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Identification of Effective Classroom Management Practices Among Teachers in Elementary Special Education Computer-Use Classrooms

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IDENTIFICATION OF EFFECTIVE CLASSROOM MANAGEMENT PRACTICES AMONG TEACHERS IN ELEMENTARY SPECIAL EDUCATION COMPUTER-USE CLASSROOMS

by

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IDENTIFICATION OF EFFECTIVE CLASSROOM MANAGEMENT PRACTICES AMONG TEACHERS IN ELEMENTARY SPECIAL EDUCATION COMPUTER-USE CLASSROOMS

Stephanie L. Kenney, Ed.D.

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Increased use of computers in elementary special education classrooms has created the need for a model for the management of such computer-use environments. Using the case study format, this study (a) identified and described, through multiple observations of eight elementary special education teachers over a 3-month period, the classroom management strategies computer-using teachers utilized to foster student on-task behavior; (b) provided rich descriptions of the contexts in which these classroom management practices occurred; (c) provided insight into the teachers' philosophies regarding computer use and management; and (d) examined relationships among teachers' computer experience and training and their classroom management practices over time. All eight teachers had participated in Project ICIP, a research study that compared the relative efficacy of three computer in-service training conditions. Four teachers had participated in the control group and four in the integration training group.

A laptop computer-based qualitative/quantitative observation system was utilized to collect qualitative data in the form of real-time field notes describing the nature of the teachers' attending behavior, quantitative real-time frequency and duration data regarding the focus of

the teachers' attention, and momentary time-sampling data regarding computer and noncomputer students' off-task behavior every 3 minutes. In addition, teachers were interviewed via telephone following each observation. Observation field notes and follow-up interviews were analyzed using Textbase Alpha, a computerized text analysis system.

Results of text analysis of field notes and follow-up interviews indicated that all teachers used a range of effective computer-use management strategies. The final four categories, inclusive of all observed strategies, were: (1) instructional use strategies, (2) instructional format strategies, (3) activity flow strategies, and (4) instructional planning and decision-making strategies. The data revealed that when computers were in use, noncomputer students in control teachers' classrooms exhibited significantly higher off-task behavior rates than did noncomputer students in integration training teachers' classrooms. Both qualitative and quantitative data supported the value of computer integration training in fostering effective instructional computer-use management.

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I wish to dedicate this dissertation to my mother, Mildred E. Kribs, and late father, Richard A. Kribs Jr., who taught me, by their example, that life's most important lessons can be learned by quietly observing and listening.

Stephanie L. Kenney

TABLE OF CONTENTS

Table of Contents--Continued

CHAPTER

Table of Contents--Continued

CHAPTER

Table of Contents--Continued

CHAPTER

Table of Contents--Continued

LIST OF TABLES

List of Tables--Continued

CHAPTER I

INTRODUCTION

Overview

Increased use of microcomputers in elementary classrooms over the past decade has generated interest in the degree to which computer-assisted instruction (CAI) enhances teaching and learning (Collis, 1988; Cosden, Gerber, Semmel, Goldman, & Semmel, 1987; Hanley, 1984; Kulik, Kulik, & Bangert-Drowns, 1985; MacArthur, Haynes, & Malouf, 1986; Rieth, Bahr, Polsgrove, Okolo, & Eckert, 1987; Woodward et al., 1986). Researchers suggest, however, that the impact of CAI depends, not only on hardware and software, but on how computers are used within the classroom contexts into which they are integrated (Bahr, 1991; Clark, 1983; Hanley, 1984; Sheingold, 1981). Student learning cannot be attributed solely to media, per se, but to the quality of the teacher's instructional methods which may or may not incorporate media (Hanley, 1984).

The Role of Classroom Management in Effective Instruction

Substantial research suggests that in order for instruction to be effective, teachers must first provide effective classroom management (Brophy, 1983; Doyle, 1986). In his synthesis of classroom management research, Doyle (1986) found that the keys to a teacher's success

in classroom management appear to be the teacher's (a) understanding of and ability to predict the likely sequence of events in a classroom, and (b) skill in monitoring and guiding activities in light of this understanding. Kounin (1970) referred to these management skills as "withitness" and "overlapping." "Withit" teachers monitor the classroom regularly so that potential problems can be avoided. This requires the skill of "overlapping," the ability to attend to more than one thing simultaneously. For example, while teaching a reading group, a teacher may continue to monitor activities occurring in other areas of the classroom by periodically glancing around the room, a behavior referred to as orchestration of classroom activities (Kounin, 1970). The effective teacher manager monitors multiple activities simultaneously, efficiently processes classroom information, and is able to make decisions rapidly.

The Impact of Computer Use on Classroom Management

Teachers often report that the presence of a microcomputer in the classroom creates new management problems (Shrock, Matthias, Vensel, & Anastasoff, 1985). Computer use in the elementary classroom represents an additional activity which the teacher must include in the classroom management structure (Foliart & Lemlech, 1989). Since most elementary classrooms have one computer for 25 to 30 students (U.S. Congress Office of Technology Assessment [OTA], 1988), a major task for the teacher is to determine how, when, and by whom the computer will be used (Phillips, 1983; Torgerson, 1983-84).

Managing the computer-use classroom requires careful planning and decision making. Thus, many educators believe that CAI research

should be based, at least in part, on the teacher planning and decision-making paradigm. This framework would enable researchers to (a) describe how teachers' thought processes interact with their classroom management behaviors, and (b) relate teachers' thought processes, decisions, and actions to the observable effects of those actions (Fogart, Wang, & Creek, 1983; Shavelson, 1983; Shavelson & Stern, 1981).

Effective Classroom Management in Computer-Use Classrooms

While volumes of information have documented ways in which successful teachers organize and manage their classrooms (Brophy, 1983; Doyle, 1986; Good, 1979), relatively few studies have focused on the nature of computer-use classrooms and teacher behavior in those settings. Indeed, Winkler, Shavelson, Stasz, and Robyn (1985) stated that the major barrier to full implementation of microcomputers in classrooms is the lack of knowledge possessed by educational researchers and practitioners regarding the nature of the knowledge, skills, and attitudes a teacher must have to use microcomputers in a pedagogically sound way in classroom instruction.

To begin to understand effective teacher behavior in computer-use classrooms, researchers have taken several different approaches. Some have examined how teacher behavior changes when a computer is introduced into the classroom. Wiske and Zodhiates (1988), for example, reported being surprised at the degree to which teaching with computers had affected their instructional practices. They described the teacher functioning more as a facilitator of student learning than as a presenter

of ready-made knowledge. In a report on Apple Classrooms of Tomorrow (ACOT), Fisher (1989) pointed out that teachers often develop new approaches to classroom management when students begin using computers. For example, teachers report that as students become more independent in choosing the processes and products of their computer work, teachers must adjust in at least two ways: (1) they must accept that their role is no longer the all-knowing expert whose job is to dispense knowledge, and (2) they must tolerate a higher level of activity and noise in their classrooms. Many teachers initially feel threatened by this challenge to the traditional approach to classroom management in which the teacher is central to all learning activity. In a later ACOT report, Sandholtz, Ringstaff, and Dwyer (1990) described a developmental model of classroom management through which teachers moved when they began the process of using computers in their classrooms. In this three-stage model, the teachers moved from (a) focusing on maintaining control of this new environment, to (b) beginning to anticipate problems and developing strategies for solving them, and finally to (c) beginning to use the technology to their advantage in managing the classroom. Moore (1990) also studied changes in teacher and student behaviors as a result of introducing microcomputers into instruction and reported similar changes in teachers' classroom organization and instructional delivery. She called for further research to examine the most effective balance between the teachers' two roles of providing and managing instruction when computers are integrated into the classroom.

Another group of researchers have examined teacher behaviors by comparing computer-use and noncomputer-use classrooms. Fish and

Feldman (1987), for example, observed the verbal behavior of experienced teachers and students across three conditions: (1) microcomputer work, (2) group work, and (3) recitation. They found that students in microcomputer classrooms used significantly more task-related talk than the other two groups. Teacher verbalization during microcomputer work, however, was consistently low across all grades. Rieth et al. (1987), in an observational study of computer-use versus noncomputer-use classrooms, found that the most positive benefits associated with computer use were increased active task engagement among students and increased individually focused instruction among teachers, both correlates of student achievement.

The Need for Identification and Description of Effective Classroom Management Practices in Computer-Use Classrooms

While these studies provide preliminary information about computer-using teachers, they neither identify nor describe effective classroom management practices in those settings. How do teachers in computer-use classrooms effectively organize and manage their instructional environment? Where do they focus their attention when a computer is in use? Is their attention qualitatively and/or quantitatively different when a computer is in use versus when a computer is not in use? Before teachers can be expected to effectively integrate computers into their classroom instructional activities, researchers must first identify and describe the specific management behaviors that foster successful computer integration, and then educators can teach those behaviors in preservice and in-service training programs.

The purpose of this study was to (a) identify and describe, through multiple observations of eight teachers over time, the classroom management practices that foster on-task student behaviors in elementary special education computer-use classrooms; (b) provide rich descriptions of the contexts in which those classroom management practices occurred; (c) provide insight into the teachers' thoughts, feelings, opinions, goals, and philosophies regarding classroom computer use and management; and (d) examine relationships among teachers' computer experience and training and classroom management practices over time.

