not significant. Some effects for time periods were noted; however, no interactions between group and time were significant. This finding indicated no decrease or increase in treatment impact.

To address research question one, (are the training manuals and workshops effective for the teachers who are relatively experienced, but have management problems), t-tests were made between treatment group teachers (n=6) and control group teachers (n=4) who were in the subsample of experienced-management problems teachers. Generally, no significant effects were noted. One exception may be in the first week activities area which had one significant difference (teacher provides feedback or review of rules and procedures, p=.01). However, it should be noted that

the small sample size used to test this question maked these tests less powerful. As a result, no evidence was obtained for an overall treatment effect of this special group of teachers.

To address research question two, (will the teacher behavior and activities associated with effective management in earlier research also be associated with effective management in the present study) data from the first eight weeks was utilized. Of a total of 75 variables used to measure implementation of management practices, 54 were significantly related ($p<.05$) to one or both student behavior criteria. Management areas with either relatively few or with low levels ($r<.60$) of correlation with both of the management criteria included: organizing the room and materials, consequences, planning activities for the first week, and adjusting instruction for special groups. Management areas demonstrating the strongest teacher behavior-student behavior relationship included: developing workable rules and procedures, student accountability, maintaining the management system, clarity, and organizing instruction ($p<.05$).

Research question three dealt with how management outcomes were affected by the contextual features of classrooms such as (a) subject area, (b) composition of the class, and (c) student entering ability. Subject area effects were tested by ANOVAs comparing student behavior means for the subgroups of science, social studies, mathematics, and English teachers. No significant effects were found for any of the five student behavior variables: on-and off-task rates, disruptive, inappropriate, and task-oriented behavior.

Analysis of other contextual variables was done by computing correlations between the context variables and the five student behavioral variables used as indicators of management effectiveness. The context variables included: (a) number of students enrolled in each class, (b) the proportion of female students in a class, (c) the proportion of class enrollment in each major ethnic group, and (d) entering class academic levels. Information about entering ability levels of classes in District A (only) were available in the form of students' test scores from the previous year. Class mean percentile scores on the mathematics and reading subtests of the Iowa Test of Basic Skills were available for two classes for each of the 13 teachers in the experimental group and 13 teachers in the control group.

Effects of these four classroom contexts on class composition variables were tested by a series of multiple regression equations with each student behavior variable used as a criterion and the context variable used as predictors. In all analyses, the effects of the group were partialed. The only significant ($p<.05$) correlations were between percent female students and on-task proportion ($r=.25$) and entering academic ability and task-oriented behavior ($r=.29$). Ethnic composition was not related to any of the management indicators. Subject matter effects were also absent, with no significant difference on any of the time management outcomes across subject areas.

Similar to previous studies conducted by this research team (Evertson & Emmer, 1982), this study was well done. A great deal of effort went into planning the methodology and establishing the reliability of the instruments. However, like the previous studies, statistically significant correlational values were low and with

questionable practical value. In addition, due to the great number of variables, some mention of the cumulative error rate was in order.

The weakest aspect of this study centered on the teacher interviews. The interviewers had a set of core questions to be addressed. However, the details concerning the analysis of the data was not given. That is, there was no mention of who analyzed the data or what methods were utilized in the analysis. In addition, if more than one person examined the interview data, there should have been some agreement reached between those analyzing the data.

Sanford (1984) provided a more in depth examination of data obtained from the Junior High Management Improvement Study (JMIS) (Emmer, Sanford, Clements, & Martin, 1982). Sanford (1984) utilized the same 13 science teachers as Emmer, et al. (1982), but addressed slightly different questions. The questions were as follows:

> (1) What classroom management practices are related to high levels of student on-task involvement and low levels of off task and disruptive behavior in science classes? To what extent are these teacher practices/student behavior relationships similar to or different from those in the JMIS sample as a whole?
>
> (2) What similarities and differences exist between management practices used by more and less effective managers in this sample with regard to (a) general classroom procedures and organization of activities, (b) conduct of laboratory (hands-on) activities and small

group work, (c) management of student assignments and keeping students responsible for their work, and (d) content presentation?

Since the methodology was discussed in a previous review (Emmer, et al. 1982), only the results pertaining to the specific questions will be addressed. Correlation of classroom management and instructional organization variables with student behaviors identified a large number of teacher practices significantly related to high levels of task engagement and freedom from disruption in science classes. The results focused on four categories of management: classroom procedures and rules, student work procedures, management of student behavior, and organization and presentation of instruction.

In the area of "Classroom Procedures and Rules," the variables showing the strongest relationships with the effective management criteria in science classes included appropriate general procedures, efficient administrative routines, efficient opening and closing classroom routines, frequency of students calling out for teacher's assistance (negative), and effective small group procedures. Correlation coefficients for these variables ranged from $r=0.68$ to $r=0.95$. Managing interruptions efficiently, having procedures that enabled students to get help without interrupting the teacher, and the effective teaching of procedures and rules to students were also significantly ($p<0.05$) related to one or more of the student behaviors.

In the area of procedures governing student assignments, strong correlations ($r=0.69$ to $r=0.91$) were obtained for several variables: consistently enforcing work

standards; suitable routines for assigning, checking and collecting work; and effective routines for communicating assignments.

In the area of managing student behavior, teachers' consistency in responding to student misbehavior, effective monitoring, stopping inappropriate student behavior quickly, and avoidance of student wandering in the classroom, all showed high correlations (r=0.67 to r=0.95) with student task involvement. Few significant correlations were obtained for any specific response to inappropriate or disruptive behavior or for rewarding appropriate behavior.

The final set of variables in this study assessed teachers' behavior with regard to organizing and pacing instructional activities and presenting information. The most consistent significant variables in this area were clear description of objectives, clear directions, waiting for students' attention before giving directions, appropriate pacing of lessons, clear explanations and presentations, plans for appropriate amounts of work for the class period, and efficient transitions. Correlation coefficients for these variables and student on-task behavior ranged from r=0.61 to r=0.89. Significant (p<0.05) correlations for three additional variables emphasized the importance of pacing and accommodating student abilities and characteristics: student success rate, student attention spans considered in lesson, and monitoring student understanding.

A small number of personal teacher characteristics were assessed in this study. The only variable significantly related to student behavior was teacher confidence (no value given). As measured in this study, teachers' enthusiasm, showmanship, warmth,

listening skills, and distracting mannerisms were unrelated to the classroom management success in the sample of 13.

The second phase of analysis consisted of ranking the 13 science teachers based on the eight effectiveness criteria. For review, these included: student on-task proportion; student off-task unsanctioned proportion; disruptive student behavior rating; appropriate general procedures; consistently enforces work standards; consistency in managing behavior; teacher gives clear directions; appropriate pacing of the lessons. The procedure resulted in three distinct groupings: three best managers, seven middle group managers, and three poor manager group teachers. The best and poor group were consistently higher or lower on most of the management variables. Comparisons and contrasts among the groups were then described based on five important aspects of science classroom activity. The five general categories included: general classroom procedures, time use and activities, laboratory and hands-on activities, student work procedures, and content presentation, including note taking. For brevity, will be on the three best managers with reference to the other two groups where it is deemed necessary are provided.

In terms of general classroom procedures, the three best managers had procedures that effectively governed student talk, participating in oral lessons and discussion, getting out of seat, checking or turning in work, having work for early finishers, and ending the class. At the beginning of the school year, all three teachers clearly explained their expectations for student behavior, and followed the presentation with reviews and reminders of policy in the following weeks. In all three classes

teachers gave clear, simple directions and were excellent in structuring transitions. They kept students aware of the time that remained for an activity; they notified students well in advance of up-coming transitions; they brought one activity to an end before beginning another. They also told students what materials would be necessary for an activity and had students get materials ready before beginning.

In the three best managers' classes, students were generally expected to work quietly when doing individual assignments with brief whispers being permitted. During laboratory work, higher levels of talking were permitted. The best managers monitored student behavior closely by circulating around the room to examine the students' work. When these teachers worked at their own desks, they were accurate in quickly spotting off-task students.

Consequence systems were more visible in two of the three best managers' classes. These two teachers used a system of demerits and detention after school consistently and fairly. The other teacher seldomly rarely used any kind of penalty with the exception of "points off," and he used no rewards other than grades. Inappropriate behavior was usually stopped quickly by all three of the teachers by reminding the students of what they were to be doing, saying the student's name, or asking for silence. The teachers' manner in conducting class was task-oriented and business-like, although pleasant.

Results pertaining to time use and activities failed to show differences between more and less effective managers with regard to total instructional time. Teachers varied widely in terms of the proportion of class time in different activities, such as

whole class instruction, student activities, and transition time. In fact, the highest and lowest proportions were found in the group of middle managers. Finally, despite their poor control of student behavior, the low manager group did not have higher mean proportions of class time spent in transition. (Time per transition may have been longer, but these teachers may have attempted fewer transitions.) Based on these results, the author concluded that the proportion of class time spent in different activities did not appear to be a productive way to look at junior high classrooms. "Total instructional time is a less important variable than appropriateness, pacing, and accountability of instructional activities and student engagement rates" (p. 583). In general, the three best managers were characterized as having a lot of work for students to do in class and students were held accountable for that work.

Laboratory activities in classes taught by the three best managers usually ran smoothly and efficiently. These teachers defined the task clearly for students, prepared materials and established procedures that allowed students to work with a minimum of confusion and delay and monitored students work closely. Periods of teacher assistance or instruction for individuals or small groups were usually brief, so that the teacher could maintain awareness of all students' behavior. Students were orderly and talk was mostly task-related.

In classes taught by the more effective managers, there were clear work requirements, good monitoring of student progress on assignments, and frequent checks of daily work and quizzes. The beginning class routines of the best managers helped students and teachers keep track of assignments. Students were held

accountable for copying each day's assignment and schedule into their notebooks. Due dates for assignments were not routinely extended or ignored. Students were penalized in some way for late work.

From both the teachers' and students' points of view one of the more difficult work procedures involved the management of relatively long term assignments such as research papers or projects. The more effective managers utilized procedures that helped students succeed on long term assignments. These included: assigning individual topics (allowing for a quick start and easy adjustment of difficultly based on the student's individual ability); providing written, detailed descriptions of requirements for form and content, and due dates; using several intermediate check points; providing examples of acceptable projects and checklists of requirements or grading criteria.

In terms of presenting content, all of the teachers presented a great deal of content utilizing strategies other than oral explanations. Students often read from a text or a handout, wrote answers to questions or definitions of terms, or completed some kind of worksheet. Class discussion focused on and reinforced the content of these assignments.

More and less effective managers were similar in that they usually helped students take notes during content presentations by writing essential facts on an overhead transparency or chalk board. Good managers were different in that their presentations and explanations were clearer, their directions about note taking were explicit and firm, and they held students accountable for notes that were to be taken.

During presentations, these teachers wrote down facts, sometimes in outline form, as they discussed points and checked for student understanding by questioning students and asking them to define terms used in their notes. Some teachers showed students examples of good notes and pointed out strategies to use. In addition, student notebooks were checked periodically.

For the most part, the pattern of teacher and student behavior relationships found in science classes are similar to those reported in other content areas (Emmer et al., 1982; Evertson & Emmer, 1882). "The skills required to manage science instruction are not significantly different from those characteristic of competent teachers in other secondary subject areas, although the complexity of some science class activities and content requires special attention to some aspects of management." (p. 585).

Since the data were derived from the previous study conducted by Emmer et al. (1982), similar methodological problems existed. The most significant concern was with the teacher interviews. Although there were a set of core questions addressed, there was no mention of who analyzed the data or what methods were used in the analysis.

As with previous studies done by this research team numerous variables were analyzed and some mention of the cumulative error rate was in order. However, what is unique to this research were the occasional high correlation values reported. Some as high as $\underline{r}$=-0.91 between consistently enforcing work standards and off-task behavior. Unlike many of the previous studies, these values were of practical value.

The Management of Academic Tasks

Numerous studies conducted in the area of classroom management were built around a conceptual framework for integrating the managerial and academic dimensions of classroom life (Doyle, 1983; Doyle & Carter, 1984; Doyle, Sanford, & Emmer, 1982; Doyle, Sanford, Clements, Schmidt-French, & Emmer, 1983; Doyle, Sanford, Schmidt-French, Clements, & Emmer, 1985). The central component of this framework was the concept of "classroom tasks." This framework represented a significant shift away from the way classrooms were previously viewed. As a result, a brief description of this framework provides a basic understanding for viewing this new perspective.

The term "task" was used to designate the situational structures that organized and directed thought and action. In other words, tasks contained the plans for behavior that were embedded in instructional settings. The study of tasks provided a way to examine how students' thinking about subject matter was ordered by classroom events. Tasks organized cognition by defining a goal and providing instructions for processing information within a given setting. For the student, a task had three elements. Briefly stated, they included: (a) a goal or product; (b) a set of resources or "givens" available in the situation; and (c) a set of operations applied to the resources to accomplish the goal or generate the product.

From the teacher's perspective, the academic work students accomplished was only one dimension of the task of teaching. In addition to structuring academic tasks

for students and assisting them in accomplishing the tasks, a teacher had to create work settings for a group and attend to the monitoring and pacing of group events. Teachers encountered classrooms as units of time and as groups of students. In addition, there was a general expectation that classroom events appeared to have some connection to the recognized outcomes of schooling. These situational factors defined the task of the teacher as one of gaining and maintaining cooperation of students in activities that filled class time. The term activity in this context refered to how groups of students were organized for working (e.g., seat work, small group discussions, lectures, etc.) Other dimensions of activities included duration, physical space, the type and number of students, props and resources used, and the expected behavior of students and teachers.

Based on this conceptual framework, an extensive research program was established. The following review encompassed three of the publications conducted by the project staff (Doyle, et al. 1982; Doyle, et al. 1983; Doyle, et al. 1985). These three studies were considered to be Phase I of the Managing Academic Tasks (MAT) study which focused on junior high schools.

The core of the research consisted of intensive case studies of two classes in the content areas of science, mathematics, and English. The particular focus was on academic work, the context of the curriculum, and how it is managed by the teachers and students in the classrooms.

Two teachers in each subject area were chosen based on indicators of teaching and management effectiveness, the variety of academic tasks used in their classes, the

feasibility of observation schedules, and the contrasts between the teachers' approaches. One average ability class (based on school district criteria) per teacher was selected for extensive observation. The classes consisted of two eighth-grade science classes, one seventh and one eighth-grade English class, and one seventh and one eighth-grade mathematics class. Observers for the study included four senior researchers with experience in writing classroom narratives and two junior level observers with graduate course work and teaching experience in science and English respectively. The sources of data collected during the six-week grading period included classroom observations, instructional materials, graded student work, teacher interviews, and student interviews.

Classroom observations were carried out by having one observer observe a single teacher every day during a six-week grading period. During each observation, the observer was responsible for generating a narrative description of classroom events. Observers took rough notes in class and then dictated, as soon as possible, a complete narrative on tape. The taped narratives were then transcribed.

In constructing the narrative records, observers concentrated primarily on information that defined the nature of students' products and the conditions under which they were produced. In addition, observers kept a record of time and provided a running account of classroom events. Observers focused on such dimensions as student participation and engagement, teacher location and movement in the room, sources of student initiated questions, and other indicators of the flow of work in the

classrooms. Information about the physical setting of the room and location of students was also noted.

The second data source was the classroom materials. Because the major question focused on defining tasks, copies of assignment sheets worksheets, textbooks, and other materials used by the teacher and students were collected.

The third source of data included graded student work. The work that students completed was examined after it was graded by the teacher to determine what the students actually did in accomplishing a task and how the teacher evaluated the products. After observations were completed, all teachers were interviewed. The general themes of the interview focused on the grading system, choice of assignments and level of importance, major purposes, successes, and failures. With regard to tasks specific to their classes, teachers were asked about goals and objectives, the cognitive operations they had in mind for students to use in accomplishing the tasks, and their views of the success of the tasks. Students were interviewed with the intent of providing some perspective on how junior high students viewed academic work and its accomplishment.

Analysis procedures were adopted from previous work done by Doyle and Carter (1984), and represented a qualitative approach to data gathering and analysis. In defining tasks, attention was directed to the products students generated for the teacher and to the events leading up to the creation of these products. In the initial analysis, each observer was responsible for generating a description of the academic tasks operating in the class of their assigned teacher. Information obtained from the

data were used to produce (a) topic lists, (b) task lists, (c) task analyses, (d) teacher task system summaries, and (c) student case studies.

The results of the study focused on the general patterns of academic tasks in the six classes. However, for the purpose of this review, commonalities across the various classes are presented along with results specific to the science classes. The results were presented in four sections with each section having a discrete focus. The first of these sections was concerned with "subject matter strands," that is, the sequence and integration of tasks into the overall content structures or schemata. Across the six classes, there were approximately 200 tasks accomplished. Briefly stated, the general task forms seen across several classes included: text or ditto assignments, routine review or practice, laboratory experiences with reports and questions, tests assessing recall level objectives, tests requiring comprehension and application operations, and composition tasks in research reports.

Across all teachers, four impressions were deemed valuable. First, the teachers were skillful managers. Work involvement and productivity among the students was typically high with no serious disruptions or patterns of inappropriate behavior observed throughout the data collection period. Second, teachers were explicit and thorough in explaining content and procedures and in helping students complete the assigned work. Third, teachers provided ample time and multiple opportunities for students to complete the assigned work. Finally, there was, with one exception, a strong semantic thread running through the content strands which served to tie separate tasks together.