CHAPTER II

LITERATURE REVIEW

Introduction

In 1990, it was predicted that within the next 5 years, computers would be routinely used in most classrooms across a wide range of curricula (Newman, 1990). As the use of computers in elementary school classrooms continues to increase, it is crucial that prospective computer-using teachers be provided with some model or standard of computer integration to emulate (Niederhauser & Stoddart, 1993; Panyon, Hummel, & Jackson, 1988). Clearly, the use of computers as a tool in classroom instruction changes the learning environment to some degree, thus affecting the behavior of the teacher and learners (Fisher, 1989; Foliart & Lemlech, 1989; Shrock et al., 1985). Further, since the teacher is the primary implementer of instructional activity in most classrooms, the successful use of any instructional tool is, to a great extent, dependent upon the behavior of the teacher (Hanley, 1984). Sheingold (1991) pointed out that, while in the past technology was touted as the answer for education's woes, today it is generally understood that it is not the features of the technology alone, but rather the ways in which those features are used in human environments that determine technology's impact.

There are many factors that influence how a teacher chooses to utilize a computer in classroom instruction. One factor often identified is

the level of comfort the teacher feels while operating the program, a factor related to technical expertise. Recently, research has begun to address instructional and curricular issues related to what software should be used and when in the scope and sequence of learning, and with which learners, it is appropriate to use a particular program (Sheingold & Hadley, 1990). However, with few exceptions, discussions of such influential factors have not included the "how" factor of integrating computers into instruction. Indeed, in a comprehensive survey of 600 teachers who were identified as experienced and accomplished at integrating computers into their teaching, Sheingold and Hadley described a collective profile of these teachers, delineating what software they used, when they used it, and how often they used it, but failed to identify or discuss the day-to-day integration management strategies used by these teachers. Given a group of acknowledged effective computer-using teachers, information regarding how these teachers maintain a high-/multi-use computer environment would be quite useful to the field.

If effective classroom management is paramount to the success of a teacher (Brophy, 1986; Christenson, Ysseldyke, & Thurlow, 1989; Doyle, 1986; Kounin, 1970), it can also be argued that effective management of computer use is the key to successful instructional computer integration. The goal of this literature review is to examine current research regarding how teachers in computer-use and noncomputer-use special education classrooms organize and manage the instructional environment.

The major body of literature to be reviewed in this chapter is classroom management, including instructional and order (often called

behavior) management. Since the study of classroom management is closely affiliated with research on effective instruction, it will be necessary to intertwine germane findings and theory from this related domain to develop a comprehensive understanding of the classroom manager. Additionally, subsets of classroom management literature including (a) the general education classroom, (b) the special education classroom, (c) the regular education computer-use classroom, and (d) the special education computer-use classroom will also be examined. Examined in this review are studies which have contributed to or resulted in a model that identifies and describes what is currently known about how instructional and behavior management behaviors operate to foster effective instructional computer use in elementary special education classrooms.

Before beginning a discussion of the extant literature on effective classroom management, it must be acknowledged that teaching skills, whether they are related to management of instruction or management of behavior, do not exist in a vacuum (Barro, 1977; Collis, 1988; Gall, 1977). The educational outcomes of students in a classroom are determined by many factors besides the skill and effort of the teacher, such as out-of-school factors and "peer group" effects (Coleman, 1966). Thus, it is not the assumption of this study that the teacher is the only variable that correlates with effective computer use, nor is it an assumption that effective classroom management is the only variable that correlates with effective computer use in a classroom. As Collis (1988) pointed out, what is known most clearly about the impact of computers in education is that it depends on many things, suggesting that computer impact can be explained best as the covariance or interaction of

many variables. While there are numerous correlates of effective elementary classroom instructional computer use, reflecting the very complex environment of an elementary classroom, it seems reasonable to assert that variables related to the teacher and his or her classroom management behaviors play a major role in the success of computer use in elementary classrooms.

Effective Classroom Management

Overview

In a literature review related to critical instructional factors for students with mild handicaps (Christenson et al., 1989), researchers found that a major determinant of student achievement is "the degree to which classroom management is effective and efficient" (p. 22). Until relatively recently, the topic of classroom management has been largely neglected in the study of teaching. Research in the early 1970s began to address the issue of classroom management, but tended to view it through a very narrow lens, focusing on characteristics or behaviors of the individual teacher rather than the sum total of what teachers do in the classroom (Doyle, 1986). In the late 1970s, specialists in teaching effectiveness research began to use Kounin's (1970) studies as a guideline for including classroom management categories in their coding systems. These categories were consistently related to student achievement, a variable that remains a common criterion for evaluating teacher effectiveness. However, as more interest developed in identifying effective management practices, it became clear that a more

comprehensive view of classroom management was needed; researchers began to study the total classroom context. This need to consider the total classroom context eventually fostered a dramatic increase in qualitative studies of classroom life (Cazden, 1986).

Classroom Management Defined

Classroom management has been defined in numerous ways, depending on how the author views the goal of management and the milieu of a classroom. For example, Doyle (1986) stated that classroom management is "the actions and strategies teachers use to solve the problem of order in classrooms" (p. 397), reflecting his belief that since order is a property of a social system, the language and goal of classroom management is to address the order of that group and specifically define management by the order needs of that context. Johnson and Bany (1970), on the other hand, viewed classroom management as "those highly skilled actions of the teacher based upon understanding the nature of groups and the forces that operate in them, on the ability to perceive and diagnose classroom situations, and the ability to behave selectively and creatively to improve conditions" (p. 3), thus reflecting their view of classroom management as having the goal of developing cooperation and a dynamic, nonstatic flow of activity. In his discussion of classroom organization and management, Brophy (1983) defined classroom management by providing his underlying assumptions which were: (a) the teacher is both the authority figure and the instructional leader in a classroom, (b) good classroom management implies good instruction, and (c) optimal classroom management strategies are not

merely effective, but cost effective.

In summary, while these definitions vary, all agree that (a) the goal of classroom management is in some way related to maintaining the degree of order necessary to foster learner success; and (b) the task of classroom management is complex, group-oriented, and context-related. Further, researchers agree that well-functioning classrooms do not just happen, but rather result from the thoughtful persistent and consistent efforts of teachers to establish, maintain, and occasionally restore conditions that foster effective learning (Doyle, 1986).

Dynamics That Are Common to All Classrooms

While each classroom context is unique, based on the kinds of instructional programming used and students' collective learning needs/ characteristics, it has been argued that there are certain characteristics that are common to all (Doyle, 1980). These elements are:

1. Multidimensionality--a concept referring to the great number of different events and tasks occurring in classrooms.

2. Simultaneity--a concept referring to the fact that many things are happening at the same time in classrooms.

3. Immediacy--a concept referring to the quick pace of events occurring in classrooms.

4. Unpredictability--A concept referring to the reality that events do not always go as planned, making it impossible for a teacher to predict the process or outcome of a particular activity on any given day.

5. Publicness--A concept referring to the fact that most behaviors of the teacher and students in a classroom are usually witnessed

by and have an effect on all other students in that classroom.

6. History--a concept referring to the fact that in the period of time students and teacher are together over the course of the school year many common sets of experiences, routines, and norms develop in that classroom and must be considered each time a new activity is planned.

Doyle (1980) asserted that the interaction of all six elements makes the task of teaching very complex even before the factors related to learner characteristics and instructional programming are added to the equation.

Contextual Differences and Classroom Management Practices

While the overall goals of classroom management do not change across differing contextual variables such as grade level, instructional content, or kind of activity, the specific methods used to accomplish the goals of classroom management may differ across contexts (Doyle, 1986). Gump (1967) studied relationships between activity types and teacher behavior and found that differences in the kind and quality of teacher behaviors were associated with the activity type. For example, he found that during supervised seatwork time, teachers provided much more individual student help than during recitation or reading groups because helping individuals at that time did not interrupt the momentum of other students and teacher-student interaction could be more private, thus was more desirable during supervised seatwork time. In a study of two third- and fourth-grade classrooms, Bossert (1979) found that the level of teacher control exerted also appeared to be activity-specific. For

example, during recitation, teachers were found to use dominant control strategies, and desist and reprimand rates were higher during recitation than during seatwork and small group activities. Similarly, in a study of classroom rules in two secondary schools in Britain, researchers found that not all rules were enforced all of the time, but were associated with particular activities (Hargreaves, Hestor, & Mellor, 1975) . Recognizing the fact that different contexts require different management strategies, teachers are encouraged to examine classroom management findings in relation to their unique settings and student populations (Good, 1983).

Classroom Management in General Education Settings

Research on effective classroom management began before ramifications of the federal special education law mandating appropriate programming to meet the needs of students with handicaps had begun to be considered. Therefore, much of the foundational research on classroom management is based on general education classrooms. Kounin's (1970) studies in the early 1970s looked at two types of classroom teachers: those who managed a smoothly running classroom and those who were constantly struggling to maintain order. Through his analysis of how successful and unsuccessful classroom managers handled misbehavior, Kounin found what he believed to be concrete techniques for managing classrooms that correlated with amount of work involvement and misbehavior among students in those classrooms. Although he found no systematic differences in the way these two types of teachers dealt with misbehavior, he did find that effective classroom managers employed systematic methods to prevent student disruptions,

whereas the ineffective managers dealt with disruptions as they occurred. Kounin identified and described the effective techniques as follows:

1. Withitness--Problems were stopped before they had a chance to escalate because the teacher stationed himself or herself where all students could be seen continuously, thus communicating the message to students that the teacher knew what was going on at all times everywhere in the room.