It turned out that the greatest contrast between classes existed in the area of science. Teacher A devoted the six weeks to measurement and experimental design. These topics were not often covered in great depth in junior high school science. In addition, tasks were defined broadly, and separate tasks were clearly presented as components of a larger content picture. In other words, the emphasis was on meaningful units of content and the setting of experiences that maked these units meaningful to students. In daily activities, the schedule was loose, and accountability and productivity were not dominant themes.

Teacher B, on the other hand, covered circulation and digestion. These topics were commonly covered in junior high science, and daily productivity was high. The emphasis in this class was on discrete pieces of the content rather than integrating concepts with the content strands and many of the tasks being only loosely tied together. The impression was that the class was driven by the logic of classroom management (i.e., keeping students on task) rather than the logic of the content. The students did numerous laboratories, work sheets, textbook reading, etc. However, it was not clear that any overall meaning was built into the system. There was also a small amount of evidence that would suggest that there were structural features of academic tasks that defined their place in the work system. For example, in the science classes of teacher A, students who wanted to earn a "B" in the class had to complete one of three optional assignments. Those who wanted an "A" had to complete an additional one of three assignments. Although some class time was allowed for working on the optional assignments, most students who chose these

assignments, worked on them outside of class. Only 12 of the 25 students elected to do these assignments and some appeared to treat them as extra credit. In fact, one of the most capable and regularly high scoring students in the class accepted a "C" on her report card rather than complete an optional activity. This example, along with others presented in the research, suggested that there were distinct structural properties associated with different types of work.

Before the onset of data collection, it was proposed that academic tasks were divided into four categories: memory, routine or algorithmic, opinions, and understanding. These categories were evident after the analysis of the data. However, as a result of data analysis and the difficulty of being able to distinguish between high- and low-level tasks, alternative ways of depicting differences among tasks became necessary. As a result, "major" and "minor" tasks were introduced to reflect obvious differences in the amount of time and credit assigned to various work.

A major task, for example, might have been a major test based on content that was covered during a two week interval counting for one fourth of the final grade for the term. Minor tasks, on the other hand, typically were those completed in one or two class periods, and grades on these tasks were averaged with several other grades before contributing to the final grade. Based on this breakdown of the data, some patterns emerged. First, in semantically integrated task systems, minor tasks represented opportunities for practice which led up to major tasks. In multiple strand classes, minor tasks were also used for weakly developed strands such as literature or

vocabulary. In some classes, the distinction between major and minor tasks was less clear. However, the teacher did give differential credit to different tasks.

Accountability and credit revealed a curious interplay between the major and minor tasks. In one sense, it appeared that standards of accountability were more stringent for minor tasks. Items were either right or wrong. On the other hand, the teachers typically handled grading of major tasks, whereas students often exchanged papers for grading minor tasks. Apparently, the grading of major tasks was much more complex because in addition to being correct or incorrect, the quality of the response was considered. In addition, major tasks counted more heavily in grading for the term and were typically more complex. In other words, the consequences of major tasks were greater and accomplishment was more difficult. However, it should be noted that these results were the initial characteristics that served to distinguish between major and minor tasks in the first place. As a result, teachers were more careful in handling accountability for the these tasks. In some instances, major tasks were repeated because the teacher was concerned about low scores. It was unlikely that the same teacher repeated a minor task because of low scores.

Familiarity and assembly in task systems were other distinctions made in an effort to understand the differential character of major tasks. Familiarity referred to the similarities in task elements across occasions in which the students worked with a particular content strand. Analysis of this dimension focused on the amount of intellectual work students had to do to connect what they knew to the particular problem or products on which they were working.

Assembly focused on the extent to which students were required to put information or operations together in ways they had not previously seen. From the perspective of student performance, there was also a difference between familiar and assembly tasks. In general, as the complexity of the task increased, rates of errors and non-completion of work increased. In addition, when assembly tasks did occur, it was much more difficult to sustain productivity in a class.

The issue of accountability became more sensible when it was viewed from the perspective of task familiarity. In general, routinized and familiar tasks, whether major or minor, were subject to strict accountability. Students were expected to hand their work in on time, and assessments of performance were traced directly to summative grades for the term. In some classes, however, it was observed that accountability was suspended or at least softened when students were working on more challenging tasks.

On a few occasions, teachers used bonus points to supplement grades for individual tasks and gave extra credit chances to complete tasks successfully. For example, low scores on a test may be accompanied with preparation for and retaking of another test. Or, the winning team in a review game may have received five bonus points to be applied toward their grades on the test. Bonus points were also used by most of the other teachers, but the relation of bonus points to grades for the term was not always clear. Bonus points were often not recorded or were attached to work that did not count heavily in calculating the final term grade. It appeared that bonus points were often used as an inducement to encourage students to do a particular task (or

those that may be more demanding), with the long term effect being minimal and not always being made explicit to the students.

The grading of daily assignments varied widely among the teachers, with half of the teachers having rather loose policies, or in some cases not grading the material at all. However, the impression was given that all work was inspected by the teacher. Accountability in these classes seemed to be based on the teachers' personal knowledge of each student's progress.

An examination of grades that contributed most heavily to a term grade, indicated that they were typically attached to work that was most familiar and routine. In other words, a significant portion of the term grades consisted of work that was readily accomplished by nearly all of the students. At one level, there seemed to be a presumption among the teachers that students were expected to accomplish these tasks and, therefore, were held accountable for the work. At another level, this policy for major grades worked in conjunction with policies for bonus points and grading new work to create an economy of surplus credit in classrooms and a "fail safe" cushion for academic work. In terms of the conceptual framework of the study, "teachers appear to suspend risk for academic work in a solution of surplus credit" (Doyle et al., 1985, p.43). Part of this effect occured because all grades were reduced to a single grade at the end of the term. Along the way, some grades were lost or their effects are erased. In addition, the surplus credit system enabled the teacher to rapidly adjust the effects of risk on particular tasks. In particular, those tasks where performance was likely to be poor was adjusted without having to abandon accountability.

In terms of the curriculum, the junior high school classes appeared to be designed for the efficient production of academic work. That is, task systems were constructed and managed in such a manner that a great deal of student work was accomplished with a high degree of involvement from nearly all the students. Classes were often organized around routinized work patterns such as warm-ups or writing journal entries. In addition, work was typically defined explicitly and students were given a great deal of guided practice. Finally, the emphasis in processing content seemed to be on using algorithms rather than on higher level cognitive operations.

An examination of the tasks themselves indicated they were usually high in familiarity and low in assembly. For the most part, students seldom operated for very long period of time in novel task environments and were seldom required to pull together information or process information in ways that had not been demonstrated to them in advance. Instruction was step-like and gaps students needed fill with their own information processing was small. As a result, students moved through the curriculum with relative ease and efficiency, and the classes ran smoothly. Most of the teachers appeared to work toward creating familiarity for the task environments, with few opportunities for students to make higher level decisions involving the content.

The interpretation proposed of the production system in these classes was that teachers anticipated possible difficulties associated with assembly tasks and refined the work into steps that students easily accomplished. Essentially, they "smoothed" out the possible work place tension in advance. If it was necessary to reduce tnesion in

the work place, then classroom management, by feeding back into planning decisions, has a substantial impact on the curriculum. That is, teachers are achieving order by excluding academic work that placed strains on the management system. In addition, establishing higher order tasks seemed to require highly refined management skills to operate the work system efficiently.

Overall, this study was well done. The theoretical framework and methodology were extensively detailed and served as a convincing background for the results. If there was a weakness, it existed in the data collection procedure where observers met to discuss problems, insights, and preliminary work on task analysis. Such discussions were also part of establishing agreement between observers. The discussions required the observers to work in pairs so continuous interactions occurred to maintain accuracy and sensitize observers to particular aspects of academic tasks. These techniques may have increased the reliability of observing particular aspects of academic tasks. However, this procedure may also have biased the subsequent data collection of individual observers, in effect, limiting the information each individual observer would brought to the analysis. Greater detail of what was discussed would be beneficial.

Classroom Management in the High School

The following high school study (Doyle, Sanford, Nespor, & Schmidt-French, 1985; Sanford & Schmidt-French, 1986) was Phase II of the Managing Academic Tasks (MAT) research program. Phase I of the MAT study was conducted at the junior high school level. Intensive case studies were conducted in three classes, one

English and two biology. Special care was taken to select teachers who had good classroom management skills (based on nominations from school district instructional coordinators, principals, and university supervisors) and who used a variety of instructional tasks.

Teacher A's class was an honors section of first year biology. There were 20 students in the class, including 7 freshman and 13 sophomores, with 12 female and 8 male students. Teacher A was an experienced teacher who participated in the development of the school's honors biology program. Teacher B's biology class, although an honors section, had a heterogeneous mix of students. There were 26 students in the room, including 12 freshman, 12 sophomores, and 2 juniors. There were 15 females and 11 males with a diverse ethnic composition. Teacher B was an experienced teacher and department chairperson. In addition, she participated in the design of the honors curriculum in the district.

In both science classes, a unit focusing on human genetics was observed. The units observed included a variety of assignments and activities and covered the topics of cell reproduction, including concepts related to the nature of genetic material, principles of heredity, genetic and environmental interactions, and evolutionary mechanisms. Data collection for the high school case studies followed the same procedure utilized in the junior high school study. Analysis for the present study focused only on academic tasks related to the genetics content. The first step in analysis was the identification and detailed description of tasks. Narrative data, instructional materials, student products, and teacher and student interviews were used

to generate descriptive and quantitative summaries of the teaching tasks accomplished. These descriptions were focused around the main characteristics of tasks: task requirements, resources students used in accomplishing the work, accountability aspects, student performance and flow of events involving the tasks. The objective of task analysis was to determine the cognitive demands of students' work. This included the demands as implied by the teacher's description of assignments, the apparent demands based on the information concerning the resources, accountability, student participation, and events in the classroom. Student understanding of the content was inferred from participation in the classroom, interactions among students during group work, inspection and item analysis of graded assignments including tests, and task-focused interviews with selected students.

The second step in analysis was the identification of all major strands of content and the work associated with each. The results concerning the biology teachers were given in Sanford & Schmidt-French (1986) and Schmidt-French (1985). In fact, no final report, appears to have been written. It seemed that individual articles were written from the large data-base and presented at national meetings or published as separate reports.

In teacher A's class, students worked on 20 tasks during the genetics unit including eight quizzes, three laboratory or hands-on activities in small groups, and some independent practice activities. The content of the tasks was based on the Biological Sciences Curriculum Study (version unknown) curriculum unit on genetics that focused on cystic fibrosis. (The class was originally designed around the genetic

chapters in Modern Biology.) As a result, the teacher sequenced lectures, class work, homework, and quizzes around the topic of cystic fibrosis. Other instructional materials included a variety of teacher collected handouts, work sheets, film loops and films on probability, DNA structure and function, statistics, and cell reproduction. Only one assignment was based on the textbook chapter. No other reading assignments were given from the text.

Another characteristic of work in this class was that many basic principles showed up on successive tasks, especially quizzes. Testing, checking, and discussion of tests and retesting provided students with repetition and independent practice with some of the important concepts. However, not all concepts were emphasized in this manner. Omission of practice tasks with other key concepts seemed to be related to the teacher's first time use of the cystic fibrosis unit.

An additional problem observed in this class was that content presentations and discussions did not always provide students with well organized, clear explanations of the content. Presentations and discussions usually preceded relevant tasks. Students were vocal and classroom discussions were almost always interactive, often unruly, and typically dominated by five or six of the students.

Task management and accountability seemed to have an impact on the students' work. Work other than laboratory was limited to individual efforts. The teacher was forced to make compromises in the checking of students' work. Assignments were frequently checked only for completion. Other times, assignments were graded in class or by the teacher or pop quizzes were given over the content.

Varying the accountability procedure, but never suspending requirements for individual effort, seemed to serve the purpose of holding the students accountable for assignments. This finding was supported by the teacher interview.

Effort grades and the chaotic climate of classroom discussions made it difficult to assess individual student's understanding, except for that content that was repeated on quizzes, however, this may have been masked due to circumstances. First, some tests were open book, even for recall questions. Second, similar or identical problems were used on different tasks. Third, the teacher often had last minute reviews prior to a test.

In teacher B's class a total of 26 tasks were completed. The content was based around the unit in Modern Biology. Other resources included articles and diagrams from various journals and magazines, film loops, teacher-made handouts, overhead transparencies, wall posters, and work sheets. Teacher B sequenced the content roughly as it was presented in the text. Although some of the text content was omitted, the teacher supplemented the content with her own materials, in particular, a fruit fly experiment started early in the unit in order to have usable data by the end of the unit.

In general, students engaged in a variety of activities accomplished in a variety of settings. Engagement was usually high with a great deal of work being accomplished during the class period. Tasks were logically sequenced and designed so that several of the tasks required students to integrate content presented in previous sessions.

Student work was usually introduced by teacher presentations of genetics content and procedures for carrying out laboratory activities. Teacher B questioned students frequently during these sessions, asking students to repeat information or provide answers to problems worked on the board. Questions were also used that required students to integrate past material or apply procedures to a new situation. Each presentation was followed by one to three minor tasks such as homework, a quiz, or laboratory assignment. For lab assignments, students were required to make observations, record data in a variety of forms, and at times provide written answers to short essay questions.

Two aspects of task management in this class seemed to have marked effects on student learning. First, in the long term fruit fly lab, procedural problems may have interfered with student learning. The laboratory activity was a very difficult and procedurally complex. Extensive teacher assistance and prompting appeared to make it possible for many students to complete the assignment without understanding their work. In addition, many flies died because of poor handling techniques and contamination of food supplies. As a result, the cognitive demands of the task were typically reduced as the teacher provided much of the problem solving for the students.

The second factor was that, although the teacher provided a number of assignments to give students practice, the use of group work and in-class checking made it difficult for the teacher to monitor individual student understanding. In group settings, one paper from each group was selected for correcting. Many students were

observed copying answers from peers or simply requesting and receiving answers without explanation. In other cases, homework assignments were checked for completion only, then discussed in class before being turned in for checking by the teacher. This practice gave students feedback on their performance, but it may have made it difficult for the teacher to assess individual student's performance.

Across the two case studies, students were considered "successfully" engaged in a variety of carefully planned tasks with genetics content. They learned about genetics by doing and discussing a range of tasks from simple observation and memory work to inference and complex problem solving. The curriculum they experienced extended beyond the textbook treatment of genetics, and comprehension and meaning were emphasized in their work. There were logical relationships across tasks and between tasks and other aspects of instruction.

Nevertheless, interviews with students, analysis of student performance on quizzes, and students' interactions during class provided evidence that there was poor student understanding of concepts and procedures in several areas. In addition, many students showed poor understanding of some of the tasks in which they were engaged. Poor student understanding was especially apparent in the laboratory task involving fruit fly crosses. Some students had misconceptions about terms used (e.g., wild flies and virgins). Others failed to understand the purpose of the exercise and what it had to do with genetics.

Sources of student difficulty became evident as a result of examining classroom tasks and their relationship to other aspects of instruction. First, in both classes there

were instances of insufficient or unclear explanation of particular concepts or problem types. Unclear explanations were particularly true of class A, where high levels of unsolicited verbal comments and confusion sometimes interfered with discussions. In classroom settings, explanations were often repeated many times, to the whole class, small groups, or individuals. Another consideration was that teachers' verbal explanations were not the only sources of explanations. Handouts, instructional materials or textbooks were also considered as a source of explanation. However, students were not always required or desired to read these additional sources.

A second issue in both classes was the amount and quality of student practice tasks. Providing sufficient practice, monitoring student performance, and giving corrective feedback were clearly problems in settings where there was a large amount of complex content. One of the teachers used peer group settings to work on problems and correct them. Unfortunately, these small group settings did not always provide individual students with accurate feedback or explanations. Group work also softened accountability for independent student effort and seemed to make it difficult for the teacher to know who understood the work.

In some cases, the learning experience was also affected by the amount of prompting and assistance students received from the teacher. For example, both teachers announced answers immediately before quizzes. Utilizing this procedure had the effect of reducing the cognitive demand of the work. Students were able to "get through" a task without actually doing the operations, much less understanding them.

The third issue concerning the two case studies was that of the difficulties teachers faced in making wise choices of classroom tasks for different objectives. Hands-on experiences were valuable, but students may have lost sight of, or failed to focus on, the meaning of concepts that were the reason for doing the laboratory activity. Therefore, teachers needed to decide when hands-on experiences contributed and when they interfered with student learning. Simplifying procedures and manipulations for students have been warranted when students were working with new or complex concepts. It could be argued that experiments provided on film loops, slides, or computer simulations resulted in better understanding for students as opposed to actually conducting the experiments themselves.

The problems associated with this study were much the same as those mentioned for the MAT studies conducted at the junior high school. Particularly, there was concern for the data collection procedure where observers met to discuss problems, insights, and to begin preliminary work on task analysis. As previously mentioned, these discussions may have resulted in biasing the individual observers by focusing attention on a limited number of variables, when the goal was to maintain validity of observations. No information was provided that allowed a reader to conclude that a biasing effect did not occur.

In addition, it was important to realize that the teachers selected for participation in both phases of the MAT studies were probably not typical of inservice science teachers. They were selected based on specific abilities (i.e., their ability to manage a classroom, use of a wide variety of tasks, and effectiveness in teaching their

content). Further, the high school phase specifically focused on higher level thinking. It turned out the two classes selected were honors biology classes. Therefore, the results may not have been a true reflection of what occured in a more typical classroom setting.

Utilizing the data and preliminary analyses collected as part of the Managing Academic Tasks Study (Doyle, Sanford, French, Emmer, & Clements, 1985; Doyle, Sanford, Nespor, & French, 1985), Sanford (1987) combined the data of the four science classes to compare patterns of occurrence and management of higher level tasks. Specifically, the analysis of tasks in these four classes was designed to answer the following questions: (a) How often were higher level tasks attempted in these classes, and what was the nature of these tasks, (b) What management strategies and conditions were associated with conduct of higher order tasks, (c) What impact did these management strategies and conditions have on student engagement in the tasks and on the use of intended or other cognitive operations?

The study utilized data from all science classes that were included in the Managing Academic Tasks (MAT) study. The study examined the work of ten secondary classes in four content areas. As a review, a brief description of the four science classes is presented.

Class A was an eighth-grade, combined life/earth/physical science class containing 25 students. The class was heterogenous with regard to academic achievement. It met in a large, well equipped room which included both regular classroom desk arrangement and six laboratory tables. During the observation period,

instruction focused on two related units: (a) the metric system and laboratory measurement, and (b) scientific research methods.

Class B was an 8th-grade general science class containing 28 students. It met in a large classroom equipped and arranged for laboratory activities. Instructional units on human circulatory and digestive systems were observed in this class.

Class C was an honors section of first-year biology. There were 20 students in the class, including 7 freshmen and 13 sophomores. Students' standardized achievement test scores from the previous year ranged from the 69th to the 90th percentile, with half scoring at the 90th percentile or above. During the six weeks that this class was observed, students completed a unit on genetics and worked on independent research.

Class D was also a high school biology section identified as an honors section, but it had a relatively heterogeneous student composition. There were 24 students, including 11 freshmen, 12 sophomores, and 1 junior. Students' standardized achievement test scores from the previous year ranged from below the 50th percentile to the 99th percentile. During the seven weeks of observation, students completed a unit on genetics, worked on independent research projects, and conducted a long-term genetics experiment using fruit flies.

Data analysis was similar to previous MAT studies. However, slight differences were necessary in order to answer the specific questions of this study. Briefly stated, preliminary analysis consisted of mapping (outlining) the content of the observed class periods and identifying tasks in each class. Next, a separate analysis of

each observed task was undertaken. Using information from the narratives, instructional materials, student products and teacher and student interviews, observers completed a detailed analysis of each task. Analysis included descriptions of all requirements, including changes, all the resources students appeared to use, and discussion of accountability aspects. The final step of analysis included an assessment of cognitive operations.

Using these task descriptions, a survey was made of the comprehension-level tasks in the four classes. Tasks were included in the higher order or comprehension-level category when they included at least some components which, by design, students could not complete by (a) simple memory, (b) routinely or automatically applying an algorithm, or (c) search and match. Consideration was given to management strategies or conditions associated with each comprehension-level task.

The following table summarizes information about the classes in the sample, frequency of tasks observed, and frequency of higher level objectives. In different classes, the proportions of observed tasks that were categorized as comprehension level ranged from about one third to one half.

Table 1

Tasks Observed in Four Classes

Class	Grade	Tasks Observed	Comprehension Level Tasks
Class A	8	20	10
Class B	8	30	11
Class C	9-10	24	10
Class D	9-10	28	13

The author pointed out that these counts may have been misleading. First, they did not differentiate among minor and major tasks. Some of the tasks may have been conducted over a period of days while others may have been a short activity at the end of the class period. Others may have been assignments loosely inspected by the teacher and with no impact on student grades. In addition, the totals included required, extra credit, and optional tasks, as well as tasks that were higher level by design, but as managed by the teacher and performed by the students appeared to make no comprehension-level demands on students.

Descriptions of the events in each of the classes, though presented in the results of this study, are not presented again, as they are similar to the previous MAT reviews (Doyle, Sanford, Schmidt-French, Emmer, & Clements, 1985; Doyle, Sanford, Nespor, & French, 1985). Nevertheless, the results demonstrated that planning and conducting comprehension level tasks in secondary schools was not an easy task. In the classes

observed, higher level tasks were demanding on the teacher and distressing for students. Results often fell short of curricular goals.

When teachers in this sample engaged students in work that was intended to be at the comprehension level, it seemed most frequently accomplished by (a) creating an aura of accountability around the task to force students to attempt the task, and (b) by providing a variety of "safety net" devices to keep students from failing at the task.

Accountability, particularly for long term, higher level tasks, was raised for noncompliance and reminded students frequently of this price. Some teachers made some tasks count 25% or more of term grades; one reminded students frequently that certain assignments counted twice in her grade book; and some sent failure warnings home to parents of students not making progress on research reports. For some tasks, public accountability was added to grade book accountability when teachers required students to present their work to the class. Some minor tasks were not graded or were checked only for completion, however accountability was maintained with sufficient regularity that students expected to be held accountable.

Many examples of management strategies that appeared to have the effect of providing "safety nets" for students were provided in the study. These strategies included a wide variety of ways that individual student's risk of failure was reduced. Briefly stated are some examples of the "safety net" strategies utilized by the teachers:

1. Group work or paired work, particularly in laboratory activities to soften the burden of individual performance;

2. Peer assistance;

3. Teachers balanced difficult or unfamiliar content with easy or very familiar content on tests, or grading tasks in such a way that higher level components counted less than memory or procedural components;

4. Teachers allowed students to revise products after they have handed them in, with no grade penalty;

5. Teacher assistance, prompting, and responses to student requests for feedback during work sessions;

6. Extra credit assignments and, to a lesser extent, extra credit questions on tests;

7. Less exacting grading (on essay or explanation questions) for low achieving students;

8. Grading on completion (effort grades) of minor tasks, not accuracy, especially when students' ability to perform tasks with accuracy is unlikely;

9. Providing models of products and other explicit resources such as outlines for students to follow;

10. No-risk pop test or when students received extra credit for perfect papers or for every correct answer, and received no penalty for incorrect answers;

11. Presenting last minute instruction or review of key content immediately prior to a test;

12. Teacher utilizes a flexible grading system which maked it easy to devalue assignments on which students scored poorly.

According to teachers' interviews, some of these strategies were used with the specific intent of reducing risk to students or preventing too many failing grades. In some cases, teachers used other rationales as well, but the problems of getting students to succeed at difficult tasks and avoiding too many failing grades in a class appeared to be the major considerations for secondary teachers. Whatever the reason behind teachers' use of different strategies in managing students' work, the strategies themselves often impacted how or whether the students engaged in higher level tasks.

When considering the effects of different management strategies on task demands, the results indicated that some strategies reduced tasks in critical ways more than others. Some may have also reduced students understanding of tasks or teacher's ability to monitor students' understanding. Such teacher decisions seemed to make a difference. For example, allowing students to revise and resubmit poorly done writing probably provided a better work experience for students than did narrowing the assignment initially by giving students a explicit outline or model to follow. The latter strategy may have been more efficient than the former, but it provided fewer opportunities for students to attempt high level work. The author claimed that, in a sense, these results argue for providing less direct instruction before tasks and more feedback and instruction during and after tasks.

Although group assignments had important merits, routinely allowing group work or peer assistance greatly reduced individual student's accountability to deal with comprehension level tasks. It made it difficult for teachers to monitor individual

student's performance and understanding, and it sometimes perpetuated misinformation and misconceptions as students shared their confusion with each other.

A management strategy that seemed to routinely suspend accountability for students' higher level work and checked consistently on only procedures or completion places higher level tasks at risk. This strategy did not appear to encourage students to take comprehension-level work seriously. On the other hand, occasionally giving completion or effort grades, before discussing these tasks in class, does not have such negative effects, especially when students expect to be held accountable for a sincere effort. Since this particular research article utilized the data gathering and analysis procedures from the larger MAT studies, the same difficulties that were apparent in those articles apply here.

Discussion

Although all of the studies in this review had varying degrees of problems, their strengths are in the consistency of results. Some of the consistencies found among effective managers included: planning and organizing the learning environment (planning before school began, arranging the classroom, planning rules and procedures, and allocating time through rules and procedures); establishing and maintaining a positive learning environment (expectations, routines, classroom rules, monitoring, student accountability). Overall, the findings indicated that teachers do influence the events that occur in the classroom. However, it should be emphasized, once again, that the considerations mentioned above were small elements of a much larger and

dynamic system. They were influenced by the tasks in which students were engaged (Doyle & Sanford, 1985), the instructional setting (Beasley, 1983), the perceptions, desires, and abilities of the students (Good & Beckerman, 1978), student socioeconomic status (Brophy & Evertson, 1976 cited in Brophy, 1979), the curriculum, and the social system of the school (Kilbourn, 1986). These, in turn, influenced each other and the result was a dynamic interplay in an effort to arrive at an equilibrium.

Overall, many of the initial, well-funded, large-scale, field-based correlational studies were well done (Emmer, Evertson, & Anderson, 1980; Emmer, Evertson, Sanford, Clements, & Worsham, 1982; Emmer, Sanford, Clements, & Martin, 1982; Evertson & Emmer, 1982). However, some problems still remained. For example, many of the studies frequently examined a large number of variables. Therefore, statistically significant variables were more likely to occur simply by chance. Further, many of the significant variables often possessed correlational values that were moderate at best, and the practical importance of such values was questionable.

Methodologically, there were often extended periods of time, during the data collection phase, when no observations were made. Observations were often made during two, two to four week periods during the entire school year with achievement data collected at the end of the year. The extended lag time between observations and the end of the year make causal inferences speculative. In addition, teacher thinking as a context variable was never considered. Clark & Peterson (1986) contended that thinking, planning, and decision making of teachers constituted a large part of the

psychological context of teaching and that teacher behavior is substantially influenced and even determined by teachers' thought processes. Therefore, interviews of the teachers might have provided insight into the actions of the teachers.

The subsequent group of classroom management studies that utilized Doyle's (1983) theoretical framework of academic tasks was also well done (Doyle & Carter, 1984; Doyle & Sanford, 1985; Doyle, Sanford, Clements, Schmidt-French & Emmer, 1983; Doyle, Sanford, & Emmer, 1982; Doyle, Sanford, Nespor, & Schmidt-French, 1985; Doyle, Sanford, Schmidt-French, Clements, & Emmer, 1985). The academic task studies collected data from relatively small samples (four to six teachers) and during a single grading period, but were very intense and "data rich." Data collection occurred on a daily basis and included classroom observations, teacher interviews, student interviews, and the students' completed assignments. As a result of the qualitative nature of data collection and analysis, the results portrayed a cognitive view of management from the perspective of the teacher, the students, and the interactions which developed. The findings indicated that there were specific problems or elements of concern that teachers should realize. The general concerns included: communicating the tasks to the students so they understand what they are supposed to be doing and how they are to be doing it, monitoring student work, encouraging students to engage in novel tasks, making connections among classroom tasks, and choosing task types and forms.

So what do these results mean for science teachers? Are there specific management concerns unique to science teaching? In an effort to answer this

question, it was necessary to examine the samples utilized in the studies and how the data were analyzed.

In the initial search of the literature, it was discovered that very few classroom management studies utilized science classrooms. In those studies that used science classrooms exclusively, in all cases, small pieces of a much bigger puzzle were examined. For example, small group laboratory settings (Beasley, 1983), management activities and task involvement in secondary science classrooms (Butler, Beasley, Buckley, & Endean, 1980; Nuccio, 1981; Tobin, 1986), academic tasks during a genetics unit (French & Sanford, 1985), student engagement in high school science classes (Gallager & Tobin, 1987). As a group, it was difficult to determine if there were unique management considerations in the science classroom because the focus of each study was slightly different. In short, significant variables served to verify many of the results obtained from the large, field-based correlational studies or the research done on academic tasks. In addition, since the samples were exclusively science classrooms there was no means of comparison with other content areas.

The studies that considered content as a context variable, and included an assortment of different subjects in the sample, were the large-scale, field-based studies and those that examined academic tasks. For example, Evertson and Emmer (1982) examined junior high school math and English classes; Emmer, Sanford, Clements, and Martin (1982) examined math, English, science and social studies; Evertson, Anderson, Brophy, and Anderson (1978) included mathematics and English in the sample; Doyle, Sanford, and Emmer (1982) included junior high school science,

mathematics and English classes; Doyle, Sanford, Nespor, and Schmidt-French (1985) utilized science and English classes.

In all the studies that utilized a variety of different content areas, descriptions of the classes were provided. In particular, the research dealing with academic tasks provided rich descriptions of the classrooms under investigation. However, in all cases, the data were analyzed to determine the commonalities that existed among the classes. In only a few isolated instances were differences between content areas noted.

One of the first studies to note management differences between content areas was conducted by Evertson, Anderson, Brophy, and Anderson (1978), who examined mathematics and English classes. It was found that: (a) there was more seatwork in mathematics than in English courses; (b) individualized instruction was rarely used because it was less effective and unpopular with students in mathematics; (c) rates of misbehavior had strong negative correlations with achievement in English, but not mathematics (the mathematics teachers were viewed by the observers as being much better managers and able to deal with misbehavior in a way that caused little disruption); (d) in English, teacher questioning and interaction was unrelated to achievement (such a pattern was less clear for mathematics).

Evertson and Emmer (1982) also noted content differences in a sample of junior high school mathematics and English classes. It was found that less effective managers in mathematics experienced fewer problems with feedback than did less effective managers in English. Fewer feedback problems were due in large part to the high frequency of checking of assignments by the students and extensive use of warm-

ups. In addition, less effective math teachers benefited from the linear structure of the curriculum in junior high math and the reliance on a single text. In English classes, spelling, English usage, writing, aspects of literature, dictionary and reference use had to be integrated. Therefore, the teacher had many more decisions to make about appropriate sequencing, mixture of activities, objectives, and assignments. Consequently, for English classes there was a greater potential for problems in communicating clearly about directions, objectives, routines for conducting activities, and carrying out assignments.

The only study that attempted to specifically address the management concerns unique to science classrooms was Sanford (1984). The study provided an in-depth examination of the data obtained from the JMIS (Emmer, Sanford, Clements, & Martin, 1982). Sanford found that, for the most part, relationships established in science classes are similar to those reported in other content areas. "The skills required to manage science instruction are not significantly different from those characteristic of competent teachers in other secondary subject areas, although the complexity of some science class activities and content requires special attention to some aspects of management" (p.585). Although there was a recognition that management demands may have differed in science classrooms, there was no elaboration on what demands required special emphasis. Such a finding was not surprising if one considered that the Sanford study utilized data obtained from a larger study designed to find commonalities among the different content areas, not distinguish among them.

It is important to note that those studies which found differences between content areas did so in a post hoc fashion. That is, there was no attempt at the onset of the study to specifically address differences that existed between content areas, even though a variety of content areas were included in the investigation in recognition that content could be a factor. It was obvious from this review that recent critics of the process-product research paradigm were correct in their claims (Buchmann, 1982; Shulman, 1986). The most significant claim focused on the tendency to ignore the specific curriculum or the subject matter being studied. Current research in the area of pedagogical content knowledge presumes that teaching does not occur independent of the content being taught. By definition, teaching implies that something is being taught. Similarly, it is proposed that the subject matter may, in part, have an influence on classroom management demands science teachers encounter. Some of the previously cited studies have identified some differences based on the content being taught. Such a finding would tend to indicate, albeit weakly, that management demands are influenced by the subject matter. However, no study specifically addressed the issue of the management demands unique to science classrooms.

It is recognized that there are some general management skills independent of subject matter. The generalist perspective to management originates from the results obtained from the process-product research paradigm and forms the current knowledge base of classroom management. The integration of subject matter into classroom management research was an attempt to examine a yet unexplored and potentially critical piece of a complex and dynamic system.

In addition to the lack of concern for the subject matter in classroom management research, it is also important to note the changes which current reform movements are attempting to institute in the way science is taught. One of the major focuses of the reform movement has been on a constructivist teaching approach for teaching science (Driver, 1985; NSTA, 1992; AAAS, 1993). The constructivist teaching approach recognizes that students bring to class conceptions about how the world is constructed, how it operates, and that new information is filtered through such understandings. The job of the teacher becomes one of presenting ideas, discrepant events, or results of laboratory exercises that may not be commensurate with the conceptions held by the students. The net result, in theory, is a shift in the way the students view the world. Hopefully, a view that is compatible with current scientific thought.

A major implication of the constructivist teaching approach is that science teachers will change the way they teach, organize, and evaluate lessons and units of study. The role of the science teacher will no longer focus on facts and terminology. Curriculum reformers favor a reduction in the amount of the content being taught in an effort to foster understanding in a few key concepts which can then be applied to new situations and across content areas. Although the constructivist teaching approach is not unique to science instruction, it has been a content area on which reformers have focused. It is believed that the management demands which are unique to science teaching will become more apparent as the reform measures become instituted by science teachers. Identifying the unique management demands of science

classrooms may ease the transition teachers will have to make from an objectivist view of teaching to one that is constructivist in nature.

CHAPTER III

DESIGN AND METHOD

Introduction

The overall purpose of this study was to explore the management demands unique to science classrooms. Although this study focused on science classrooms, language arts classes were included in the sample as a means of comparision. The exploratory nature of the study required qualitative and quantitative approaches. Data collection methods described in this section were taken from previous research studies (Emmer, Sanford, Clements, & Martin, 1982) and modified in an attempt to reproduce and extend the findings of previous research. Specifically, to reproduce previous research and to establish a baseline, classroom observations utilized a coding system described in Emmer, et al (1982). The quantitative data resulting from the data collection methods were statistically analyzed. In addition, field notes were qualitatively analyzed by context to explore management differences between content areas.