2. Overlapping--More than one classroom event was attended to at a time without disrupting either or any of the events by the giving of a remark, direction, or simple look, thus conveying to the students that all activities could continue without interruption.

3. Signal continuity and momentum in lessons--Thorough preparation enabled the teacher to move at a brisk pace with few interruptions resulting from such concerns as a missing teaching prop, the need to consult the teacher's manual, or having to backtrack to capture information that should have been presented earlier. Further, student inattention was either ignored or dealt with using such techniques as moving near the student, giving nonverbal signals, or directing questions to the student requiring the student to attend. The teacher always provided a clear task and a clear signal to attend.

4. Group alerting and accountability in lessons--Through the use of presentation and questioning techniques, the teacher kept the group alert and accountable. Such techniques included looking around the group before calling on a student, calling on students randomly, calling on every student frequently, using both choral and individual responses,

issuing challenges as to the difficulty of the next question, and asking for volunteers to raise their hands.

5. Variety and challenge in seatwork--Because students often work independently without direct supervision, the teacher provided seatwork that was at the right level of difficulty, easy enough for successful independent completion, yet difficult or different enough from previous assignments to engage the student.

While Kounin's (1970) early studies focused on teacher desists, his data quickly revealed that effective and ineffective managers handled desists in the same way, but utilized measures to prevent disruption in very different ways. The key theme in Kounin's work was that the effective classroom manager keeps students continually focused on engaging academic tasks, avoids downtime, and conveys to students that the teacher knows what is going on and about to happen, thus providing the students with reasons to stay on task.

Doyle (1980) pointed out that Kounin's (1970) findings lent support to the conceptualization of teaching as having two very distinct task structures: Learning-related roles and order-related roles. He stated that learning is related to individual processes, while order involves a social system or the classroom as a group. To further illustrate his point, Doyle explained that order can often exist without continuous engagement by all students in learning tasks. While this kind of passive nonengagement is not necessarily a problem for order-keeping, it may not be appropriate when the goal is learning. Similarly, Brophy (1979) advocated the study of instructional issues which are independent of classroom management. Good (1983), however, suggested that the

boundaries between instruction and management become blurred upon examination because the degree of importance of one or the other varies depending on the subject matter and whether the teacher is pursuing process or product goals. Good's discussion is particularly germane to the management of computer use and will be mentioned further in a later discussion of contextual variables.

Planning as a Precursor to Classroom Management Success

Building on Kounin's (1970) work, Good and Brophy (1994) addressed the need for preparation and planning before the school year begins. They recommended that preplanning should address such issues as use of space in the classroom, based on the kinds of instructional activities the teacher has planned for the year, developing traffic patterns that foster smoother transitioning, and positioning student supplies and storage areas in such a way that is convenient for students and minimizes need for teacher help. Evertson and her colleagues (Emmer, Evertson, & Anderson, 1980) conducted a series of studies in which they observed 27 third grade teachers and took detailed notes regarding the rules and procedures teachers introduced to their students, especially focusing on the first few weeks of school. They found that in the effectively managed classrooms, (a) classrooms that appeared to be running smoothly and automatically were doing so as a result of much preplanning, (b) teachers taught the students rules and followed through on expectations related to the rules, (c) teachers modeled procedures, giving students opportunities to discuss and practice them, and (d) teachers clearly communicated and consistently carried out

consequences.

Building on their earlier work, Evertson and Emmer (1982) conducted a year-long study of two groups of 13 teachers of junior high mathematics and English who were identified as either "more" or "less" effective in terms of classroom management practices and outcomes. Using both process and product measures and focusing on the first 3 weeks of school, the authors compared the teacher behaviors of less versus more effective classroom managers in order to identify teacher behaviors that were antecedents for year-long effective management practices. From extensive observational data, they identified five broad clusters of variables differentiating the more and less effective manager: (1) teaching rules and procedures, (2) monitoring of student compliance and following through with consequences, (3) establishing a system of student responsibility or accountability for work, (4) clearly communicating instruction- and procedure-related information, and (5) carefully planning and preparing instructional activities.

The studies discussed in this section have consistently revealed the importance of teacher planning and decision making on effective instructional and order management. Indeed, research has reported that a teacher's decision making is primarily preinstructional; that is, teachers do not make significant changes once instruction has begun (Borko, Cone, Russo, & Shavelson, 1979). Assuming this is true, there is real benefit in studying effective classroom managers in order to discover the conceptual, experiential, and informational base on which they predicate their total classroom management system (Evertson & Emmer, 1982).

Classroom Management From the Viewpoint of Students

Tapping a different perspective, Allen (1986) conducted a naturalistic field study to explore 100 high school students' views on effective classroom management. The following themes developed: (a) when students were not challenged with academic demands, they focused their attention on socializing and felt that while they had fun in this class, they learned very little; and (b) in classrooms where academic demands were high, instruction was fast-paced, and grades were influenced by behavior, students reported that they completed their work, but did not particularly enjoy their learning because learning in this room was generally an individual, nonsocial experience. These two themes suggest that teachers should manage a high school classroom in such a way that high quality work is required and students are provided opportunities to socialize while performing academic activities. These findings reflect the teacher expectations regarding work quality and completion that were found among effective managers in Evertson and Emmer's (1982) studies. Further, the finding regarding the need for socialization, also important in the learning of younger children, reflects the current school restructuring trend toward cooperative and active learning as highly effective methods (Sheingold, 1991).

Much of the theory and practice that has been discussed in this section on classroom management seems intuitive and logical to most teachers. However, as a result of this body of research, behaviors that have been commonly practiced among most effective teachers for decades are now codified in the professional literature as effective

classroom practices, giving all teachers a better idea of how these variables (e.g., teacher behavior and student on-task or achievement behavior) interact (Bickel & Bickel, 1986). While much of this research has taken place in general education settings, there are clear connections and implications for special education of mildly handicapped students. The following section will outline the application of aforementioned fundamental theories in special education classroom management research literature.

Theoretical Bases for Classroom Management in Special Education Settings

Since the early days of Public Law 94-142 (The Education for All Handicapped Children Act of 1975, 1976) and mainstreaming, volumes of research have been conducted comparing the relative effectiveness of general versus special education settings in the education of special needs students (Carlberg & Kavale, 1980; Leinhardt & Pallay, 1982). This research focused on the setting as the primary treatment variable and generally found little or no advantage for students placed in special education settings (Carlberg & Kavale, 1980). More recent research focusing on effects related to the special education teacher's classroom management has grown out of studies conducted in general education settings. As the perceived need developed for a model of effective classroom management in special education classrooms, researchers looked to the extant body of literature which had accumulated from studies conducted primarily in general education settings. Indeed, documents reviewed in this section reflect the strong influence of the

work of several researchers cited previously (Brophy, 1983; Emmer et al., 1980; Evertson & Emmer, 1982; Kounin, 1970).

Addressing preventive discipline through effective classroom management in special education settings, Cheney (1989) identified the following three key elements: (1) organizational management of classroom elements; (2) anticipation and redirection of student behavior; and (3) positive, encouraging interactions with students. Cheney, like Evertson and Emmer (1982), described organizational management of classroom elements as activities teachers engage in prior to the start of school. These activities include physical arrangement of the classroom, developing a consistent schedule of activities, and devising procedures to handle classroom routines. Her second key element, anticipation and redirection of student behavior, occurs through lesson planning and delivery, use of specific teacher behaviors, and knowledge of individual student behavior patterns. Borrowing from Brophy's (1983) research findings, Cheney asserted that students seldom misbehave when they are involved in lessons that are presented at the correct skill level, invite active involvement, and provide high levels of success. Incorporating Kounin's (1970) findings regarding group management, Cheney described the use of withitness, overlapping, momentum, smoothness, and group focusing as several effective group and lesson management techniques. She continued by describing specific teacher behaviors associated with lesson management techniques including teacher movement and proximity, interference and signaling, and use of humor. She argued that discipline problems in both general and special education settings could be prevented through effective use of the three key elements.

Similarly, application of earlier teacher effectiveness and classroom management research conducted predominantly in general education settings can be seen in an article by Englert (1984) in which she cited the work of researchers such as Brophy and Evertson and their respective colleagues. Englert looked at the domains of classroom management, instructional organization, and teaching presentation. Englert, like Good (1979), stressed the point that any given teaching strategy does not work equally effectively in every setting. She called for teachers to examine all effectiveness research in relation to their own unique setting and student populations. In the area of classroom management, she reviewed the importance of teaching, rehearsing, reviewing, drilling, and carefully monitoring the use of classroom rules and procedures. Her discussion of key management behaviors also included Kounin's (1970) withitness and overlapping strategies. In the domain of instructional organization, she identified important teacher behaviors to include those that maximize learning time, sustain a high level of academic responding or practice, and keep students engaged in the academic task. She further stated that learning can be maximized by the teacher adhering to allocated instructional time, implementing clear and rehearsed rules for independent workers in order to avoid interruptions during instruction, and making use of small group instruction and tutors. In order to assure engaged time, Englert advised monitoring students during instruction and seatwork times to determine the length of time they could actually sustain engagement and remain accurate in their work. Finally, in the area of lesson presentation, Englert described the three major lesson phases including (1) review, (2) active teacher

demonstration and guided practice of new concepts, and (3) many independent practice opportunities. Throughout lesson presentation, the teacher should maintain an appropriately brisk pace and provide high levels of accuracy. Englert argued that these teacher behaviors, when practiced collectively, offer special education students the best chance to make adequate progress in their learning.

In summary, classroom management researchers have clearly demonstrated in their work that the goals of effective classroom management are applicable to a variety of settings. However, the methods of carrying out those goals change according to specific contextual characteristics. In applying these research findings, the caveat to the teacher is that one must thoughtfully choose from the many available methods those which fit ones unique contextual needs (Doyle, 1986; Good, 1983).

Teachers' Thoughts and Decisions Related to Classroom Management

Because teaching is basically a decision-making process, analyzing teachers' thoughts and actions can lead to a clearer understanding of management in the classroom. One area of research that has examined teachers' intentions and the link between intentions and behavior is the research on teachers' pedagogical thoughts, judgments, and decisions. The two assumptions upon which this research is based are: (1) Teachers are rational professionals who must make judgments and decisions and carry them out in a complex environment; and (2) teachers' behaviors are guided by their thoughts, judgments, and decisions

(Shavelson, 1983; Shavelson & Stern, 1981; Smith, 1988).

Teaching is intensely active; teachers do not have the luxury of large amounts of time for reflection. Interactive decision making, decisions teachers make during lecture, discussion, and tutorials with students, have been called "real-time" decisions that must be made with little or no time to reflect or gather additional information. These decisions occur when the teaching routine is not going as planned. According to a survey of teachers, the most usual instances of evaluation and planning occur while class is in session and involve (a) observing class and individual behavior in order to identify needed changes, and (b) actually making those adjustments in plans while they are being implemented (Smith, 1988).

A few early studies have reported that (a) teachers make between 9.6 and 13.9 decisions per lesson (Morine-Dershimmer, 1978-79), and (b) teachers make approximately 10 interactive decisions per hour (McKay, 1977). Further, in a study which examined the effects of teacher planning and behavior on student achievement, teachers reported using information about student participation and involvement during lessons to judge how well the activity was progressing, making strategy changes in approximately one-half of the problematic situations (Peterson & Clark, 1978). The research on teachers' decision making, like effective teaching and management literature, is largely descriptive, delineating the variables that influence teachers' decision making during planning and instruction. These variables, or cues, are described in a model developed by Shavelson and Stern (1981) which posits that interactive teaching is a series of well-established routines which are

interrupted only when the teacher receives cues (e.g., unacceptable student behavior such as nonparticipation) that the routine is not proceeding as planned. It is, again, only part of the management picture.

Classroom Management in a Computer-Use Classroom

Overview

Educational theorists agree that management of a classroom is an extremely complex activity (Brophy, 1983; Doyle, 1986; Johnson & Bany, 1970; Kounin, 1970). Computer use in the elementary school classroom creates an additional activity the teacher must incorporate into an already complex classroom management structure (Foliart & Lemlech, 1989). Managing the computer-use classroom requires careful planning, making the teacher a critical variable in the effective use of computers (Collis, 1988; Phillips, 1983). Despite the importance of teacher behavior in computer-use classrooms, only a handful of research studies have been done examining the nature of computer-use classrooms and teacher behavior in those settings.

Effective Classroom Computer Use Defined

It has been previously stated that instructional effectiveness is at least in part dependent upon the support of effective classroom management practices. However, in order for management to be successful, it is necessary to have a clear picture of what is to be managed. Pedagogically sound classroom computer use has been defined as "the appropriate integration of microcomputer-based learning activities with

teachers' instructional goals and with the ongoing curriculum, which changes and improves on the basis of feedback that indicates whether desired outcomes are achieved" (Winkler et al., 1985, p. 286). Applying the decision-making model to computer integration, these authors pointed out that in order to make appropriate use of computers, the teacher must make decisions regarding (a) goals for students' use of computers, (b) coordination of computer use with the curricula, (c) the learning activities that will be enhanced by computer use, (d) pedagogical implications of integrating computers, and (e) methods of assessing the effectiveness of computer-based instruction. They suggest that the instructional/management function of the computer-using teacher is to thoughtfully plan and monitor ongoing activities and maintain the activity flow, or activate a routine for handling problems that interrupt the flow.

Teacher's Role in a Computer-Use Classroom

While the role of the classroom teacher in computer-use classrooms has been viewed as significant, relatively little empirical research has been done in this area (Cosden, 1988). According to Collis (1988), teacher's preferred instructional style is a critical variable affecting computer use. Further, Cuban (1985) and Wiske and Zodhiates (1988) found in their studies that (a) teachers were unlikely to change their characteristic teaching practices when planning for computer use, (b) most teachers reported no change in their teaching style after implementing computer use, and (c) most teachers adapted computer use to their existing style.

In contrast, other studies have indicated that the management role of the teacher in computer-use classrooms appears to vary as a function of the kind of software being used. In a study conducted by Fish and Feldman (1987) examining teacher and student verbal behavior in computer classes at the primary, middle, and junior high school levels, the investigators found that when computer programs provided correction and feedback, teachers' verbal interaction with computer students was consistently low.

Fish and Feldman (1988) conducted another study in which 58 intermediate school students were observed across three types of software in paired and individual groupings. They found that behaviors varied by student groupings, keyboarding roles, and type of educational software. As in their previous study (Fish & Feldman, 1987), the authors again found overall low levels of teacher verbalization occurring. In both studies they suggested that the low level of teacher verbalization was related to the role of the teacher as primarily a resource person and the fact that there was very little behavioral disruption during the observations. An additional finding was that while the level of verbalization among teachers remained low across all conditions, the kind of teacher verbalizations differed across conditions. For example, during word processing assignments, the teachers gave more procedural directions to students. Further, the teachers gave lower grade students more procedural information than upper grade students using the same software. This study suggests that there are differing instructional and order management demands on teachers depending on the type of software used and the level of the students using the software. These findings

are consistent with those of Wiske and Zodhiates (1988) who reported that teachers in their study who used drill and practice and tutorial software reported seeing no effect on their teaching as compared to teachers who utilized software that required problem-solving behavior. Indeed, in a discussion of research studies that evaluate some form of student outcomes in traditional versus technology-mediated instruction, Kearsley (1993) pointed out that unless the content of the instruction and the instructional strategies are changed to take advantage of the specific capabilities of the technology, it is not very surprising that nothing new happens!

Likewise, Cosden et al. (1987) found that computer students spent most of their computer time without direct teacher contact. When they compared resource rooms with mainstream classrooms, they found that teachers had more direct contact with students in the more restrictive environments. Most of that contact involved active engagement with students related to the computer task rather than passive monitoring of computer students.

When examining differences between categories of teacher behaviors observed in computer-use and noncomputer-use secondary-level classes, Rieth et al. (1987) found that in computer-use classes, the amount of teacher-based instruction provided was significantly reduced, suggesting that the teachers were delegating instructional responsibility to the computer and using that time to do paperwork and preparation. Their interactions with students consisted primarily of structuring and directing. By comparison, teachers in noncomputer-use classes spent significantly more time delivering planned instruction to students by

lecturing, demonstrating, and leading class discussions. These findings suggest that while teachers planned to use the computer to handle mundane instructional tasks such as drill and practice, thus freeing them up to do additional instruction, they seemed to use the additional time for managerial and preparation tasks. Additionally, much less teacher-directed instruction was done during computer-use times. These data clearly show that teachers' instructional behavior is different during computer-use times compared to noncomputer-use times.

In a study done by observing and interviewing 15 teachers regarding computer-use implementation, Carleer and Doornekamp (1990) also investigated the question of the changing role and practice of the teacher relative to computer implementation. The authors asked questions regarding lesson preparation, lesson implementation problems, teacher role during the lesson, and the type of instructions and managerial activities the teacher performed during the lesson. Of interest to this current study were the insights regarding the type of instructional and managerial activities the teachers reported using. Teachers reported that because the software often required students to learn in a different way, the teachers, likewise, had to fulfill different roles. For example, because the computer activity was more individualized, the teacher role was that of consultant rather than central source of information. While this was viewed positively by most teachers, some teachers viewed this as a threat, feeling that they had lost control of the classroom instruction and order.

Observational data revealed that teachers spent 50% of their time engaged in management activities such as organizing groups, distributing

materials, and monitoring student activity. The other 50% of their time was used for instructional activities such as lesson content, courseware, hardware, and related computer-delivered exercises. Additionally, teachers were observed spending considerable time assisting students in solving computer exercises.