Subjects

The sample for this study included six experienced teachers (three biology, three language arts) from two high schools located within the same district in Northwest United States. The school district was situated in a small city with a

population of 45,000 people. All teachers were certified to teach the courses observed in this study.

From the first high school, four teachers agreeded to take part in the study. Teacher A was a biology teacher, with 19 years of teaching experience, who taught two periods of introductory biology and one period of advanced placement biology. The two biology classes contained 32 and 36 students respectively. Teacher B was a biology teacher, with 15 years of experience, who taught two periods of introductory biology and one period of physics. The two biology classes contained 34 and 35 students respectively. Teacher C was a language arts teacher, with 11 years of experience, who taught two periods of English 11 (American Literature) and was responsible for the yearbook. The two American Literature classes contained 33 and 32 students respectively. Teacher D was a language arts teacher, with 18 years of teaching experience, who taught one period of freshman English and two periods of sophomore Honors English (World Literature). The two sophomore Honors English classes contained 31 and 34 students respectively.

From the second high school, two teachers agreed to participate in the study. Teacher E was a biology teacher, with nine years of experience, who taught two periods of introductory biology. The two biology classes had a student population of 35 and 34 students. Teacher F was a language arts teacher with 17 years of teaching experience, who taught a Media Research course and two sections of Global Humanities. The two sections of Gobal Humanities contained 29 and 26 students respectively and were the courses of interest for this study. Unlike the other courses

in the sample, the Global Humanities course was team taught with a social studies teacher during a single period. That is, the students were split into two groups that alternated between the two teachers every other day. For example, group 1 would be in the language arts portion of the class on Monday then go to the social studies portion on Tuesday. The schedule was then repeated on Wednesday and Thursday. On Friday group 1 would see both teachers for half the period. Although the two teachers taught different material to the sections, their efforts were coordinated to emphasize connections. Consequently, the course was taught for the entire year. Only on very rare occasions were the two teachers together in the same room with all of the students. As a result, the influence of the social studies teacher during any particular observation period was of little concern.

The district in which the high schools are located utilized a compressed-block schedule. The school day consisted of four, 90-minute periods that met daily (Monday through Friday). With the exception of the Global Humanities course, all courses were completed in two grading periods (18 weeks). During the 18 week time period, teachers were expected to cover one year's equivalent of curriculum material. Therefore, by the end of the school year, each teacher taught the same course twice.

It is realized that the sample size may be considered small relative to previous research. For example, Emmer, Sanford, Clements, and Martin (1982) utilized a sample of 51 teachers. However, their study employed 15 observers collecting classroom data. Some simple arithmetic indicates that each observer was responsible for three to four teachers. Since a sample of four teachers was deemed inadequate to

answer the question proposed, and 51 teachers was impossible for a single observer to manage, a balance was struck between the two extremes. Such a balance is justified when one considers that a distinguishing feature of the study was the in-depth data gathering technique and qualitative analysis of the data. Therefore, it was believed that a sample size of six teachers was logistically manageable for a single observer and, with purposeful sampling, would answer the research questions.

High school teachers were chosen for this study for a number of reasons. First, it was believed that a greater number of high school science teachers instruct in more than one content area relative to junior high school science teachers. This conclusion was based on the personal experience of the author while supervising student teachers in other classes. Second, relative to research at the junior high school and elementary school grade levels, classroom management research at the high school level was limited. Finally, at the elementary and middle school level, a great deal of energy is directed toward the development of the students' social skills. Although social skills are developed at the high school level, the emphasis is not as great as it is at the middle school level. Therefore, if there are subject-specific aspects to classroom management, they may be more apparent at the high school level.

Biology teachers were selected over other science content areas due to their availability at any particular school. Biology teachers account for the majority of the science teacher population. In addition, limiting the science subgroup to only basic biology teachers eliminated variables that could be introduced by including other science content areas. For example, the mathematical foundations of physics typically

results in classes composed of students not representative of the general population. Therefore, the nature of the subject matter and students would detract from the validity of making comparisions between content areas. Finally, the observer's subject matter background is primarily biology. The second subgroup consisted of three teachers that taught and were certified in language arts. Science and Language Arts courses were selected because these content areas are primary in the secondary curriculum and are subject matter areas of national concern. In addition, contrasts among tasks in these diverse disciplines (Doyle et al, 1985) may make management differences, based on the content being presented, more evident. It was realized that comparisons between grade levels and school size are not addressed by this sample. Further, other content areas that make up the core of the curriculum (e.g., mathematics and social studies) were not included in the sample. The importance of these variables was recognized, but were not included in the sample for logistical reasons (i.e., sample size and data collection feasibility). Since the teacher was the focus of this study, it was deemed advantageous to collect in-depth data on a smaller sample, than to use a large sample spread over a variety of schools, subject matter areas, grade levels. Such a sample would necessitate the inclusion of school and grade levels as variables and would ultimately result in data that would be more dilute and of superficial value.

Method

Contacts with teachers were made in the spring. Since experienced teachers, with a reputation for being good managers, were desired for inclusion in the sample, the opinions of the principal, department chairs, university supervisors, and other faculty at the school were considered before final selection was made. In this investigation, an experienced teacher was considered to have five or more years of teaching experience. Favorable recommendations from all individuals listed for each teacher of the sample were required for selection.

With the exception of one language arts teacher, who taught 11th-grade English, all teachers in the sample had 10th-grade students in their classes. The 11th-grade language arts teacher was included in the sample for a number of reasons. First, the teacher met all the criteria and was a willing participant. Second, other teachers approached either did not want to participate in the study or would be teaching 10th-grade English for the first time. Finally, at the time the language arts teachers were approached, most did not know what course they would be teaching the following fall. Courses were often rotated among the teachers. In the fall, teachers were contacted to obtain class schedules and to reconfirm that the researcher's presence in the class would not be disruptive. At this time, it was discovered that one of the teachers in the sample would be teaching 11th-grade English. Other potential teachers, either did not have the experience necessary or were not willing to participate in the study. In short, this teacher was included in the sample by default.

To avoid biasing the data, teachers were told that the nature of the study was to examine teaching techniques unique to different content areas and that there was no desire on the part of the observer to evaluate the lessons observed. It was anticipated that presenting the study to the teachers in this manner satisfied their curiosity and at the same time did not change their management or instructional behaviors. Prior to data collection, permission from the school principals and school district were obtained. In addition, research methods were examined by the Human Subjects Review Board and informed consent forms (Appendix A) were signed by all teachers participating in the study.

Each teacher was observed during the first grading period of fall term in two different class periods (12 classes total) with a minimum of one classroom observation per teacher per class per week. Numerous studies have recognized that the first few weeks of school are critical for establishing a classroom atmosphere that is continually maintained throughout the year (Emmer, Evertson, & Anderson, 1980; Evertson & Emmer, 1982). The first few weeks of school are when rules are established and the students are socialized into the teacher's system of rules and procedures. Although any grading period might have been selected for data collection, the paramount importance of the data collected during the first few weeks would be missing.

Description of Data Sources

Classroom activity records. On the Classroom Activity Record form (Appendix B), field notes were collected that focused on the classroom behaviors of the teachers. Specifically, the notes focused on the class as a whole. The field notes generally described what the teacher was doing, the time allotments, general topic of study or change of topics, the activities in which students were engaged, and levels of student cooperation and participation. The objective was not to record all of the interactions verbatim. Rather, the goal was to produce a coherent record of major classroom activities and events related to teacher behaviors.

In addition to descriptive notes and elapsed time, the descriptive notes were coded for the type of activity in which the students and teacher were involved. The activity codes were included in an effort to document the different instructional settings (or contexts) that existed in a classroom (e.g., seatwork, group work, lecture). It is generally accepted that classroom management is, at least in part, context dependent. That is, each context emphasizes a different set of management behaviors. In addition, the context is where subject matter is delivered to the students. Therefore, capturing the contextual features of the classroom was a prerequisite for determining if there were management differences specific to subject matter. The code and description of each activity code, found in Table 2, were slightly modified from Emmer, Sanford, Clements, & Martin (1981). It was realized during practice sessions that two additional activity codes were necessary to adaquately capture classroom

events. The additional activity codes were: activity code 11 (Procedural-Administrative-Academic Routines) and activity code 16 (Media Presentation).

Table 2

Description of Activity Codes

Code	Activity and Description
1	Content Development: Teacher presentation of content. Includes lecture, demonstration, explanation of academic content. May include questions from students, but the main function of this activity is informing students, introducing new material or reviewing previously introduced material.
2	Content Development: Recitation/Discussion. Includes questioning of students by the teacher. The function of this activity is to provide students practice of skills or review of material. This category might also include short written tasks, as when teachers ask students to work one problem at their desks to assess understanding during a content development activity. The tasks should last no longer than three minutes. This code could also include a content oriented game or board work activity involving most of the class.
3	Individual Seatwork. Students are working at desks individually. This code includes warm-up activities that are content centered. Brief directions for seatwork or short teacher interuptions of seatwork to explain or clarify directions should be left in seat work time unless they last more than one minute. If during a content development activity the teacher assigns a written task, the task should be coded as seatwork if it lasts three minutes or longer.
4	Tests. Anything called a test, quiz, readiness test, or assessment. Students are typically working independently.

Table 2, Continued.

5 Pairs or Group Seatwork. Group projects or small group tasks with students seated at their desks. Teacher circulates or monitors from desk.

6 Pairs or Groups Hands-on Activities. Group projects, experiments/labs, or small group tasks where the students may be out of their seats and working with manipulatives. Teacher circulates or monitors from desk.

7 Student Presentation. One or several students present to the class for more than one minute. The presentation is planned ahead of time rather than in response to a direct teacher question as is possible in a recitation.

8 Small Group Instruction. Teacher works with a group of students for more than one minute while the rest of the class is in seatwork. This category takes priority over all others.

9 Procedural/Behavioral Presentation. The teacher presents or reviews classroom procedures or rules. This code should be used any time the teacher institutes and explains classroom procedures or rules governing student behavior. It should also be used when the teacher gives the class extensive feedback on their behavior, or discusses problems relating to student behavior in class, or students' following of classroom procedures.

10 Procedural/Administrative Routines. The code can include roll call, announcements, opening or closing routines (unless academic content is involved), distributing graded papers, recording grades in class, and changing seating. These activities must involve most of the students. For example, if roll call or paper distribution involves the teacher and one or two students while the rest of the class is in seatwork, the "Seatwork" code should be used.

Table 2, Continued.

11 Procedural/Administrative/Academic Routines. The code is similar to activity code 10, but includes opening and closing routines where academic content is involved, giving directions for assignments, reminders of academic expectations or discussion of grades.

12 Checking. Going over homework problems, a quiz, or assignment for the purpose of checking/grading it in class. Little or no teacher explanation or review is entailed. The teacher or students announce answers or write them on the board or overhead.

13 Transitions. Activities entailed in changing from one activity to another. Includes getting supplies, passing paper, waiting for everyone to get ready, quiet, or find their place.

14 Non-academic Activity. Games, discussion, TV, not related to the content of the class.

15 Dead Time. Two-thirds or more of the class have no assigned task; students are just waiting.

16 Media Presentation. Teacher presents audiotapes, videotapes, movies, records, or laser-disks as part of the lesson.

After completing each classroom observation, a few summary notes were made by the observer. The focus of the notes was to summarize the classroom events and reflect on the activities of the lesson. The summary notes also aided in the development of interview questions.

Audiotaping of lessons. A second source of data included audiotapes of the lessons. Audiotaping of the lessons was necessary to aid in the data collection process. Although a verbatim record was not required, audiotaping allowed the observer to note more of the visual events that occurred in the classroom and reduced the need to attend to multiple events that could be occurring simultaneously. In short, the audiotape served as a backup, data gathering system that allowed the observer to enhance the recording of field notes.

Teacher interviews. Teacher interviews were used to verify the trends or patterns observed in the classroom. It was anticipated that the interviews would be conducted periodically throughout the data collection period. Minimally, one interview was to be conducted half-way through the grading period and one at the end of data collection. However, due to the busy schedules of the teachers and a desire not to be disruptive to each teacher's routines, it became more appropriate to ask questions in an informal manner, that is, a question or two either before or after class, or before or after school. Sample questions included: How did first period do today; Did you anticipate class would go like that; or Were there any problems during period one that you will try to correct during period two? This informal approach was found to be more practical during the data collection phase. A final interview was scheduled with each teacher at the end of data collection. The guiding questions used during the interview included:

What determines the particular instructional approach to any given lesson?

What were you particularly concerned about when planning an instructional approach?

Are those the same concerns you have when planning other instructional approaches?

Do management concerns ever determine how the lesson is taught?

Have you ever taught another subject? (Yes/No) Explain.

I work with beginning teachers a great deal. Based on your experience, what would be the most important concerns you have when teaching your subject matter? That is, what would you emphasize to the beginning teacher in your area?

In this case, instructional approach refered to the context selected for teaching a particular lesson (e.g., laboratory, small group, lecture etc.), not necessarily whether the lesson was taught inductively or deductively. With the exception of questions four and six, all questions were developed prior to the onset of the study. The objective was to use a language that was consistent with the reason given to the teachers for doing classroom observations. In addition, since management is one of the major concerns of teachers, it was hoped that the teachers would volunteer their management concerns prior to it being addressing specifically.

Research Questions

The specific research questions addressed by this investigation consisted of statistical hypotheses and qualitative research questions. The following two sections describe each category of research questions. Subsequent sections specify the analysis of data related to the questions from each of the sections.

Statistical Hypotheses

The purpose of this study was to investigate the extent to which teacher management behaviors may differ based upon subject matter area within a particular context. To establish a framework whereby subject matter differences may be examined, the following null hypotheses were investigated:

H_o^1: There is no significant difference in the frequency of contexts utilized in the two content areas.

H_o^2: There is no significant difference in the amount of time spent in each of the contexts based upon the content being presented.

The two hypothesis are stated in general terms. Indeed, there are 16 individual hypotheses being tested for each of the null hypotheses that correspond to each of the 16 contexts previously described. Taken together, the two hypotheses serve as a framework upon which an examination of specific management demands were conducted. Due to the exploratory nature of the study, the cumulative error rate was not of great concern. Once again, the purpose of this study was to "explore" the variables that possibly distinguished subject matter-specific management and not to "test" what variables differed between the subject-matter area.

Qualitative Research Question

As a result of the process-product research paradigm, numerous teacher behaviors were identified as being associated with classroom management and effective teaching in general. The teacher behaviors were the result of comparisons made between effective and less effective teachers across different subject matter areas. Therefore, the teacher behaviors described in texts such as Looking in Classrooms (Good & Brophy, 1987) or Classroom Mangement for Secondary Teachers (Emmer, Evertson, Sanford, Clements, & Worsham, 1989) were general and applied to any subject matter area. Since the sample for this study consisted of good managers, there was little reason to suspect that the teachers differed significantly on any of the general teacher behaviors. In short, since all of the teachers were good managers, they should have exhibited all the desired management behaviors. As a result, little information would be gained by correlating lists of teacher behaviors with a particular context or content area. What was of interest were the different management demands placed on the teacher based upon the context and the subject matter being presented. It is generally accepted that classroom management is, at least in part, determined by the context or format of classroom activities. What is not clear is the role subject matter plays in managing the classroom. Therefore, the specific qualitative research question addressed by this study was as follows: Are there specific management patterns to be emphasized based upon the context and subject matter being presented? For example, what are the management routines associated with each of the contexts

and do they differ based on the content being presented? Or, specifically, what are the nature and kinds of questions used by teachers while they monitor seatwork?

Data Analysis

Statistical Analysis of Data

Since the data addressing the first hypothesis involved the counting of classroom contexts, a chi-square (α=.05) analysis was used to examine the difference of frequencies with which each context was used in each of the content areas. It is believed that a teacher's decision in selecting a particular context was, at least in part, due to the different management behaviors required for each context. For example, a teacher may choose to present a topic in a lecture format because it is more easily managed than a small group setting. In addition, the degree to which a particular context is utilized may be dependent, to some degree, upon the content being presented.

The second hypothesis was intended to reflect the amount of time spent in each of the contexts based on the content being presented. Although each subject matter area may utilize, for example, a small group format, the duration in that format may differ between the subject matter areas. To assess the time differences, a nested design MANOVA (α=.05), (teacher by context within content) was used for testing H_0^2. If a significant difference existed, an ANOVA was used to identify the differences. The MANOVA test required virtually all cells of the data matrix be filled

with a value. Since every classroom context did not occur during every classroom observation (which would be quite extraordinary), numerous empty cells occurred in the data matrix. To satisfy the statistical program, zeros were used to fill the empty cells. However, it is important to realize that the zeros were also included in the calculation of the mean time spent in each context. As a result, unrealistic mean values occurred. Therefore, in addition to running a single MANOVA, t-tests (α=.05) were calculated for science versus language arts in each of the contexts. The t-test utilized only the non-zero values of the data matrix. Such an approach provided a more realistic representation of the data obtained from the observations.