Contextual Differences Related to Effective Computer-Use Management

In 1985, Apple Computer, Inc. began collaborating with several schools throughout the United States to examine the impact that access to interactive technologies had on learning and teaching. Students and teachers in these Apple Classrooms of Tomorrow (ACOT) were provided with computers for home and school, thus providing them continual accessibility to computers. While the context of this study was atypical because every student and teacher had two computers, the authors discussed very important principles related to classroom management, asserting that classroom management is not a skill that is mastered once and for all. Rather, as the classroom context changes, so do the classroom management issues (Dwyer, Ringstaff, & Sandholtz, 1990; Fisher, 1989; Sandholtz et al., 1990). Based on their study of ACOT teachers, the researchers provided a developmental model of management stages through which ACOT teachers seemed to pass. In Stage 1, survival, teachers were concerned about their own computer competency. They were primarily concerned with self-adequacy and maintaining control of the classroom and students and tended to react to, rather than prevent, problems. In the second stage, mastery, teachers began to anticipate

problems and started to develop strategies for solving them. In the third state, impact, teachers began to evaluate, focusing on the effects of their computer management system. Teachers were observed to pass through these stages in an idiosyncratic and unsystematic manner, much like that of any developmental process.

The stage process delineated by these authors illustrates the point that before teachers can be effective classroom managers, they must first understand and manage themselves relative to all of the impinging contextual variables. If an instructional tool such as the computer is to be used effectively, the teacher must first develop self-confidence in using the tool. Only then can the issues of instructional and order management of computer use be addressed.

In an examination of the effects of training and support on integrating technology with elementary mathematics instruction, Niederhauser and Stoddart (1993) found that when the software was of the type that could easily be assimilated into existing instructional practice (e.g., drill and practice mathematics software), little teacher behavior change was observed and little improvement was seen in the students' mathematics skills. In contrast, when the introduction of the mathematics software made significant demands on the teachers in terms of time, effort, and increasing their understanding of mathematics (e.g., Toolbox, a flexible, open-ended tool that allows students to graphically represent problems and solutions), teachers gradually changed their views concerning the role of computers in instruction and their role as teachers, and improvement was seen in the students' mathematics skills. In this study, teacher behaviors changed in response

to the nature of the instructional software.

The findings of these studies lend support to the assertion that the role and management functions of teachers vary depending on the demands of the environment. However, these variations seem related to the methods of management while the goal of management, maintaining an uninterrupted flow of learning, remains constant across all classroom contexts.

Management in the One-Computer Classroom

According to Cosden and Abernathy (1990), classroom-based computer use was found to be constrained by the limited number of computers and the teachers' concerns regarding equal access. In their study of 73 elementary schools including general and special education classrooms, the researchers found that in order to solve this management problem, teachers tended to either (a) develop computer activities that could engage more than one student at a time in conjunction with a simultaneous and related noncomputer-based activity, or (b) plan computer activities that were unrelated to other ongoing instructional activities, most often choosing the latter.

In a study examining the use of Logo in the one-computer classroom, Torgerson (1983-84) delineated a more extensive list of seven management questions which must be answered prior to implementation of computer use. These questions address (a) placement of the computer in the classroom, (b) finding time in the daily schedule for the target program, (c) developing a way of scheduling all children for computer use without losing valuable instructional time, (d) creating a

record-keeping system for computer assignments, (e) providing a source where computer students could get help without disturbing the teacher, (f) developing a means of monitoring progress on computer assignments, and (g) instituting computer rules. These issues, while they relate specifically to computer management, reflect many of the teacher behaviors delineated in the effective teaching and management literature.

Time management has also been cited as a salient issue in the one-computer classroom (Foliart & Lemlech, 1989; Phillips, 1983). For example, when integrating computer use into the instructional program, teachers must decide (a) how much time should be allotted to each student for computer use, and (b) whether it is appropriate for students to miss out on whole-group instructional time in order to use the computer. To help alleviate this problem of ethical use of time, Phillips (1983) suggested a variety of time formats by which to schedule computer use. The formats include: (a) Timed-Use Relay, in which the teacher schedules students by given segments of time to use the computer during small group instruction/independent work times, monitoring the schedule by means of a kitchen timer; (b) Block-Time Format, in which the teacher blocks out the entire instructional week to allow each student 20 to 30 minutes of computer time and posts the schedule so that students can refer to it; and (c) Non-Scheduled Format, in which sign-up sheets are available and special rules posted for use of computers before and after school as well as during recess times.

Addressing the issue of the one-computer classroom, the Missouri Technology Center for Special Education (1989) described seven techniques for utilizing the classroom computer as a teaching tool. Included

in these techniques were the following: (1) using the computer as a smart chalkboard via a black-and-white television monitor and software such as Scholastic Science Toolkit modules to demonstrate dynamic experiments while students are problem-solving answers; (2) using the computer and projection panel or monitor to stimulate discussions or provide advanced organizers or guided practice for a particular lesson; (3) dividing the class into teams and "playing" educational games in which automaticity, accuracy, and group effort are fostered; (4) using the word processing capability to conduct whole-class lessons on sentence structure and semantics; (5) using the word processor for group review before a test; (6) using the computer for independent practice of skills, following a schedule of specifically assigned software and times for each student; (7) using the computer for managing grades and creating individualized educational plans, progress notes, tests, worksheets, handouts, and displays.

Foliart and Lemlech (1989) supported the creative use of one computer by pointing out that more than any other teaching tool, the computer is capable of being used via a variety of teaching strategies. As teaching strategies vary, each requires a concomitant set of management strategies. For example, if the teacher chooses to use the computer as a database in a social studies lesson, the teacher must plan a variety of instructional materials for students to use while individuals or small groups access the computer database.

Summary

The goal of this literature review was to examine the findings to date regarding how teachers in computer-use elementary special education classrooms effectively organize and manage their instructional environment. The major body of literature reviewed was related to classroom management theory, specifically focusing on management of elementary general and special education noncomputer- and computer-use classrooms.

To set the focus for the review, various definitions of classroom management were reviewed. The common features of these definitions were that (a) the goal of classroom management is related to maintaining the degree of order necessary to foster learner success, and (b) the task of classroom management is complex, group oriented, and context-related. The review progressed from a discussion of commonalities across classrooms to contextual differences among classrooms. Based on the literature, one can conclude that while the goal of classroom management generally does not change across contexts, the methods used to manage do change.

It also seems clear from research and practice that effective classroom management and effective instruction are inextricably linked in teaching practices; and while certain researchers have argued for separating the two constructs for purposes of study, their arguments seem circular and require much clearer definitions of management and instruction than were given. Indeed, most studies reviewed did not make clear distinctions between management and instruction, often referring to

elements of effective instructional practices when describing effective classroom management techniques.

Throughout the review, several recurring themes emerged:

1. Preplanning is an essential element of effective classroom management (Borko et al., 1979; Evertson & Emmer, 1982; Good & Brophy, 1994). Effective managers planned, even before the school year began, how they would manage such variables as transition times, instructional units, and classroom procedures and rules learning.

2. Adjustments must be made in teacher roles as contextual variables change. Effective classroom managers must switch roles to accommodate such contextual factors as kind of activity and instructional tools being used.

3. Adjustments must be made in management strategies as contextual variables change (Collis, 1988; Cosden, 1988). Effective managers adjust their strategies to such contextual factors as content area being taught, kind of activity planned, learning levels of students, and instructional tools being utilized.

4. There are intrapersonal variables that influence the planning and decision making of teachers. The way the teacher views the role of teacher and the task of teaching influences the plans and decisions he or she makes related to classroom management and instruction (Good, 1983; Shavelson, 1983; Shavelson & Stern, 1981; Smith, 1988).

5. The contextual variable described as the one-computer classroom presents the greatest management challenge to computer-using teachers. Both general and special education teachers experience great challenges with scheduling and time management related to the reality

of only one available computer for many students (Cosden & Abernathy, 1990; Foliart & Lemlech, 1989; Missouri Technology Center for Special Education, 1989; Phillips, 1983; Torgerson, 1983-84; U.S. Congress OTA, 1988).

It can be concluded, based on the themes that emerged in this literature review, that (a) volumes of research studies have addressed effective management in the noncomputer-use classroom, and (b) several relatively recent studies have identified the problems associated with the one-computer classroom. However, no studies have been conducted to examine how to effectively manage this unique and challenging computer-use context.

While it is understood, from the foregoing literature review, that the teacher's primary concern is maintaining the learning activity flow of a classroom, teachers make judgments and decisions and implement them based on their model of reality. Evertson and Emmer (1982) have called for studies which query teachers about the conceptual, experiential, and informational base upon which they develop their classroom management system. A parallel question in this study might be: All external factors being equal, what are the intrapersonal or internal factors operating on a teacher that cause him or her to choose or reject the computer as an instructional tool? Further, what are the internal factors influencing how that tool is used? Research is needed to (a) determine teachers' effective computer-use management methods (how), and (b) query effective computer-using teachers about the reasons (why) they do what they do. Such information would provide a more complete

picture of what constitutes effective classroom management as it relates to instructional computer integration.

CHAPTER III

METHOD

Overview

The purpose of this study was to identify and describe the classroom management practices of elementary special education computer-using teachers. While there are many ways to define and evaluate the various aspects of classroom management, this study examined management through the lens of the teachers' attending behaviors described by Kounin (1970). Kounin defined the act of "attention to" as a comment, a directive, or a look, and suggested that it is currently the best technique available to enable a teacher to obtain knowledge about what is going on in the classroom. Thus, "teacher attending" behaviors were used as a lens through which to describe classroom management behaviors of elementary special education computer-using teachers. The inquiry focused on the following questions:

1. To what or to whom do elementary special education teachers attend when computers are in use versus when computers are not in use?

2. What is the nature of teachers' attending behaviors when computers are in use versus when computers are not in use?

3. What specific teacher attending behaviors coexist with student on-task behaviors when computers are in use versus when computers are not in use?

4. How do teacher attending behaviors change over time when computers are in use versus when computers are not in use?

5. What are the personal attitudes and beliefs that influence a teacher's decisions regarding computer use and related classroom management?

6. How does teacher computer experience relate to classroom management?

The questions required a design that would enable simultaneous collection of both qualitative and quantitative data across time, one that would provide a thorough description of a particular kind of setting or context. The goal of the study was to provide thick description of classroom settings, identify classroom management practices in those settings, and determine the effectiveness of those practices as measured by on-task student behavior. It was determined that the best framework for such a study was the naturalistic inquiry paradigm using nonparticipant observation (via a laptop computer observation system) as the primary data collection procedure and employing the case study method as the format for reporting the data.

To focus the inquiry, the following variables were identified and defined:

Independent variables: The independent variables were: (a) computer experience, which was either computer integration training (integration group) or no training (control group); and (b) computer influence which included computer-in-use (the computer is used by at least one student or teacher) or computer-not-in-use (the computer is not used by any students or teacher).

Dependent variables: The dependent variables were: (a) focus of teacher's attention, defined as the person or thing to whom the teacher is observed attending; (b) nature of teacher's attention, defined as a rich description of the activity in which the teacher is engaged while attending; and (c) student on-task behavior, defined as preparing to do, waiting to do, doing, or putting away a given task. These variables were then used to design the observation system which is discussed in a later section.

The Naturalistic Inquiry Paradigm

Every researcher brings to his or her study a set of beliefs or assumptions, a general view of the world. The approach that he or she takes as an investigator is directly influenced by that systematic set of beliefs, or paradigm. One such paradigm is naturalistic inquiry, which is best described by a brief review of its underlying set of assumptions or axioms as delineated by Lincoln and Guba (1985). The five axioms are:

1. The nature of reality: The world is made up of multiple constructed realities that must be studied holistically. With each inquiry, more questions are raised so that while prediction is an unlikely outcome of a study, some level of understanding is achieved; thus, a set of assumptions is developed.

2. The relationship of inquirer and object of inquiry: The inquirer and the object of inquiry interact with and influence one another throughout the study. While the "human-as-instrument" brings with it acknowledged biases, when checks and balances (referred to in this paradigm as trustworthiness measures) are employed, the inquirer can

function as a "smart instrument," bringing to bear intuitive knowledge and prior experience which serve to broaden the inquirer's understanding of the subject's reality.

3. The possibility of generalization: Recognizing that truth is idiographic and context-bound, the purpose of inquiry is to develop a body of knowledge that describes the individual case. Because each inquiry is context-bound, generalization is not possible. Instead, the naturalistic inquirer seeks to craft an in-depth description of the context that will allow others to determine the similarities and differences between that which is described and their own setting.

4. The possibility of causal links: It is not possible to explain any action apart from its multiple, interacting factors, thus making it impossible to clearly distinguish cause from effect. Rather than looking for cause-effect sequences, the naturalistic inquirer looks for patterns of mutual shaping in order to establish inferences about the way in which multiple factors shape one another.

5. The role of values in inquiry: Inquiry cannot be value-free. There are at least four sources of influence--the personal values of the investigator, the values undergirding the paradigm guiding the inquiry, the values undergirding the methodology used in the inquiry, and the values inherent to the context in which the inquiry is conducted. Recognizing the impact that values have on the conduct of a study, attempts were made throughout the study to identify and acknowledge the sources of the values which were influencing the conduct of this study by employing trustworthiness measures. These measures, which set the standard for inquiry, will be discussed in a later section.

Naturalistic inquiry begins with the defining of a problem. This problem serves to focus and bound the inquiry and to determine the initial data collection strategies. The problem addressed in this study was the need for a model which identified and describes effective classroom management strategies for the computer-using teacher. To address this problem (a) six inquiry questions were developed, and (b) appropriate quantitative and qualitative data collection instruments and methods were identified.

A central characteristic of naturalistic inquiry is the use of "human as instrument." In this study, the inquiry was conducted by a single investigator. The advantage of the human as instrument is that, unlike a paper-and-pencil measure or other standardized data collection instruments, the human can exercise flexibility, insight, and responsiveness to the data. Further, the human can respond from a base of experience that he or she brings to the study. Because the inquirer's previous experiences, competence, and values directly impact the course of study, it is critical that the reader of any naturalistic study be provided with a description of the inquirer's educational background and philosophies that have influenced the study. A brief description of this investigator's educational background, professional experiences, and personal philosophy is provided in Appendix A.

Grounded theory is often the goal of naturalistic inquiry. If this is the goal, the researcher enters the field with as few predetermined ideas as possible and contextual data-grounded theory is developed as a result of the inquiry (Glaser, 1978; Glaser & Strauss, 1967). An alternative practice of the naturalist is to begin with an existing theory with the goal

of expanding or refining the theory. In this study, the investigator was aware that much research-based information is available regarding effective classroom management. The question remained, however, as to whether such management practices remained the same and/or effective when a computer was used in the classroom instructional environment. Therefore, given this question, it was helpful to have as a beginning point an existing theory with which to compare and contrast observed management practices.

Participant Observation

Bogdan (1972) described participant observation as "research characterized by prolonged periods of intense social interaction between the researcher and the subjects, in the milieu of the latter, during which time data, in the form of field notes, are unobtrusively and systematically collected" (p. 3). Participant observation has been identified as an effective method to test and/or extend existing theory (Jones, 1985). Further, because it involves sustained, multiple observations in a setting, it allows the researcher an opportunity to discuss findings which are grounded in the context (Crabtree & Miller, 1992; Strauss & Corbin, 1991). Thus, it seemed that if the focus of interest was how the activities or influences of a setting or context give meaning to certain behaviors and beliefs underlying the behaviors, participant observation was an appropriate choice of method for this study.

According to Jorgensen (1989), the ultimate aim of participant observation is to generate practical and theoretical truths about human life which are grounded in the realities of daily life, from an insider's

viewpoint. There are various levels of participant observation, ranging from overt participant observation to nonparticipant observation. The most obtrusive form of observation is nonparticipant observation because, in distancing oneself from the activities of a context, the inquirer does not become a member of the group, making it more likely that reactivity effects will occur. Therefore, nonparticipant observation requires a longer period of time for participants to accommodate to the presence of the observer and a longer time, if ever, for participants to return to "natural behavior" during observation (Krathwohl, 1993). The sustained presence of the observer, a characteristic of naturalistic inquiry, helps to diminish reactivity. An advantage of such nonparticipant observation, on the other hand, is that it allows the inquirer to concentrate on the observation process, thus enhancing the credibility and dependability of the study.

Patton (1990) stated that the ideal is to adopt the level of participation that will most efficiently accomplish the goals of the study, given the characteristics of the participants and the context under study. It was determined, given the purpose of this study and the characteristics of the teachers and students involved, that the best level of observation was nonparticipant observation. The participants' familiarity with the investigator had the potential to influence, positively or negatively, the reactivity of the participants. In order to decrease the degree of reactivity of teachers and students, the investigator spent time interacting with the students and teacher in each classroom before and/or after each observation, sharing comments and observations designed to foster greater comfort with the investigator's presence in the classroom. The

goal was to develop a level of trust and a sense of common purpose among the teachers and their students, that by behaving in the most natural way possible during observation, they were contributing to an accurate reporting of how computers could be used effectively in other classrooms similar to theirs.

Case Study Methodology

Qualitative research such as that of naturalistic inquiry is often reported in case study form (Krathwohl, 1993; Lincoln & Guba, 1985; Stake, 1978; Strauss, 1987). Lincoln and Guba (1985) stated that the purpose of the case study is to improve the reader's level of understanding of whatever the report deals with. Further, Stake (1978) reported that the case study may accomplish this purpose best because it allows the reader to build on previous experience and tacit (intuitive) knowledge to develop personal understandings or naturalistic generalizations through probing of the detailed description provided in the case. Case study methodology originated in the fields of medicine and law where it was utilized to provide a detailed and concise description of the characteristics of a single individual, situation, or problem and has recently been generalized to educational research to describe or evaluate an event, institution, process, or program (Krathwohl, 1993). Case study research usually begins with a problem identified from practice, focusing on one unit of analysis across many events or participants.

The naturalistic inquirer is likely to prefer the case study method of reporting because it is well-suited to the five axioms of naturalistic inquiry discussed in the previous section. Its format is adaptable to

(a) reporting multiple realities at a site; (b) considering the investigator's interaction with the site and consequent biases that may result; (c) providing bases for individual naturalistic generalizations and transferability to other sites through "thick description"; (d) demonstrating the variety of mutually shaping influences present; and (e) picturing the value positions of the investigator, substantive theory, methodological paradigm, and local contextual variables (Lincoln & Guba, 1985). Lincoln and Guba identified the following six advantages of case study methodology:

1. It is the primary vehicle for emic inquiry, that is, inquiry that seeks to reconstruct the subject's constructions rather than the a priori construction of technical inquiry.