Qualitative Analysis of Activity Record

Are there management behaviors to be emphasized based on the subject matter being presented? In an effort to answer this question, a systematic qualitative analysis (Bogdan & Biklen, 1982) was conducted across the different contexts described in the classroom activity records. In general, the data were examined holistically in an effort to derive patterns. But, what does this rather vague statement mean? First, the classroom activity records were rewritten (with the aid of the audio tape) for legibility. The classroom activity records were then photocopied. Each classroom context within the activity record was "cut out" and placed with others of the same context. Each group of narratives for each context was then systematically analyzed in an effort to identify common themes, strands, events or teacher behaviors that tended to repeat themselves. For example, at a macro level, language arts teachers may use a sequence

of routines that differed from biology teachers. At the micro level, the quality or nature of the questions asked by teachers while monitoring seatwork may be different if the teacher had a thorough understanding of the subject matter as opposed to a teacher who had a weak understanding. For example, did the teacher answer the students' questions or ask probing questions in response? Comparisons were then made between each of the subject-matter areas.

CHAPTER IV

RESULTS

Introduction

The purpose of this study was to explore how subject matter may influence the classroom management behaviors of teachers in biology (Bio) and language arts (LA) courses. To establish a framework whereby subject matter differences may be examined, the following statistical hypotheses were addressed:

H_o^1: There is no significant difference in the frequency of contexts utilized in the two content areas.

H_o^2: There is no significant difference in the amount of time spent in each of the contexts based upon the content being presented.

The two hypotheses are stated in general terms. In reality there are 16 individual tests for each hypothesis that correspond to the 16 contexts described in Chapter III. In addition to the statistical hypotheses addressed by this study, a qualitative research question was proposed in an effort to delineate subject matter differences. The specific qualitative research question was as follows: Are there specific management patterns to be emphasized based upon the context and subject matter being presented? The qualitative research question is meant to complement and enhance the results obtained from the statistical hypotheses.

Statistical Hypotheses

Since the data addressing the first hypothesis involve the counting of classroom contexts, chi-square (α=.05) analyses were used to examine the differences in the frequencies with which the different contexts were used in each of the content areas. Table 3 presents a summary of results obtained from the chi-square analyses.

Table 3

Results of Chi-square Analyses by Classroom Context

Classroom Context	Frequency Bio/LA	X^2	Classroom Context	Frequency Bio/LA	X^2
1	36/42	0.46	9	13/13	0.00
2	54/69	2.10	10	81/88	0.60
3	17/56	10.42*	11	57/81	3.46
4	9/13	0.72	12	6/1	3.58
5	25/41	3.88*	13	74/66	0.12
6	19/1	16.20*	14	11/2	6.84*
7	1/11	8.34*	15	46/19	11.22*
8	3/0	3.00	16	10/6	1.00

*p<.05, df=1, critical chi-square value=3.841.

Classroom Contexts: 1=Content Development/Lecture, 2=Content development/Recitation, 3=Individual Seatwork, 4=Tests, 5=Group Seatwork, 6=Hands-on Activities, 7=Student Presentation, 8=Small Group Instruction, 9=Procedural/ Behavioral Presentation, 10=Procedural/Administrative, 11=Procedural/Academic, 12=Checking, 13=Transitions, 14=Non-academic Activity, 15=Dead Time, 16=Media Presentation.

Six of the 16 classroom contexts were found to be significant. The six classroom contexts include: Variable 3 (Individual Seatwork, X^2=10.42), Variable 5 (Pairs or Group Seatwork, X^2=3.88), variable 6 (Pairs or Groups Hand-on Activities, X^2=16.20), variable 7 (Student Presentation, X^2=8.34), variable 14 (Non-academic Activity, X^2=6.84), variable 15 (Dead Time, X^2=11.22).

The second hypothesis, intended to reflect the amount of time spent in each of the contexts, was approached using two different statistical procedures. For the first statistical procedure, two-tailed t-tests (α=.05) were performed which compared the mean times for biology and language arts in each of the classroom contexts. The two-tailed t-test procedure utilized only non-zero values in the calculation of t-scores. In other words, if a classroom context occurred during an observation period, the length of occurrence was used in the calculation of the mean. Whereas in the second statistical procedure, a nested MANOVA, if a classroom context did not occur during an observation, it was coded as zero and was included in the calculation of the mean. It is believed that the two-tailed t-test procedure portrays a more realistic representation of the data. Table 4 presents the two-tailed probabilities for comparisons of mean times in biology and language arts courses.

Table 4

Two-tailed Probability of t-values Comparing Mean Times (in Minutes) for Biology and Language Arts Courses by Classroom Context

Classroom Context	Mean Bio/LA	2-Tail Prob.	Classroom Context	Mean Bio/LA	2-tail Prob.
1	19.9	.049*	9	4.2	.216
	13.2			8.9	
2	13.3	.919	10	5.9	.140
	13.0			4.8	
3	20.3	.478	11	5.3	.087
	17.2			3.9	
4	26.6	.043*	12	21.7	NO
	11.5			3.0	VARIANCE
5	17.6	.169	13	2.3	.041*
	11.0			1.6	
6	29.4	NO	14	5.2	.262
	00.0	VARIANCE		11.5	
7	43.0	NO	15	8.6	.123
	24.9	VARIANCE		5.1	
8	3.0	NO	16	15.0	.103
	0.0	VARIANCE		27.3	

* $p<.05$, No variance means there was either 1 or 0 occurrence of the activity code.

Activity codes: 1=Content Development/Lecture, 2=Content development/Recitation, 3=Individual Seatwork, 4=Tests, 5=Group Seatwork, 6=Hands-on Activities, 7=Student Presentation, 8=Small Group Instruction, 9=Procedural/ Behavioral Presentation, 10=Procedural/Administrative, 11=Procedural/Academic, 12=Checking, 13=Transitions, 14=Non-academic Activity, 15=Dead Time, 16=Media Presentation.

Three of the 16 classroom contexts were found to be statistically significant. The variables include: Variable 1 (Content Development: Teacher Presentation of Content, p=.049), Variable 4 (Tests, p=.043), and Variable 13 (Transitions, p=.041).

The second statistical procedure utilized a nested design MANOVA (α=.05) (teachers by context within content). The MANOVA procedure requires that few cells of the data matrix be empty, or be considered "missing values." Since every classroom context did not occur during every observation period, numerous blank spaces occurred in the data matrix. In an effort to satisfy the statistical procedure, zeros were used to fill the empty cells. However, using zeros to fill empty cells means they are used to calculate the means for each variable. Although the MANOVA procedure controls for the cumulative error rate, unrealistic/impractical mean values occurred. Results of the MANOVA analysis can be found in Appendix C. The results showed no significant differences between content areas in any of the contexts.

Qualitative Research Question

The purpose of the qualitative research question was to explore the role of subject matter in managing each of the classroom contexts. To answer this question, systematic qualitative analyses (Bogdan & Biklen, 1982), were conducted across the different contexts described in the classroom activity records. In general, this type of analysis means that the data were examined holistically in an effort to derive patterns. Specifically, the classroom activity records were first rewritten (with the aid of the

audiotape). The classroom activity records were then photocopied. Each of the classroom contexts contained in the activity record were cut out, placed with others of the same context and grouped by subject matter area. Each group of narratives for each context was then analyzed in an effort to identify common themes, strands, events or teacher behaviors that tended to repeat themselves. What follows are the results and representative quotes to support the findings associated with each of the classroom contexts.

Activity Code 1, Content Development: Teacher Presentation of Content. This classroom context was operationally defined as lecture, demonstration, explanation of academic content. This activity may include questions from students, but the main function is informing students, introducing new material or reviewing previously introduced material.

The results showed that the general management behaviors of biology and language arts teachers were essentially the same. While lecturing, teachers in both groups frequently used the chalkboard or overhead, moved around in the room while talking, paused to command the students' attention, and questioned the students for understanding or to maintain a sense of accountability. It was interesting to note that instructional standpoint, the goal of lecture in a language arts class sometimes served a different purpose than a biology lecture. In both instances, students were confronted with new information. However, in biology the information was primarily in the form of facts, vocabulary, and concepts to be learned by the student and ultimately

reproduced on a future test. In contrast, lectures in a language arts class presented new information to the students, but the students are not necessarily expected to learn the material for a future test. Instead, lecture notes served to build a foundation or jumping off point that students can reflect on in the form of writing or speaking tasks. The students were rarely tested on the material presented in the lecture.

In terms of classroom management, the difference observed in the lecture format was not the behaviors of teachers during the lecture, but the strategy used for keeping the students accountable for the material. Biology classes typically relied on tests to maintain student accountability. In fact, lectures were sometimes repeated after a test to clarify ideas and vocabulary so students could retake the test to improve their grade. In contrast, language arts students were held accountable for lecture material in that they were expected to keep a notebook that was to be handed in at the end of the grading period. The notebook included lecture notes and writing assignments related to the lectures that were assigned throughout the grading period.

Activity Code 2, Content Development: Recitation/Discussion. Includes questioning of students by the teacher. The function of this activity was to provide students with practice of skills or review of material. This category also included short written tasks, as when teachers asked students to work one problem at their desks to assess understanding during a content development activity. The tasks lasted no longer than three minutes. This code also included a content-oriented game or board work activity involving most of the class.

Systematic qualitative analysis revealed that since the teachers were not obligated to remain at the overhead or the blackboard, they often moved around the classroom to a greater degree than in the lecture format. Since students played a more prominent role in the recitation format, teachers found it necessary to remind students of classroom protocol. Depending on the situation, the protocol included hand raises, listening while another student was speaking, or taking ordered turns. As might be expected, the success of the recitation format was largely dependent upon the orderly nature with which ideas were exchanged between the teacher and the student or between students. In biology and language arts classes, vocabulary was often a focus of discussion. In language arts classes, weekly vocabulary lists were assigned that may or may not be related to reading assignments. Although expectations for vocabulary assignments varied between the language arts teachers, students were expected to minimally look up definitions of the assigned words and write context sentences using the words. The sentences were expected to reveal something about the meaning of the word. In all cases, students shared the definitions and context sentences with the class. In one case, students were required to make formal presentations at the front of the room. The teachers role was to elaborate on the definition or context sentence and in some cases provided a practical definition for the word.

In biology classes, vocabulary originates from lecture or the text. The recitation format was a vehicle to reinforce the terminology and how it related to the

concepts being studied. The recitation format often served as a review prior to a test, to clarify laboratory instructions, or to review answers on a test previously taken.

In addition to the discussion of vocabulary, language arts classes used the recitation format to discuss open-ended questions that originated from reading or writing assignments. Events that occurred in reading assignments were often open to interpretation. Students were encouraged to offer various interpretations of the reading if there was support for their ideas. The following excerpt is taken from a discussion concerning whether Atticus, from the novel To Kill a Mockingbird, was a good father. The students were provided with time to work in pairs and formalize their ideas before starting the class discussion.

Teacher:	Ok, times up. Now comes the easy part. Why might people in the town think that Atticus is a poor father?
Student:	Too easy on the kids.
Teacher:	Do you have an example from the book?
Student:	He doesn't spank them.
Student:	He allows Scout to cuss.
Student:	He delegates parenting to the housekeeper.
Student:	Scout wears overalls and fights.
Student:	He leaves town all the time.
Teacher:	Let me add a few more. He talks to his kids about rape. Allows them to go to court. Defends a black man against a white man's words. The kids go with Calpurnia to the black church.
Teacher:	Ok, now defend him.
Student:	He teaches them the world. He doesn't hide anything from them.
Teacher:	Excuse me, I should only hear Amy's voice.
Teacher:	Your examples are specific, relevant, and supported. Good!
Student:	He respects them, but he doesn't hit them.
Teacher:	Ok, we need some specific examples.
Student:	Teaches values...Sharing, tolerance, leave Boo alone.

Student:	He sticks by his word. Doesn't lie, not two faced.
Student:	Models morality.
Teacher:	So, he models morality. How would you defend him against "letting them run wild?"
Student:	He limits certain places they are not suppose to go.
Teacher:	Anything else we've forgotten? What about wearing overalls?
Student:	It's just a phase.

The preceding quote demonstrates how different ideas were supported from the same reading. Although the discussion was guided by the teacher, the goal was to illustrate that different interpretations were possible.

In contrast, the content driven nature of biology did not allow a great deal of latitude for different interpretations. Meiosis, mitosis, and protein synthesis (to name a few) have sequential steps that students were expected to learn. Alternative steps for the sequences were not an issue. There were occasional brief discussions concerning moral issues surrounding protein synthesis and genetic engineering, but societal and moral issues were rather uncommon. The findings associated with the recitation format were predominately instructional in nature. However, the results were included in this section because the nature of recitation in language arts was quite different from a recitation in biology. For example, biology classes tended to focus on obtaining correct answers where language arts classes frequently pursued open-ended questions. Therefore, the management demands placed on the teacher in the two types of recitation formats may be different. Specifically, being able to deal with a wide variety of potential responses may require slightly different management skills than the skills required when searching for a single correct answer.

Activity Code 3, Individual Seatwork. Students were working at desks individually. This code included warm-up activities that were content-centered. Brief directions for seatwork or short teacher interruptions of seatwork to explain or clarify directions were left in seat work time unless they lasted more than one minute. If during a content development activity the teacher assigned a written task, the task was coded as seatwork if it lasted three minutes or longer.

In general, the management behaviors exhibited by all teachers in the sample were consistent. For shorter periods of individual student seatwork, teachers were moved throughout the classroom, offering suggestions, fielding questions, or just watching the students to note progress. During longer periods of seatwork, teachers often monitored for a period of time then situated themselves at their desks or podiums. Teachers used the longer periods of seatwork to deal with administrative tasks, grade papers, or possibly do the assignment along with the class.

The results from Table 3 revealed that language arts teachers used individual seatwork more frequently than biology teachers. Biology teachers used individual seatwork to engage students in test corrections or study guides. Infrequently, students read a short article related to the topic being studied. The following segment of field notes occurred over a period of 28 minutes and illustrates the test corrections routine.

Teacher: When you do test corrections you need to do them on your own and you need to do them quietly.

The teacher began to pass out graded tests. A few minutes passed and the teacher paused due to the increasing noise level. "I don't have to do this!" The students immediately became quiet.

Toward the end of the 28 minute segment, students began to finish and they brought the corrected tests to the front of the room and handed them to the teacher.

Teacher: Ok, you should be finishing up in about three more minutes.

The teacher, who up to now was at the front desk, began walking around the class helping those students who had not finished with test corrections or those finishing up a lab from the previous day.

Teacher: Ok, let's bring your test corrections up. We need to do it now. (The teacher moves to the right front corner of the room out of the way of the student traffic.)

In contrast, language arts teachers often used short writing or reading assignments as part of their daily or weekly routines. Writing assignments took a variety of different forms. Students responded to guest speaker, a piece of poetry, reactions about an idea presented in a novel, a story told by the teacher, or just how their life was going that week (often referred to as "checking in"). The writing assignments were often kept in a journal and handed in on a regular basis. The following quote illustrates what a short writing assignment. After receiving writing instructions, the students wrote for 15 minutes.

Teacher: Ok, let me have your attention ... Little focus please. I'm going to have a "Tuesday Tidings" I know you checked in on Thursday, but I want you to check in today. Couple of thoughts that I have for you?

Student: Can we mention the book?

Teacher: Yes, you can mention the book. Mostly, I want you to respond to the rock in some creative fashion. (The rock is the size of a Volkswagen Beetle and is located at the corner of the school parking lot.) I loved it. I drove in this morning and saw the sign [painted] on the rock. One of my biggest pet peeves in this world are how people treat each other. And I saw the sign and thought, "I wonder what it had to have been to motivate someone to do that?" What I want you to respond to is to create a scenario that would motivate someone to write "mean people suck" on a rock. Ok, you have about 10 minutes. (As the class is writing, the teacher passes out corrected papers.)

Although the teachers in both content areas had similar classroom behaviors when students worked individually, the tasks required by the students were quite different. In biology the focus was content driven or to obtain a "correct" answer. In contrast, the tasks required of students in a language arts class were more creative and open-ended in nature. Students were frequently asked to share their thoughts, reflect, or evaluate. The language arts teachers seemed to emphasize communication skills and the need for students to support their feelings or conclusions, whereas the biology class emphasized the correct answers or definitions of terms.

Activity Code 4, Tests. This activity referred to anything called a test, quiz, readiness test, or assessment. Students were typically working independently.

The results from Table 4 revealed that within the classroom context of tests, evaluation activities in biology classes lasted significantly longer than tests in language arts classes. The increased length was due primarily to the substantial amount of material covered on a typical biology test. Typically, biology tests were given when the material from a chapter was completed. In addition to the content presented in the classroom text, material from laboratory exercises were often included on the test.

In contrast, tests in language arts classes assessed smaller quantities of material. Weekly vocabulary quizzes of 10 to 12 words comprised the bulk of the tests. Fewer tests included short grammar quizzes or short answer questions related to a novel that was being studied. In both content areas, teachers began with some preliminary instructions, passed out the tests and monitored the progress of the class. As tests increased in length, teachers often graded papers, planned, prepared for the next classroom segment, or set up laboratories while students worked. Toward the end of the exam, teachers often recommended activities for students to do while the remainder of the class finished taking the test. If the activities were short and explicit or of immediate concern to the student, such as missing assignments, the student usually complied. If the activity was to "look at the next chapter," very few students pursued the assignment with great enthusiasm. Representative quotes are not presented for this section since there were no interactions between the student and the teacher. Field notes for this activity code were mostly observer comments of the few events occurring in the room while the class was engaged in the test. In short, a summary of the observer comments was presented in the last two paragraphs.

Activity Code 5, Pairs or Group Seatwork. For this activity, group projects or small group tasks were conducted with students seated at their desks. The teacher circulated or monitored from the desk.

Once again, the behaviors of teachers in this activity code were consistent across content areas. For shorter periods of group seatwork, teachers commonly circulated throughout the classroom, asked questions, or supplied hints to aid the students in reaching appropriate outcomes. During longer periods of group seatwork, teachers began by monitoring the class for a period of time to confirm that the students were not having difficulty. However, once the class was engaged in the activity, teachers were able to use the time to deal with administrative chores, grade papers, return graded papers to the class, or set up equipment for the next classroom activity.

The results of the Chi-square analysis showed that language arts teachers used the small group format more often than biology teachers. In language arts classes, small group work typically preceded classroom discussions or less frequently as warmup activities to begin the class. Teacher interviews indicate that small group work was an opportunity for the students to formalize or rehearse their thoughts before presenting them to the class or before taking a test. Not only were students more comfortable presenting their ideas, but doing so made classroom discussions more lively because the students had an opportunity to think about the question. Small groups were also used to provide students with an opportunity to review before taking

a quiz or to provide each other constructive criticism. The following quotes provide a sample of the questions students were expected to consider while in their small groups. In the second quote, the class has just finished a 25 minute writing assignment.

Teacher: Ok, so answer these three questions with your partner (the questions have been written on the board). What is a mockingbird? How is Boo like a mockingbird? Who else is [like a Mockingbird]?

Teacher: I want you to be able to find the quotes to backup what you say.

The teacher recorded attendance and hung it by the classroom door. The teacher then began to walk throughout the room noting the progress of students.

Teacher: You may not be done, but what I want you to do is share what you have written with those in your group. Remember your volume controls. (11 minutes passed. During that time, the students within each group were to read what they had written to others in the group. The better papers would be read to the class.)

Teacher: Ok, someone step up within your group.

A student was identified by the group and, although reluctant, was encouraged by the rest of the group members that his paper was the best one.

In addition to promoting discussion, the small group format served as a management tool. All language arts classes utilized small groups of two to four students that were assigned by the teacher whose members were not necessarily best friends. At regular intervals the groups were reorganized to obtain new pairings of students. The rationale provided by the teacher was to encourage students to get to know each other and to learn how to work cooperatively with those they may not

know. However, the underlying goal seemed to be that students were less likely to be disruptive if they were sitting with someone other than their friends. As one teacher stated to the class:

> One of the main things I want you to get out of this class is being able to work together. So, I usually do boy girl pairs because this class is about cultural differences and two of the biggest subcultures in our culture is the male and female subcultures. So the better we can understand each other, the better. That's part of the task.

In biology classes, the small group format played a less prominent role in classroom events. On rare occasions, one of the three biology teachers utilized the small group format in a manner similar to language arts classes. More commonly, biology teachers had students work in groups to make test corrections, work problems from the book, conduct library research projects, work with manipulatives, or quiz each other before tests. For example, the following quote illustrates a test correcting activity that lasted for 58 minutes. The purpose of the activity was to have the students look at their mistakes and improve their responses. The students had received their tests and were asked to work on the essay questions.

The teacher had the students count off by tens then walked over to the bulletin board to post test percentages. The students walked up to the bulletin board to check their test scores while trying to determine who they were to be working with. Five minutes later, the students were working in groups of three while the teacher was walking around monitoring progress or answering questions. "You only need to turn

in one paper per group. It is to be treated as an assignment." The teacher then walked over to talk to the observer.

Teacher: Writing within the content area is difficult for the students even though their writing skills from language arts classes may be strong. Tomorrow they will get another test over the same material.

Teacher: When you're done with all this, I do need to get the tests and the strips returned.

The teacher attempted to grade papers, but did not get far before a group asked for his assistance.

In general, the role of small groups in biology classes was somewhat different than in language arts classes. Student groups in biology classes were often created for a particular activity. The pairings often changed for every activity, or students simply worked with those sitting next to them. Overall the role of small groups in biology classes was to provide students with an opportunity to work together in an effort to obtain correct answers on worksheets or corrected tests. In contrast, the role of small group work in language arts classes played an integral role in the following: how content was approached, how activities were sequenced during a lesson, how ideas were generated, and how the class was managed. It is important to note that although differences between the two subject matter areas were identified, the differences could have been attributed to the teacher or teaching methods that may have been independent of the subject matter.

Activity Code 6, Pairs or Groups Hands-on Activities. This activity included group projects, experiments/labs, or small group tasks where the students were out of their seats and working with manipulatives. The teacher circulated or monitored from the desk.

Results of the chi-square analyses indicate that Activity Code 6 was a classroom format unique to the biology classrooms of this study. During hands-on or laboratory activities, teachers spent a great deal of time monitoring student laboratory groups. For a number of reasons, teachers were more active during Activity Code 6 than during Activity Code 5. All of the biology classes observed contained over 30 students. Attempting to monitor, answer questions, provide time reminders, or sign-off on portions of a laboratory, was a demanding process. In fact, the large number of students limited the level with which the teacher could interact with the students and at times was a source of frustration for the students. In addition, teacher interviews suggested that safety issues were a constant concern for the teacher, particularly with the increased number of students. Key safety concerns were not only highlighted during pre-laboratory instructions, but were frequently included as reminders while the students were engaged in the laboratory activity.

Instructions provided prior to a laboratory activity were typically clear and allowed the students to make a quick transition into the laboratory activity. During the activity, teachers reminded students to wear goggles, provided time reminders, answer questions, suggested where in the activity the class should be, and reminded students of clean up routines. The following quotes are representative of laboratory

activities lasting 65 and 62 minutes respectively. The quotes contain primarily observer comments because it was difficult to hear what the teacher was saying to the individual laboratory groups.

The teacher watched as the students began the laboratory exercise. The teacher made effort to move around to all laboratory stations adding a few more directions and hints to a group to get them off to a good start. The students required very few directions. They seemed to know the routine and quickly began the activity. Some students, due to limited space, chose to work in pairs at their desks instead of in the laboratory area. These individuals were not ignored by the teacher, but it did require the teacher to monitor a larger area. Next, the principal of the building entered the room and meandered through the laboratory groups asking questions and offering suggestions. The teacher moved to the lecture area to check on the students who chose to work at their desks. The teacher hinted of a smile. He seemed pleased with how the activity was progressing and the ideas students identified during the activity. Toward the end of the period, the students began to wrap-up. Without instructions from the teacher, students were cleaning up the lab stations and finishing up the assignment at their desks. Most of the students were at the lab stations. In general, the class made a fairly quick transition into the activity. "I do need signatures on all parts of the lab before you begin to use the yeast stuff." (The students will be feeding stained yeast to paramecium.) The teacher left the room to correct the attendance sheet. After 11 minutes into the lab, many students had their hands raised. Some

students were complaining that the teacher has not signed off on their lab section. In addition, it was also unclear if the students did not find what they were looking for under the microscope or if the teacher had forgotten about them. Overall, the students seemed involved in the activity. The biggest difficulty seemed to be for the teacher to get around to the numerous hand raises. When students' hands were raised it typically meant that the students were unable to find what they were supposed to find or were waiting to have a section of the activity initialed. In either case, students were waiting, but were not disruptive. The students seemed more frustrated than anything else based on the looks on their faces and their comments.

Time and materials were additional concerns mentioned by biology teachers during interviews. Large numbers of students, and limited materials in some cases, limited the number of laboratory activities teachers were able to conduct. For example:

Researcher: What determines the particular instructional approach taken for a lesson?

Teacher: Time ... Most of what I do I'd do very differently if there was time to do the kind of preparation that should be done and the number of kids to do it with. So what we have kind'a reverted back when you start dealing with 33, 34 kids in a classroom and very little prep time is you do mass presentation, which is exactly what should be done. It's what you call survival.

Researcher: Is that a function of the compressed nature of the content too?

Teacher: No, not so much as just a lack of time to keep up-grading and supervising stuff. I have tons of stuff around and labs to do, but I don't have any time to organize and to use it.

Activity Code 7, Student Presentation. This activity involved one or several students giving an oral presentation to the class for more than one minute. The presentation was planned ahead of time rather than in response to a direct teacher question as in a recitation.

The chi-square analyses showed that student presentations were used significantly more often by language arts teachers than biology teachers. Considering that speaking and being able to communicate clearly were but a few general goals of language arts courses, providing numerous opportunities for students to practice those skills was not surprising. Within this format, language arts teachers had students read short essays, conduct speeches, tell Native American myths, act out short plays, or report on interviews students conducted with individuals who lived during the depression.

In biology classes, student presentations centered around a single library research project that required weeks of research. In both biology and language arts classes, teachers listened carefully to the presentation and provided immediate feedback to the presenter. To maintain a level of student accountability, students in the audience were often involved in the feedback process. To eliminate confusion, feedback provided by students was often done in a structured manner. For example, a

student who finished a presentation provided feedback to the student that followed. Typically, student presenters were selected on a volunteer basis. If there were no volunteers, selection of presenters occurred in a seemingly random fashion. In general, aside from the planning involved for setting up the projects that lead to the student presentation, teachers had relatively few management demands during the presentations. The teachers needed to determine the order of presentations, listen carefully to what was said, provide feedback to the presenter, and occasionally make comments to members of the audience about the need to listen while their peers were presenting. The following quotes represent two different types of student presentations in language arts class.

"Ok, the trial is about to begin." The teacher assigns the actors their places at the front of the room.

Teacher:	Ok, here's the situation. Everyone that is here, you have two roles to play. Later this period you are going to be reporters. Everyone here will have to write a news account of what goes on, so pay attention to significant events. If you are in the play, you need to pay especially close attention so you know when to read your parts.
Teacher:	Ok, it's a hot, hot August afternoon. The courthouse is old and rickety. In the balcony ... Who's in the balcony?
Student:	Jem and Scout.
Teacher:	Downstairs are all the white folks, because remember it is segregated. The bailiff will need to swear everyone in. Ok, let's begin.

The teacher is followed the script. Six minutes into the play a student giggled (inappropriately) after a line in the play. As the play continued, the teacher gave the student a long, stern stare and pointed to the hall. The student left without the teacher

saying a word. "Ok, let's have a round of applause ... Now we need to get back into the books."

In the following scenario, the students were expected to memorize a Native American Myth and tell it to the class as a story teller might tell the story. "What I'd like to do is finish with the myths ... Any volunteers?" The teacher called on a student, but he was not ready to present his story. The teacher called on two more students, but they were absent. The fourth student came to the front of the room and told a story about how Coyote brought fire. While the student told the story, the teacher was seated at the desk listening and taking notes. When the student finished, the teacher related the Coyote story to the myth of how Prometheus stole fire from the gods. Another student came to the front and told the story "Coyote Arranges the Seasons." The teacher explained that the story was similar to the story of the Chinook brothers. "Since the other people are absent, we'll just move on to something else."

Activity Code 8, Small Group Instruction. The teacher worked with a group of students for more than one minute while the rest of the class was in seatwork. This category took priority over all others.

The classroom format of small group instruction rarely occurred in biology classes and never occurred in language arts classes. It seemed reasonable to assume that due to the large numbers of students in all but one teacher's classes, small group instruction was not a practical classroom format. The format required the teachers to

focus their attention on a single group for an extended period at the expense of the rest of the class.

Activity Code 9, Procedural/ Behavioral Presentation. The teacher presented or reviewed classroom procedures or rules. This code was used any time the teacher instituted and explained classroom procedures or rules governing student behavior. It was also used when the teacher gave the class extensive feedback on their behavior, or discussed problems relating to student behavior in class, or students' following of classroom procedures.

Statistical results revealed no significant difference in the number of times or amount of time spent in the behavioral presentation format between language arts classes and biology classes. As expected, the most extensive behavioral expectations were made to the students during the first few days of class. The presentations were sometimes lengthy and were frequently incorporated into procedures for handing in assignments, late work, attendance, tardies, grading procedures and general classroom routines. Biology classes were unique in that proper behavior, in the interest of safety, was of paramount importance. In one class, students were required to pass a safety test before they were allowed to participate in laboratory activities. Aside from the issue of safety, the expected behavior of students in both language arts and biology were quite similar and were viewed as being intentionally vague. Following are two sets of classrooms rules which were posted in two different rooms.

Teacher: Three things I ask of you ... They are posted up by the clock. Come to class prepared; book, something to write with and so on. Follow all your directions. Stay on task. This is for my sanity and your safety.

Teacher: Behavior! What do I have to say about that? Be on time. No put downs. Help each other, don't get in each other's way. Be constructive, be safe. Especially in the lab. No screwing around. If it looks like you can't handle it, sit down you have an "E." If you're endangering someone else, you're out.

Admittedly, the preceding quotes were both taken from biology classes. Aside from introductory comments concerning student behavior, behavioral expectations in language arts classes were more implied and resulted from classroom routines and the expectation that students were working in assigned pairs on many classroom activities. For example, "What I need from you is that you respect your partner. Listening is a common courtesy when working with someone." Further, teachers introduced expected routines when the situation presented itself.

> Ok, high everybody, pardon for the delay. The first thing you should do when you get here is look at the agenda and if you see there is an activity, and you know how to do it, jump right in. Sometimes it might say, R. J. question. For you today it says: (The teacher is pointing to the board.) Partners review seven kinds of intelligence. (The teacher seems to be training the students on the opening routines for the class.)

Aside from the general behavioral expectations, specific expectations in biology and language arts were emphasized as the situation warranted. For example, the

following instructions were given to a language arts class prior to being released to gather information for a research project. The students were allowed to be in the computer room, library, career center, or in the classroom.

> Teacher: One of the things I learned in the Marine Corps ... Even if you're not busy, look busy. I'm not going to sit there and police ... Unless I see you hanging out in the hallway doing something other than what you're s'pose to. When you are given the free time, my expectations are that you pursue it in some fashion with vigor, and if you fall into the category where you're getting it done at home or you're on hold for some reason, then hang out in my room, or the library, and work on something.

In general, the behaviors expected of students in both subject matter areas were quite similar with two exceptions. First, biology classes incorporated safety procedures into the routines. Second, language arts classes relied on group pairings to serve as a management tool. That is, out of common courtesy, there were behaviors expected of individuals when they work together.

Activity Code 10, Procedural/ Administrative Routines. The code included roll call, announcements, opening or closing routines (unless academic content was involved), distributing graded papers, recording grades in class, and changing seating. These activities involved most of the students. For example, if roll call or paper distribution involved the teacher and one or two students while the rest of the class was in seatwork, the "Seatwork" code was used.

Statistical and systematic qualitative analysis of activity code 10 resulted in no significant difference between content areas. Intuitively, insignificant results were of little surprise. Returning papers, taking attendance, recording grades, creating new seating charts, and opening and closing administrative routines required no special knowledge of content. However, it was interesting to note that the teachers, to varying degrees, often embedded administrative tasks within other activities. For example, daily objectives or short tasks were often on the board when the students entered the room. If there was an activity that students could begin without instructions from the teacher, they did so. In other cases, students were expected to keep a daily log of assignments in their note books that were to be handed in at the end of the grading period. Therefore, upon entering the room, students were expected to copy the assignments from the board into their notebooks. In general, "warm-up" activities allowed teachers to take attendance, set up for class, deal with students who may have been absent on the previous day, answer individual questions students had related to an assignment, or deal with a student's personal problem. The ability to simultaneously carry out a number of different tasks was best exemplified on one occasion in a language arts class. At the start of class, the students were expected to be reviewing for a test in their preassigned small groups. The teacher was walking around in the room returning papers and answering questions proposed by the student groups. The questioning by the students slowly transformed the small group format into a "small group recitation/discussion" session with the teacher and students asking questions of each other. In the meantime, the teacher was still returning papers that,

when completed, resulted in taking attendance for the day. In short, there were four events occurring at the same time. It should be noted that the aforementioned scenario was an extreme and isolated instance. Nevertheless, all teachers performed simultaneous tasks to some degree in an effort deal with administrative chores.

Activity Code 11, Procedural/ Administrative/ Academic Routines. The code was similar to activity code 10, including opening and closing routines where academic content was involved, giving directions for assignments, reminders of academic expectations or discussion of grades.

Statistical analysis revealed no significant differences between biology and language arts classes on Activity Code 11. In both content areas, Activity Code 11 focused primarily on procedures students were intended to observe on a subsequent activity. In language arts and biology, the clearer the directions, the more efficiently students became engaged in the task. Biology courses were unique in that directions for laboratory activities typically included reminders of safety. Students needed to be reminded of general safety practices as well as specific concerns unique to the laboratory activity.

Activity Code 12, Checking. This code involved going over homework problems, quiz, or assignment for the purpose of checking or grading it in class. Little or no teacher explanation or review was entailed. The teacher or students announced answers or wrote them on the board or overhead.

Due to the single observation in the language arts class comparisons between the two content areas was difficult. However, both subject matter areas seemed to use checking as a vehicle that allowed students to review the subject matter. Occasionally, teachers retested the students over the same material to provide students with an opportunity to improve their grades. Done as a class activity, the checking format closely resembled a recitation format with the exception that tests were being graded. The teacher selected individual students to respond to questions and elaborate on student responses if necessary. Overall, the teachers utilized the checking format at the start of the school year in an effort to demonstrate the types of responses that were expected on a test. The following classroom scenario represented eight minutes of a 41 minute checking segment. The 41 minute segment consisted of grading seven essay questions from a test. After the first question was graded, the pattern repeated itself six more times. In the interest of brevity, only the opening sequence and first question is presented.

Teacher: Ok, let's grade these things from the last test. Now, there are seven essay questions. I'm going to read the key things I'm looking for. If you feel like they know about these things, leave it. If you're not sure, put a question mark. They will come back to me.

Teacher: Do you want colored pencils to grade with?