2. It builds on the reader's tacit knowledge by presenting a life-like description much like the reader encounters in his or her world rather than providing symbolic abstractions as in a technical report.

3. It is an effective vehicle for demonstrating the interaction between inquirer and subject. The reader can judge better the nature and impact of the interaction from a case report to a much greater extent than from a technical report.

4. It provides an opportunity for the reader to probe for internal consistency (trustworthiness) by comparing each new item of information with all previous information provided in the case.

5. It provides the "thick description" necessary for the reader's judgments about transferability.

6. It provides a grounded assessment of the context. If the phenomena (e.g., teacher behavior) under study takes its meaning from

and depends for its existence on its context(s), it is essential that the reader be given an adequate picture of what that context is like.

Using the case study method, findings from the study are reported as eight separate, modified case studies, distillations of the data from each case. Each case study consists of (a) a description of the context, using any portions of the data that add new meaning to the description; (b) a summary report regarding the computer-using teacher's management practices, based on the quantitative data, qualitative field notes, and related follow-up interview data, including the teacher's overt management behaviors, as well as beliefs and reasons underlying those behaviors; and (c) a resulting set of context-grounded assumptions regarding the management practices which seemed to be effective (using the aforementioned student-on-task rates as criteria for determining management effectiveness) in that particular setting.

In summary, the axioms undergirding the naturalistic inquiry paradigm and the closely aligned characteristics of participant observation and case study methodologies made it an appropriate choice to frame and facilitate the study of the management practices of computer-using elementary special education teachers. This naturalistic approach was chosen because it offered the best procedural framework by which to foster a trustworthy, in-depth description of the computer-using teacher's management practices. Similarly, nonparticipant observation was chosen because it allowed the inquirer to (a) directly observe and concurrently obtain an in vivo description of the teacher's management behavior in the computer-using context, and (b) discuss with the teacher any aspects of the observation. Further, the case study method was

chosen because it provided the best vehicle by which to communicate the context and grounded findings to the interested reader. Finally, it was believed that the merging of qualitative and quantitative methodology would serve to strengthen the trustworthiness of the study.

Study Participants

Because this study involved human subjects, approval of the study methodology and related instrumentation was obtained from the Human Subjects Institutional Review Board at Western Michigan University (see Appendix B). The participants in this study were eight elementary and middle school special education teachers who had participated in the 1991-92 phase of Project Instructional Computer Integration Preparation (ICIP). Project ICIP was a 3-year (1990-1993), federally-funded research project awarded to the Department of Special Education, Western Michigan University by the U.S. Department of Education (#H023C00107). The purpose of Project ICIP was to compare the relative effectiveness of three methods of preparing teachers to use instructional computer technology in educational programs for children and youth with disabilities (Bahr, Kenney, & Hannaford, 1993).

Since one of the goals of this current study was to test and extend the Project ICIP hypotheses, participants were randomly selected from the Project ICIP sample. Because the purpose of sampling is to include as much information as possible, the investigator used maximum variation sampling in an effort to capture the greatest potential variations in the sample (Lincoln & Guba, 1985; Patton, 1990). Of the eight teachers, four teachers had completed all components of the 1991-92

phase of Project ICIP integration training while the other four teachers had completed all components of the 1991-92 Project ICIP control group. Integration training teachers participated in three 4-hour in-service training sessions conducted on Saturdays during the 1991-92 school year. At these training sessions, they (a) received software designed to meet their instructional needs, (b) were given software demonstrations and hands-on practice, (c) participated in ongoing discussions of effective technology integration principles, and (d) shared instructional strategies for computer use with other Project ICIP integration training teachers. Integration training teachers were also provided with technical and integration assistance throughout the project. Control teachers received the same software at the same times, but no training or follow-up assistance.

Teachers were contacted by telephone and queried regarding their interest in participating. Nine potential participants were initially contacted; one individual who declined to participate cited a change in teaching assignment from elementary to high school. Seven participants were elementary special education teachers of students with mild handicaps. One was a middle school teacher of sixth grade students with mild mental impairments.

At the time of the telephone call, an initial interview was conducted with those individuals who consented to participate (see Appendix C). Table 1 presents demographic information about the study participants. Seven females and one male comprised the pool of participants. Mean years of teaching experience was 11.63 (SD = 6.82). All participants reported having similar basic computer literacy skills, including booting

and formatting a disk, using a word processor, and using other application software such as database programs. All participants reported having had formal training through in-service or preservice classes. Further information about each participant/context can be found in the case studies in Chapter IV. In addition to the demographic information obtained, three questions were asked regarding the participants' attitudes toward using computers in the classroom and two questions regarding the participants' current computer integration practices. The responses to these questions are included in the individual case studies which are presented in Chapter IV.

Table 1

Participant Demographic Information

Teacher ID	Gender	Years of teaching experience	Level of computer skills	Self-reported prior training
1	M	23	Basic	In-service
4	F	11	Basic	In-service
10	F	12	Basic	In-service
15	F	8	Basic	Preservice
18	F	20	Advanced	Preservice & in-service
31	F	9	Basic	Preservice
36	F	8	Basic	In-service
45	F	2	Basic	Preservice

Note. M = 11.63. SD = 6.82.

Observational Data Collection

Each teacher was observed approximately 10 times between January and April 1992 during language arts classes. All observations were prearranged and conducted from the beginning of the class period to the end, regardless of its length. Total minutes each teacher was observed across the 10 observations ranged from 279 to 453 minutes. The mean length of minutes observed across 10 observations for individual teachers ranged from 31.00 to 45.30 minutes. The grand mean across all eight teachers (79 observations) was 39.16 minutes (SD = 12.10). The large standard deviation resulted from the fact that the investigator observed the entire language arts period, the lengths of which varied significantly across and within teachers (see Table 2).

Observation System

The observation system used was the Teacher Attending Behaviors (TAB) observation system designed by the investigator as a modification of the WORD observation system developed by Haus (1989) (see Appendix D). This system was designed to collect both qualitative and quantitative data. It allowed the investigator to record, in real-time, the object of teachers' attending behaviors or focus, and to describe, via field notes, the nature of his or her behavior. Teacher focus categories defined and coded by the investigator were based on the research questions and information obtained from classroom visits during the 1991-92 phase of Project ICIP. The six categories of teacher focus were: (1) students/computer(s), denoting that the teacher's

Table 2

Mean Length of Classroom Observations

Teacher ID	Sessions n	Minutes		
		Sum	M	SD
1	9[a]	279	31.00	15.47
4	10	404	40.40	7.58
10	10	395	39.50	14.76
15	10	411	41.10	11.59
18	10	352	35.20	6.69
31	10	371	37.10	9.87
36	10	429	42.90	14.60
45	10	453	45.30	11.76
Total	79	3,094	39.16	12.10

[a]Missing case due to unreadable observation file.

attention was directed toward student(s) within the classroom, at least one of whom was using a computer; (2) student(s)/no computer(s), denoting that the teacher's attention was directed toward student(s) within the classroom, none of whom were using a computer; (3) non-student(s), denoting that the teacher's attention was directed toward nonstudents (adults and/or students from other classrooms); (4) materials, denoting that the teacher's attention was directed toward materials/objects within the classroom; (5) no focus/unable to determine, denoting that the teacher was in the classroom but was not overtly

attending to anyone or anything, or the observer was unable to determine the teacher's focus of attention; and (6) out of room, denoting that the teacher was physically outside of the classroom with the focus of his or her attention outside of the classroom.

The TAB observation system enabled the investigator to collect quantitative real-time frequency and duration data regarding the focus of the teachers' attention while concurrently recording descriptive field notes. Each time the teacher changed focus, a code was entered using the aforementioned system and a detailed description of the teacher's behavior in the form of field notes was typed into the system. The field notes provided a real-time qualitative description of the teacher's overt behaviors. Since description must be carefully separated from interpretation (Patton, 1990), all information of a contextual or interpretive nature was denoted by the word "note" preceding the information. This was done to separate the teacher's behavior from the investigator's interpretation or comment.

In addition, the TAB observation system prompted the observer to record counts of computer and noncomputer students' off-task behavior every 3 minutes. These real-time off-task behavior rates, when examined with the contemporaneous quantitative and qualitative data on teacher focus, enabled the investigator to identify the teacher attending behaviors that most fostered student on-task behavior.

Reliability

To insure that the investigator was reliably coding the quantitative teacher focus and student off-task behaviors, periodic reliability checks

were conducted. The investigator identified an individual who had extensive experience in classroom observation, reviewed the definitions involved in the quantitative portion of the observation system with the individual, and conducted three reliability checks over the course of the 4-month data collection period. Care was taken during reliability checks to avoid discussion of behaviors under observation in an effort to avoid observer drift, a situation that may occur if observers discuss the behaviors being coded, agree with each other in what and how they code, but drift away from the original definition (Jones, 1985).

Overall reliability, indicating the percentage of all instances in which both observers recorded the same behavior, was calculated using the following formula:

$$\frac{\text{\# of times observers agreed}}{\text{\# of agreements + disagreements}}$$

Reliability was calculated for "teacher focus" and "computer and non-computer student off task" frequency counts for each of the three reliability checks. Mean reliability for teacher focus was .82 (SD = 0.19) and .97 for student off-task behavior (SD = 0.05), exceeding the accepted standard of .80 (Slavin, 1984). These percentages are presented in Table 3.