The teacher began passing out papers to the class in a random manner, while a student was handing out colored pencils. "Ok, let's give 2 points for each of these." While moving throughout the room, the teacher read the first question about a niche in

the environment. A student read a lengthy answer. "Do you think that answers the question?" "Yes!" Another student read another answer to the same question that was a bit more vague. "Take off one point." Two more students have questions regarding the responses to the essay question. It would seemed that there was more time dealing with a student's indecision about an answer than with the actual grading. "Ok, number two about decomposers." The same sequence continued for the remaining six essay questions. All that changed was the increased frequency of students asking questions about responses on the test. The increased questioning probably doubled the time required to grade the tests.

Activity Code 13, Transitions. These activities entailed changing from one activity to another. Including getting supplies, passing paper, waiting for everyone to get ready, becoming quiet, or finding their place.

Statistical and qualitative analysis revealed no significant difference between biology and language arts classes. Typically, teachers were observing the class during the transition or setting up materials for the next activity. If the activity was a form of seatwork, teachers patrolled the class toward the end of the transition to deal with questions students might have had concerning directions. Although the length of time in transition was found to be statistically insignificant, qualitatively, language arts classes seemed more efficient at making transitions depending on the type of activity. The increased efficiency in language arts classes was attributed to the assigned student groups. Students within the groups were always seated together. Therefore, if the

next activity was a small group format, for example, little time was wasted moving to another place in the room. The most notable time differences between the two content areas were transitions into laboratory activities. Transitions into a laboratory activity was a rather lengthy process considering that students were out of their seats, obtaining necessary materials, finding their lab partner, setting up equipment, and asking questions. In general, it seemed that the most important element of a transition occurred before the transition. That is, clear directions and expectations for the activity, seemed to be of paramount importance. However, since all teachers in the sample were considered to be good managers, a comparison of good versus bad transitions was not possible. Representative quotes would do little to enhance the description of this activity code. Field notes indicated that a transition occurred and identified teacher and student behaviors that are summarized above. In general, there was little interaction between the teacher or the student. The teacher was simply waiting.

Activity Code 14, Non-academic Activity. This activity included games, discussion, TV, not related to the content of the class.

Statistically, non-academic activity was found to occur more frequently in biology classes than in language arts classes. Nevertheless, in both content areas, non-academic activity was composed primarily of stories or discussions not necessarily related to the content of the class. The stories often revealed something about the teacher's activities or dealt with a current event that was of interest to the student.

Although non-academic activity tended to have a negative connotation, the classroom format did allow the teacher to interact with the students on a personal level. The following classroom segment occurred during the first 15 minutes of a biology class.

"Ok, let's get this lecture over with." Almost immediately the teacher began with a story about playing rugby with broken fingers and bruised thighs. After approximately three minutes the teacher decided to take attendance. The students were quietly conversing. "Ok, take out half a sheet of paper and secretly write down an organism. While the students are working, a discussion concerning the seating arrangement ensued and continued for about three minutes. "Why don't you get out that yellow sheet", (referring to a previous handout). As the students looked for the yellow sheet, the teacher began conversing with three students in the front row about Monty Python. The students in the front of the room were attentive, but those in back became involved in their own conversations. After approximately six minutes the teacher attempted to bring the class back together. "You have all been desensitized! ... Did I ask you yesterday about what would happen if we all turn vegetarian?" The students respond with a,"No." The teacher commented, "Ok, we'll talk about that tomorrow." Over 15 minutes passed during the period before the formal lesson began.

In contrast to biology classes, language arts classes more frequently used stories within the context of the lesson to illustrate a point or to set the students up for a short writing assignment. If that was the case, the story became part of another activity code depending on the type of task. For example, a teacher told a story about his/her most embarrassing moment. The students were then expected to write about a similar experience. Segments of field notes would provide little if any further insight.

Activity Code 15, Dead Time. This code was used when two-thirds or more of the class had no assigned task and students were just waiting.

Chi-square analyses showed that dead time occurred statistically much more frequently in biology classes than in language arts classes. Unfortunately, the rather high frequency of dead time in biology classes may have been directly attributed to a single biology teacher that was coded for 33 of the 46 occurrences.

In both content areas, dead time usually occurred when teachers were making last minute preparations for the lesson, looking for materials that were forgotten, or waiting for the bell to ring at the end of a class period. In most cases, the occurrences were relatively short in duration. Similar to activity code 14, dead time does not necessarily have negative connotations. Due to the length of the periods, teachers would commonly plan five minute breaks into the 90-minute class to allow students to stretch, go the restroom, or get a drink of water.

Activity Code 16, Media Presentation. Teacher presented audiotapes, videotapes, movies, records, or laser disks as part of the lesson.

In biology and language arts, the behaviors of the teachers were found to be rather consistent. The predominant type of media presentation involved videotapes. However, laser discs, audiotapes and movies were noted. Teachers typically introduced what was to be seen or heard and monitored the class for a period of time after the starting the presentation. If the length of the presentation was sufficiently long, the teachers took care of administrative tasks or grade papers. Language arts courses were unique in that the media presentations were typically lengthy. Language arts teachers showed the movie version of a book the students had finished reading or a movie that paralleled the theme of a book the students were reading.

Summary

Stated in general terms, the first null hypothesis refers to the frequency with which each of the contexts are used and is as follows:

H_o^1: There is no significant difference in the frequency of contexts utilized in the two content areas.

Of the 16 specific null hypotheses that corresponded to each of the 16 classroom contexts, six of the null hypotheses were rejected. Variable 3 (Seatwork), variable 5 (Group Seatwork), and variable 7 (Student Presentations) were found to occur with significantly greater frequencies in language arts classes than in biology classes. In contrast, variable 6 (Hands-on Activities), variable 14 (Non-academic

Activity), and variable 15 (Dead-time) occurred with significantly greater frequencies in biology classes.

The second null hypothesis, stated in general terms, reflected the amount of time spent in each of the contexts and was as follows:

H_o^2: There is no significant difference in the amount of time spent in each of the contexts based upon the content being presented.

Of the 16 null hypotheses, four were rejected. In biology classes, a significantly greater average time was spent in the following activity codes: Activity code 1 (Content Development/Lecture), Activity Code 4 (Tests), and Activity Code 13 (Transitions). In contrast, language arts classes spent a significantly greater average time in Activity Code 3 (Seatwork).

The results of the qualitative data indicated that within any given classroom context or activity code, the classroom management behaviors of the teachers were quite consistent. That is, the behaviors of the teachers during recitation or small group activities were essentially identical. Differences between contexts emerged where the occurrence of a context, in either of the subject matter areas, occurred once or not at all. These contexts might be viewed, albeit doubtfully, as unique to the subject matter. Nevertheless, in general, subject matter differences did not directly reveal themselves in terms of management within a particular context. What seems more important was the instructional approaches taken within the two subject matter areas. The approach affected the nature of the context and the context determines the management demands.

CHAPTER V

DISCUSSION AND CONCLUSIONS

Introduction

The purpose of this study was to explore the management demands unique to science classrooms. Two different, yet complementary, research methods were utilized. First, two statistical hypotheses were proposed in an effort to document the frequency and duration that different classroom contexts were utilized in each subject matter area. The two statistical hypotheses are stated in general terms, with 16 individual hypotheses being tested for each of the null hypotheses that correspond to each of the 16 classroom contexts. Second, a qualitative research question was addressed by this study. The purpose of this question was to examine the extent to which subject matter influences classroom management within a particular context.

Conclusions concerning the statistical hypotheses and qualitative research question are addressed in the following sections. In addition to the conclusions and associated discussions, comments concerning the limitations of the study, recommendations for future research, and implications for classroom practice are addressed.

Discussion and Conclusions of Statistical Hypotheses

Of the 16 specific null hypotheses associated with the first general statistical hypothesis, six of the null hypotheses were rejected. Variable 3 (Seatwork), Variable 5 (Group Seatwork), and Variable 7 (Student Presentations) were found to occur with significantly greater frequencies in language arts classes than biology classes. In contrast, Variable 6 (Hands-on Activities), Variable 14 (Non-academic Activity), and Variable 15 (Dead-time) occurred with significantly greater frequencies in biology classes. The significantly greater frequencies of Variables 3, 5, and 7 in language arts classes reflects a general classroom pattern observed in all language arts classes. Specifically, students are provided with opportunities, either individually or in groups, to examine a question or form an opinion prior to presenting their thoughts to the class. Doyle and Sanford (1985) and Slavin (1980) have suggested that allowing students to pool their efforts on particularly novel tasks is a way to soften the individual student risk. Similarly, teacher interviews suggest that allowing students to formalize their thoughts creates a safer environment where the students are more likely to respond and take part in class discussions because they have had an opportunity to think about their responses. As one teacher stated:

> I always try to think about something they [the students] can do that will engage them in an activity. So that's why I use partner teams. I'll try to break up the information into smaller bits and let them rehearse and discuss with their partners. I use response journals for them to do writing daily so they can try out the ideas before we do a discussion in class. When we read things in class a lot of times I have them take notes or copy down provòcative statements from the article ... Things

> they would like to discuss. You know things to pull out. So I let them generate the questions.

In addition to being a vehicle for students to rehearse ideas, the custom of pairing students seems to be a classroom organization critical for managing the language arts classes observed. That is, student pairs are the classroom social structure on which many classroom activities are based. Discussions and sharing of ideas were common among all language arts classes observed. Therefore, creating a safe environment where all students feel safe to participate was essential.

> The partner teams work well in all cases; that's why I use it in all my classes. If I were teaching adults I'd use it. With little kids, like the green group, (The most immature group. In fact, the most immature group I've had for some time.), it's essential because they need to talk and that way I can build in a structure where what they are talking about is relevant to the class. It lets them practice talking about things before we do a big group discussion.

The student pairings also imply that students are expected to behave in an appropriate manner when working with other people. The pairings require students to cooperate, respect each other's opinions, and work toward a predefined goal. One of the goals of the language arts classes observed, and identified by the National Council of Teachers of English (1982), was to develop an understanding for other people and cultures. Student pairings allowed the teacher to place individuals with others they may not know and, in most cases, with students of opposite gender. Therefore, the practice of forming student pairings served an instructional purpose as well as a management tool. The partner pairs compel students to work with others they may not

know or understand and may be less disruptive since they are not working with their best friends.

One of the three variables found to occur with significantly greater frequency in biology classes was Variable 6 (Hands-on Activities), otherwise known as laboratories. The significance of Hands-on Activities in biology classes, and science classes in general, is of little surprise. Traditionally, laboratory activities have been considered an integral part the science curriculum and have been a focus of research for a number of years (Hurd & Rowe, 1966; Hofstein & Lunetta, 1982; Oakley & Crocker, 1980; Shymansky & Penick, 1979). Furthermore, laboratories present the teacher with management demands that may be unique to science classrooms. A teacher needs to plan the activity, gather necessary supplies and equipment (which might take weeks), organize the materials for efficient distribution, provide adequate pre-laboratory instructions to ensure a smooth transition into the activity, monitor the class while engaged in the activity, provide the necessary instructions and facilities to clean up after the activity is completed, and provide an adequate discussion of the results. In addition to the somewhat generic management demands previously listed, safety concerns are pervasive. Science teachers must be aware of equipment and chemicals that could be dangerous and take appropriate precautions to limit student injuries.

The additional variables found to be significant in biology classes were Variables 14 (Non-academic Activity) and 15 (Dead-time). Although these two variables were operationally defined, making a distinction between the two was often

difficult when closely examined. As a result, it may be beneficial to address Variables 14 and 15 concurrently, since the results and conclusions concerning the two variables are identical.

During observations of all teachers in the sample, a certain degree of dead-time and non-academic activity occurred. However, such occurrences may not necessarily have negative connotations. Due to the 90-minute class periods, it was not unusual for teachers to plan a short break into the lesson to allow students to stretch or use the restroom. The remaining occurrences (or unplanned segments) typically transpired during the opening or closing of a lesson when a teacher was making last minute preparations, looking for materials, or waiting for the bell to ring. It could be argued that adequate planning, in many cases, could have averted many of the occurrences. It is important to note that collectively, there were 58 occurrences of Non-academic Activity and Dead-time in the biology classes and 22 occurrences in language arts classes. Of the 58 occurrences in biology, 38 occurrences were attributed to a single teacher who frequently told short stories unrelated to the lesson or engaged in conversations with teachers passing in the hall apparently in an effort to entertain the class. To illustrate the time consumed by the teacher, two students were overheard in the bathroom talking about the class. One student said to the other, "Can you believe that?" "It took us over an hour to grade those seven questions!" "We didn't do anything!" As a result of the behavior exhibited by this teacher, there is a reluctance to form conclusions for the biology classes of the sample even though the variables were found to be statistically significant.

Of the 16 specific hypotheses associated with the second generally stated hypothesis, three of the null hypotheses were rejected. Variable 1 (Content Development/Lecture), Variable 4 (Tests), and Variable 13 (Transitions) were found to occur for significantly longer periods of time in biology classes than language arts classes.

The significance of Content Development/Lecture reflects a number of important factors. First, in contrast to the group and individual seat work of language arts classes, biology classes seemed driven by the idea of single correct answers. That is, students are expected to learn facts, definitions, and concepts from the body of knowledge of biology and reproduce those facts on tests and quizzes. For experienced teachers, the relationship between a teacher's beliefs about teaching the subject matter and his/her classroom instruction is quite strong (Grossman & Stodolsky, 1994) and may have implications for how a class is managed. The "correct answer" focus of the classes, in turn, tends to promote a traditional approach to teaching where lecturing is the most efficient means of bestowing information to classes when they contain over 30 students. In addition, the "compressed block" schedule requires teachers to complete a traditionally year long class in half the time. In practice, teachers feel compelled to cover the same amount of content. Consequently, the most efficient means of accomplishing such a goal is through lecturing. As one teacher stated: "It's what you call survival." Unfortunately, such a teaching approach may also give students the impression that science is not a tentative body of knowledge open to question.

Tests, once again, reflect the content-driven nature of the biology classes. Tests were often long and included material from the text, lectures, and laboratory activities. In contrast, tests in language arts classes were relatively short. Language arts tests typically focused on 10 or 12 vocabulary words or possibly a short factual quiz over a few chapters from a novel in an effort to maintain student accountability for reading assignments. So what does this result mean in terms of classroom management? Although both content areas utilized tests as a motivating factor, the weight of a chapter test in biology was much greater than a vocabulary test in language arts classes. Biology tests were often worth 70-100 points where a vocabulary test was worth 10-12 points. A single biology test could determine a student's grade at the end of the grading period. Due to the great weight given to biology tests, teachers often provided students with opportunities to make test corrections for additional points or retake a test in an effort to improve their scores. The notion of a classroom where students engage in a "performance for grades exchange" is not a new idea (Becker, Geer, & Hughes, 1968). In addition, the reduction or negotiation of task demands have been noted by Doyle, Sanford, French, Emmer, and Clements (1985) and Doyle, Sanford, Nespor, and French (1985). In general, tests in biology classes were the end points of instruction and carried the greatest weight. In language arts classes, weekly vocabulary tests were similar in that the students were expected to learn the definition and possibly a context sentence. However, the primary weight of a grade produced in a language arts class was based

on writing assignments that typically addressed some open-ended question, arriving at an opinion, or evaluating a situation.

The significantly shorter transitions in language arts classes were due primarily to assigned student pairs where students were required to sit together, and assignments that were short and typically verbal. For example, "In your groups, I want you to come up with five good things about America and five bad things about America." Consequently, when the teacher made an assignment requiring students to work in small groups or with their partners, students were able to begin almost immediately. In contrast, the longer transitions in biology classes can be attributed, in part, to the lengthy transitions required to begin laboratory activities. Specifically, laboratory activities invariably require that students move around in the room to find their laboratory partners and obtain the necessary materials prior to beginning the activity. The entire process could last several minutes. Although biology students had assigned laboratory partners, the nature of the activity was often different from the activities in language arts classes where students rarely needed to leave their seats. Aside from transitions involving laboratory activities, numerous transitions in biology classes often included the distribution of worksheets, review guides or outlines that tended to lengthen the transition segments.

Discussion and Conclusions of Qualitative Research Question

Results of the qualitative analysis revealed few differences between content areas within each of the 16 contexts. That is, for any given format/context the

behaviors of the teachers were consistent. For example, within the lecture format, a biology teacher and a language arts teacher present different content to their classes; however, the behaviors of the two teachers while engaged in a lecture is consistent. Although management differences were not apparent between content areas, instructional demands placed on the teacher were often quite different based on the content being presented. The most striking difference between content areas occurred within the context of Content Development/Recitation. During a recitation, by definition, students are asked to review and discuss previously presented material. In a biology class, teachers are typically interested in a "correct" answer or guide the students to elicit the correct response. In contrast, a language arts teacher may frequently need to consider a number of different correct answers because a student response can be based on the interpretation of a reading or dictionary definition. If a student supported a particular point of view with evidence from the reading, the answer was considered acceptable. Although biology classes might utilize a similar approach in some instances, it is much easier to simply tell or lead the students to the desired answer. In addition, the nature of the subject matter does not always allow for alternative views. In particular, molecular biology is typically approached as a set of steps to be learned by the students (e.g., mitosis, meiosis, replication, transcription, and protein synthesis, to name a few). In short, students are expected to learn the current dogma and be able to reproduce it on tests.

This finding does not mean that biology students are continually memorizing facts. Discussions focusing on the ethical considerations of genetic engineering, and

ecological decisions made by governments throughout the world did occur. However, the extent to which students were provided with opportunities to engage in higher level thinking skills were more apparent in language arts classes than biology classes. Instead of looking for a single correct answer, language arts teachers had to be prepared for a variety of potentially correct answers and be prepared with many more questions in an effort to allow alternative responses to emerge. The instructional approach of providing students with opportunities to engage in higher level thinking skills also seems to increase the management demands placed on the teacher. In the study of classroom tasks, Doyle and Sanford (1985) and Sanford (1987) found that conducting comprehension-level work with students appears to be complex and demanding. Seldom were students seen accomplishing tasks where they were required to struggle with meaning. As a result, teachers may be avoiding higher level tasks due to the increased management demands placed on the teacher. Bossert (1979) has suggested that some activities are inherently more difficult to manage. For example, it is easier to maintain order in activities such as supervised seatwork, small group activities and class discussion than individual seatwork and recitation.

As previously stated, apart from the content being presented by the teacher, subject matter differences did not reveal themselves directly in terms of management within a particular context. What seems more important are the instructional approaches used within the two subject matter areas. The different approaches, at least in part, may be reflected in the Chi-square analyses where different contexts were more frequent in one content area than the other.

If one considers that some of the goals in language arts classes are to teach speaking, reading, listening, and writing skills (NCTE, 1982), providing opportunities for students to practice those skills are reflected in the results. In contrast, if biology classes are primarily emphasizing the content of biology, longer periods of lectures and tests should not be surprising results.

In general, it seems quite obvious, based on the sample, that teaching these two subject matter areas requires two different sets of goals and objectives and that certain contexts lend themselves better to teaching certain objectives than others. Different goals and objectives may not be a surprising finding. If one considers the nature of the two subject matter areas, different goals and objectives would be expected. For example, speaking, reading, writing, and listening are skills that require practice if they are to develop. Therefore, it is appropriate for teachers to utilize those classroom contexts that allow students to practice those skills. In contrast, biology, and science in general, is a process that contributes to a body of knowledge. Typically, it is the body of knowledge of science that receives the greatest emphasis in classrooms because it is the primary focus of achievement tests and college entrance exams. In addition, all of the biology teachers echoed the familiar phrase: "learning science is similar to learning a foreign language." That is, if one is to communicate or read about a scientific topic, it is essential that an individual be familiar with the terminology, if a topic is to be understood or discussed.

A similar idea was argued by Doyle and Sanford (1985) who contended that to solve academic problems, students need domain-specific knowledge in the subject

area. In general, it seems that biology teachers are attempting to provide the domain-specific knowledge, but due to other variables (primarily time), the processes of science are placed in a secondary role.

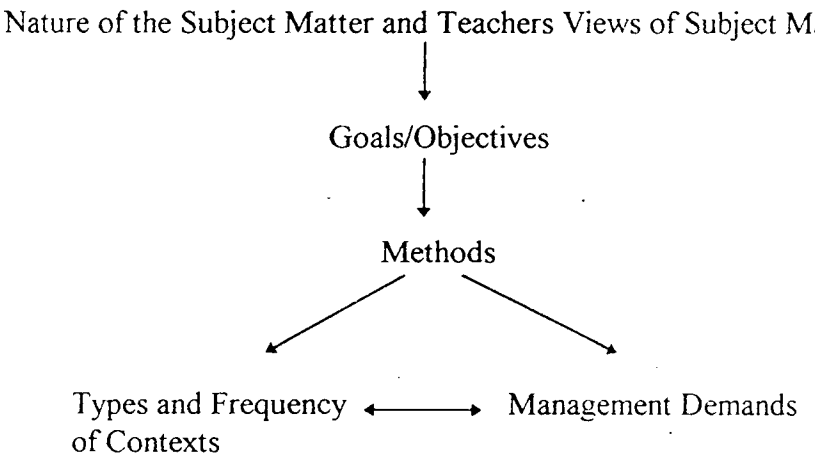
In conclusion, the goal of this study was to identify management behaviors unique to science classrooms by comparing them to language arts classrooms. Although management behaviors were found to be quite similar within each of the contexts, the frequencies with which the contexts occurred varied. It is proposed that the frequencies with which the contexts occurred is related to the nature of the subject matter and/or possibly how teachers view their subject matter. Although teachers' views of their subject matter were not explicitly addressed by this study, Grossman and Stodolsky (1994) suggested that for experienced teachers a particularly strong relationship exists between a teacher's beliefs for teaching the subject matter and his/her classroom instruction. Therefore, it is proposed that how an experienced teacher views his/her subject matter may then be translated into the goals/objectives of the class, and the methods used to accomplish the goals/objectives. The methods, in turn, dictate the types and frequencies of contexts utilized in the class, and each context carries with it particular management demands. Figure 1 presents the findings diagrammatically.

It is important to note that the impact of students is implicit throughout the diagram. Although students were not the primary focus of the study, their role in classroom management cannot be overlooked. Each group of students is unique and brings a different set of personalities and expectations to the classroom. The implicit

impact of students is certainly reflected in the bi-directional relationship between "Types and Frequency of Contexts" and "Management Demands." As a result, a teacher may elect to present the same material utilizing two different approaches based upon the students in the class.

Figure 1

Diagramatic Representation of Findings



The results also indicate that the link between classroom management and subject matter is not direct. At a superficial level, it is easy to assume classroom management to be a general pedagogical skill (Shulman, 1986b). However, upon close scrutiny of classroom interactions it becomes apparent that classroom management behaviors differ based upon subject matter being presented. Biology and language arts classes were selected, in part, based on their known curricular

differences. If Shulman was correct in his categorization of classroom mangement, no differences would have been found. However, the results of this study indicate that Shulman's generic categorization of classroom management is likely incorrect, or at least too simplistic.

Limitations of the Study

At the onset of the study, a number of limitations were recognized. Many of the limitations can be directly linked to the logistics of utilizing a single observer. Specifically, the sample did not address grade level differences, school size, content areas other than biology and language arts, and urban versus rural communities. Since a single observer was used to collect data, it was considered more important to limit the variables and do an effective job with a smaller sample than to take into consideration the aforementioned variables and risk collecting data that would have little meaning. In addition, since all teachers included in the sample were located in the same school district, the sample may not be representative of the general population of biology and language arts teachers. Therefore, the ability to generalize the findings to the general population of biology and language arts teachers is limited.

Second, there was a desire for a portion of the sample to include teachers who taught both a science and language arts course. The inclusion of teachers who taught in both content areas could have been used as a means to verify differences observed between those teachers only teaching within a single content area. Needless to say, such a teacher was found to be quite rare and finding two such teachers was impossible.

The frequency of observations may be an additional limitation of the study. Each teacher was observed two times each week. Each observation was during a different period of the day. Although the teachers did a good job of keeping the classes in the same place, it could be argued that one observation per week with a particular section is inadequate to gain a sense of continuity for the events occurring in the classroom.

Implications for Classroom Practice

In general, the results of this study tend to support the findings of Sanford (1984) who found, that for the most part, the pattern of teacher and student relationships established in science classes is similar to those reported in other content areas (Emmer, Sanford, Clements, & Martin, 1982; Evertson & Emmer, 1982). Although differences in management demands were recognized by the researchers, there was no discussion of the activities or specific management demands placed on the teacher.

The results of the present study indicate that management demands are particular to the classroom context being utilized. For biology teachers, the classroom context of Hands-on Activities (or laboratories) seem unique to the science classroom. As recommendations for science education reform become implemented, an emphasis on constructivist teaching methods, the processes of science, and laboratory activities will likely play a more dominant role in the teaching of science. Further, the inquiry-oriented nature of the activities may make their management more demanding.

Therefore, it seems quite clear that the management demands associated with laboratory activities should be a concern for both inservice and preservice science teacher education programs. Specifically, the management demands associated with laboratory activities could be emphasized in science methods classes.

Given the domain-specific knowledge touted by Shulman (1986b) and Buchman (1982), it seems that management must be learned in a particular subject matter context. Such an approach would be beyond the more generic treatment of classroom management that occurs in general education classes, where teachers from a variety of subject matter areas are being addressed. Learning classroom mangement within the subject matter implies a strong, field-based component to preservice teacher education programs. The field based component would apply to all subject matter areas where the management demands associated with each subject matter area could be addressed.

Recommendations for Future Research

It is important to note that this study attempted to approach classroom management at a micro-level. However, classroom management is much more complex than what may have been portrayed. The results of this study support the notion that management and instruction are not distinct entities (Weade, 1987). Management is typically regarded as a necessary precondition for, and during, effective instruction (Evertson, Emmer, Sanford, & Clements, 1983; Emmer, Sanford, Clements, & Martin, 1983). This conception implies that management and instruction

are somehow separate processes that can be thought of in isolation from each other. Evertson and Randolph (1995) contended that such a dichotomy may be a naive conception for viewing classrooms. Observers have noted that when watching an ongoing stream of talk and interaction in the real time and space of the classroom, distinctions between management and instruction become blurred. As these processes evolve, they become intermingled and are in a continual dynamic relation (Erickson, 1986; Weade, 1987). The complexity of classroom management is further complicated when social and academic factors are considered by teachers when making managerial decisions. Again, academic and social task demands should not be considered as separate entities. "Social and academic participation evolve interdependently. Adjustments in expectations for social participation influence what can and will occur academically, and vice versa" (Evertson & Randolph, 1995, p. 4). Then, to add yet another layer, cultural considerations and the language used by teachers may play an important role in how classrooms are managed (Ballenger, 1992).

When one considers the complex nature of classrooms in conjunction with the current reform movements, a different conceptual view of classrooms may be necessary to deepen our understanding of how classrooms function and the management demands associated with those functions. For example, Project 2061: Science for All Americans (1993) provides suggestions for the teaching of science, mathematics, and technology. The suggestions include: start with questions about nature, engage students actively, concentrate on the collection and use of evidence, provide historical perspectives, insist on clear expression, use a team approach, do not

separate knowing from finding out, deemphasize the memorization of technical vocabulary, welcome curiosity, reward creativity, encourage a spirit of healthy questioning, avoid dogmatism, promote aesthetic responses, build on success, provide abundant experience in using tools, support the roles of women and minorities in science, emphasize group learning. This vision of science teaching portrays a different state of affairs than what currently exists.

As reform measures attempt to change the way science is taught, a shift in the conceptual understanding of the classroom may need to shift as well. In fact, a conceptual shift may be appropriate regardless of the reform movement; specifically, a shift from a classroom once thought of as a "workplace" to a classroom viewed as "learning-oriented" (Marshall, 1990). In such a classroom, an organization exists where small groups of students use a variety of materials and procedures for high level conceptual learning (Cohen & Lotan, 1990; Marshall 1990). The metaphorical shift from a "work-oriented" classroom to "learning-oriented" classroom seems to match the vision of the current reform movements and may provide science educators with opportunities to ask different questions and come to a better understanding of science classrooms.

Specifically, it has been argued that learning-centered classrooms are likely to be more complex in terms of variety and flexibility of activities that are offered (Evertson & Randolph, 1995). However, how much direct teacher control is required to manage the complexity is unclear. Doyle (1986) suggests that complex classroom settings require more direct management and control. In contrast, Cohen and Lotan

(1990) and Marshall (1990) point out that another classroom organization exists where small groups of students use a variety of materials and procedures for high level conceptual learning. They argue that when complex instructional strategies are utilized, it is effective for teachers to delegate authority to students or groups of students. As science teachers shift to a constructivist teaching style, classroom structures will likely become more complex. Science educators will need to address the question of how to best manage science classrooms, particularly laboratories, that are open-ended in nature and where students are allowed to formulate their own solutions to problems.

It is important to note again, that due to the limited sample size, the ability to generalize the findings of this study is limited. Clearly, further research is needed that describes and explains the role of additional factors and their interrelationships for a larger number of teachers in a variety of settings. Further, the limitations of this study point to additional research questions or interrelationships that could be examined.

The factors can be grouped into three general categories and would impact the diagram in Figure 1 at various levels. The first category would include variations urban versus rural environments, school size, socio-economic background, and academic expectations of the local school board and departments. Such variables would be valuable factors to examine in conjunction with classroom management, subject matter, and instructional practice. This first group of variables would impact Figure 1 at the level of "Goals/Objectives." In general, the first group of variables consider the impact of social expectations, both external and internal to, on the

classroom. Social expectations are independent of the nature of the subject matter or a teacher's view of the subject matter. However, what a teacher elects to teach is often influenced by the community in which the school is located.

A second set of factors concerns differences that exist among teachers with different levels of experience, range of subject matter knowledge, perceptions of subject matter, instructional practices, management styles, and thought processes. In general this second groups of factors are those that are internal to diagram in Figure 1. For example, Lee (1995) proposes a number of possible questions that examine the relationships among teachers' level of experience (experienced versus inexperienced), management style (strict versus flexible), and a teacher's level of subject matter knowledge. In addition, future research should include those teachers that teach across different subject matter areas. Such an approach would allow researhers to take into account teacher variations and allow for a more direct analysis of the influence of subject matter on classroom management.

In addition, factors that influence the instructional decisions of teachers may provide insight into the management demands of teachers. Clark and Peterson (1986) proposed three major categories of teachers' thought processes. They included: teacher planning, teachers' interactive thoughts and decisions, and teachers' theories and beliefs. Teachers' theories and beliefs would include more than how a teacher interprets the subject matter; it also includes the nature of the learner and beliefs about how students learn.

The final set of factors includes student characteristics such as achievement level, ethnicity, gender, or socio-economic background and the possible interactions with classroom management, teacher subject matter knowledge, and instructional practice. For example, no studies on teacher knowledge in different achievement-level classes can be found. Similar to the first set of factors, this final group impacts Figure 1 at the "Goals/Objectives" level. It is also apparent that some of the variables are similar to those listed in the first group of variables. However, an attempt is being made to separate student characteristics, that are internal to the classroom, from the more global factors that impact the classroom externally.

The aforementioned variables suggest a myriad of possible combinations that could be investigated simultaneously within a particular study. However, based on the results of this study, the fundamental elements of specific subject matter and a teacher's perception of that subject matter would also be necessary to explain the subject specific management demands placed on teachers. Lee (1995) has started to examine the relationships between classroom management, instruction, and subject matter knowledge. However, how a teacher views the subject matter and how those views influence classroom mangement have yet to be addressed.

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APPENDICES

APPENDIX A

INFORMED CONSENT FORM

Mark Latz
Department of Science and
Mathematics Education
Weniger Hall 237
Oregon State University
Corvallis, OR 97331
Work Phone: 737-1824
Home Phone: 737-1241

RE: Informed consent form

As you already know, I will be conducting a research project beginning the first grading period of the 1994 school year. What follows is a brief description of what I hope to accomplish and the minimal demands that may be placed on the teachers in the sample.

First and foremost, I want to assure those teachers in the sample that I have no desire to be judgmental, critical, or offer suggestions for the classes I observe. My goal is to explore what goes on in a variety of different classes, both within and between different subject matter areas, and to ascertain if there are any common threads that might exist. Therefore, do what it is you usually do. There is no need to do special lessons simply because I may be in the room. From a research perspective, this would tend to bias the data. I have anticipated that my presence in the room may be a bit uncomfortable at first. Typically, such feelings disappear quickly. I hope that after a period of time my presence will not be noticed. I addition, be assured that classroom events are confidential and that every effort will be made to ensure anonymity of teachers in the sample.

But what does this mean for the teachers in the sample? What demands are being placed on you? Hopefully very little. The biggest demand would seem to be allowing me to observe in two of your classes. In addition to classroom observations, short interviews half way through the grading period and at the end of the grading period are anticipated. In short, my goal is to use as little teacher time as possible.

Finally, I want to emphasize that participation in this project is voluntary. If for some reason at any time you chose not to participate after the start of data collection, that decision will be honored.

Sign below if you have read this form and agree with the terms of the agreement.

Signature_____

APPENDIX B

CLASSROOM ACTIVITY RECORD

Classroom Activity Record

Teacher #____ Period #____ School ____ Subject____ Date_____

# of Ss____ # Adults____ Grade____ Page ____ of ____

Activity Code	# Min	Time	Descriptive Notes

APPENDIX C

MANOVA RESULTS FOR NESTED DESIGN USING ZEROS TO FILL BLANKS IN DATA SET

MANOVA Results for Nested Design Using Zeros to Fill Blanks in Data Set

Variable	Mean Time Biology	Mean Time English	F	p
1	11.75	7.40	1.234	.329
2	7.98	11.61	.906	.395
3	6.45	11.66	2.915	.163
4	5.43	2.75	2.315	.203
5	7.18	5.28	.142	.726
6	10.14	1.22	4.745	.095
7	0.97	4.99	2.446	.193
8	0.07	0.00	1.010	.372
9	1.05	1.96	.665	.460
10	5.07	4.49	.257	.639
11	3.62	3.35	.025	.881
12	1.92	0.86	.948	.385
13	1.46	1.31	.278	.626
14	0.95	0.42	1.43	.298
15	4.17	1.49	1.940	.236
16	3.04	3.28	.035	.860

* $p<.05$.

Activity codes: 1=Content Development/Lecture, 2=Content development/Recitation, 3=Individual Seatwork, 4=Tests, 5=Group Seatwork, 6=Hands-on Activities, 7=Student Presentation, 8=Small Group Instruction, 9=Procedural/ Behavioral Presentation, 10=Procedural/Administrative, 11=Procedural/Academic, 12=Checking, 13=Transitions, 14=Non-academic Activity, 15=Dead Time, 16=Media Presentation.