The greatest area of difficulty for observer agreement occurred when the teacher was focusing on two or more students simultaneously while also correcting a student's work, a behavior described by Kounin (1970) as overlapping. This occurred in Observation 2 and the difficulty involved is reflected in the relatively low agreement score for teacher

Table 3

Overall Agreement Percentages for Observer Reliability Check

Observation number	Teacher focus	Computer/noncomputer student off-task counts
1	.97	0.92
2	.61	1.00
3	.89	1.00
M	.82	0.97
SD	.19	0.05

focus. In such cases, the description provided in the qualitative data becomes extremely important.

Observational Data Analysis

Reid (1992) pointed out that computers cannot perform analysis, but can perform many of the labor-intensive tasks associated with data management, such as coding, sorting, and summarizing data, much more quickly and accurately than the investigator. A content analysis procedure was used to analyze the observational data. Textbase Alpha (Tesch, 1989), a program designed for the analysis of qualitative data, was used to facilitate the analysis of the text portion of the observational data. While this observation system had one existing level of codes which enabled the investigator to identify the focus of the teacher, it was the thick description of the concurrent field notes that identified the quality and goal/intent of the teacher's focus. For example, while the

teacher's focus may have been on the computer students, the intent of the focus may have been to correct the student's behavior or to explain how to use the computer program he or she has just booted. In such instances, the focus code alone would have revealed very little about the intent or purpose of the behavior.

Using the framework of Textbase Alpha, all text from field notes were content analyzed, coding by segments of meaning. That is, any portion of the text that related to the kind or quality of a focus was examined and codified. Additionally, any segment of the text that indicated multiple foci received multiple codes. A sample of a coded page appears in Appendix E. After the first level of analysis was completed, the field notes were sorted by codes and text segments assigned to each code were compared. This process of comparison yielded the initial set of categories which were again sorted and refined. A definition was written for each of the categories which emerged out this third and final analysis, which described the defining features of each category and gave examples of activities subsumed by that category.

Observational Data Categories

Twenty-six strategies for managing the computer-use classroom emerged during the second round of content analysis. The third round enabled the codes to be collapsed into three broad categories:

Instructional uses: Strategies the teacher employed when using the computer in instruction, such as (a) using the computer as a demonstration tool to teach an editing lesson, (b) using the computer as part of an integrated activity in which students used the computer to word

process their creative writing pieces, and (c) using the computer as a drill and practice activity related or unrelated to other concurrent classroom activities.

2. Instructional formats: Grouping and associated strategies the teacher employed when using the computer, such as (a) small group instruction using a grammar drill and practice program, with follow-up individual help as students used the program individually; (b) cooperative learning dyads in which one student performed the keyboarding while the other student checked spelling and syntax of a paragraph composed together earlier; and (c) whole-group discussion of the construction of haiku, using an overhead projection panel.

3. Instructional activity flow: Strategies the teacher employed to foster uninterrupted activity flow when the computer was being used, such as (a) visually monitoring the computer student(s) while teaching a reading group, (b) providing written directions for use of the computer and/or computer program, (c) providing a preassigned peer helper for the computer student to access when he or she needs help, or (d) proximately monitoring computer students during independent work time.

Quantitative data regarding the frequency and duration of the teacher foci and the 3-minute off-task rates of computer and noncomputer students were computed for each observation and averaged across all observations for each case in order to determine (a) the frequency with which a teacher displayed a particular focus, (b) the duration of observation time a particular focus was maintained, and (c) the percentage of computer and noncomputer student off-task time. A summary of incidents comprised of the simultaneous behavior of teacher and

students was then examined by comparing off-task rates to teacher foci and field notes at any point in time, to determine teacher focus behaviors that most fostered student on-task behavior.

Interview Data

Two types of interview data were collected: (1) initial/exit interview data and (2) follow-up interview data. All interviews were audiotaped and immediately transcribed against the notes taken during the interview to insure an accurate and complete script of the interview. The initial telephone interview solicited demographic information discussed in a previous section of this chapter and qualitative data related to the participants' attitudes regarding computer usage in the classroom and current integration practices. The exit interview was conducted after all data had been analyzed and a rough draft of the case studies had been mailed to the respective participants. The purpose of this interview was to conduct a final member check of the information included in the case studies. Upon reviewing their case studies, teachers were asked to (a) determine whether the description adequately represented their classrooms; (b) check for errors of fact, interpretation, or omission; and (c) provide any other suggestions that would contribute to the accuracy of their reports.

Ten follow-up interviews per teacher were conducted via telephone the afternoon or evening following each classroom observation. The investigator asked questions related to how and why the teachers managed the computer-use classroom as they did during the observations. The purpose of these interviews was to stimulate the teachers'

recall of the observed events in order to ascertain their perceptions of the focus and nature of the attending behaviors that occurred during the observed session (Evertson & Green, 1986; Shavelson, 1983). These interviews also served as a check of the observer's perceptions of the events observed (Lincoln & Guba, 1985). As a result, two types of qualitative data were gathered: (1) corroborative factual data which clarified behaviors or events observed, and (2) data which reflected the teacher's attitude and philosophy driving his or her actions.

These qualitative data were also content-analyzed using Textbase Alpha. The interview text was segmented into codes and categories using the same procedure outlined for the observation data. However, rather than representing teacher behaviors, as in the observation data, the interview data reflected teacher beliefs and attitudes that influenced their decisions which, in turn, influenced behaviors observed in the classroom. The following broad category emerged from the third and final round of content analysis.

Instructional planning and decision making: Strategies the teacher employed for planning and evaluating his or her instructional computer use, such as (a) recording students' computer scores on drill and practice programs, (b) planning computer-related projects that resulted in products that could be used in portfolio assessment of students' computer work, and (c) basing computer-use decisions on cost- or time-efficiency constraints.

This category included approximately 16 different reasons cited by the teachers for implementing particular computer-use management strategies. They related to: (a) maintaining activity flow, (b) maintaining

behavior control, (c) working within externally imposed limitations, and (d) meeting student needs. These reasons were collapsed into the final category described above and used in the individual case studies to further explain teacher behaviors, and determine the degree of congruence and/or incongruence between teachers' beliefs about computer integration and their actual computer management practices.

Secondary Data Sources

The investigator kept a journal chronicling all daily research activities, personal reactions to, or insights about the overall study or individual cases, and all methodological decisions related to the study. This journal, filled with facts, musings, and decisions relative to the study, served as a guide through the course of the inquiry. A sample of a journal entry can be found in Appendix F.

Application of Trustworthiness Criteria

Observation is a process which is mediated or influenced on several levels: The observer is a person with biases, beliefs, training, and abilities that influence judgment; the observation tool has a certain capacity to record an observation; and the observation system, by design, has a point of view, bias, and structure (Evertson & Green, 1986). While its detractors argue that the naturalistic inquiry method of using self-as-instrument may sacrifice objectivity and reliability, fostering undisciplined research based on subjective judgment (Fetterman, 1988; Smith, 1988), Lincoln and Guba (1985) have developed trustworthiness criteria which, when applied by the naturalistic inquirer, lend credence to

the truth value, applicability, consistency, and neutrality of the study. The four trustworthiness criteria, credibility, transferability, dependability, and confirmability, were applied via a variety of activities during the study.

Credibility

In order to preserve the credibility or truth value of the study (internal validity), the investigator practiced what Guba (1981) called "prolonged engagement at a site" (p. 84). During a 4-month period of study, each participant was observed 10 (25-minute to 1-hour) times. These frequent visits helped in several ways: (a) They reduced the effects of any perceived observer intrusiveness, decreasing teacher and student reactivity with each visit; (b) they provided the investigator multiple opportunities to test personal biases or misperceptions related to the context or teacher behaviors; and (c) they allowed sufficient time and generated enough data by which to accurately characterize the subjects/contexts being studied. In addition, the investigator periodically sought out a peer who was familiar with the goals of the study to listen and react to the inquirer's developing thoughts and insights regarding the teachers being studied.

A second credibility technique used was member checks. After each observation, follow-up teacher interviews were conducted via an open-ended interview format using the stimulated recall procedure. This procedure enabled the investigator to gain insights into the thoughts, decision-making processes, and beliefs which guided the teacher's behavior during the observations. Additionally, it provided an

opportunity to check perceptions/understanding of the teacher's behavior directly with the teacher, by asking questions and probing for further information regarding the teacher behavior under discussion. The interviews were audio-taped to allow for closer analysis of the teacher's responses as well as a check of the inquirer's perceptions and recording of the interview event.

A second member check procedure was used after the investigator had drafted the case studies. The teachers were asked to review their case studies for accuracy of information and interpretation of the context and events observed. Suggestions for revisions and/or additions were discussed and changes were made in reports where both investigator and teacher agreed it was appropriate.

Transferability

To facilitate transfer of the information collected to other similar contexts (generalizability and external validity), a thorough description was developed which included contextually grounded statements which were descriptive or interpretive of each specific classroom setting. In order to maximize the range of information regarding the management behaviors of teachers in computer-use elementary special education classrooms, the eight teachers who were asked to participate were selected from the extreme training conditions of Project ICIP. Through teacher self-report data and personal observation in each teacher's classroom during the 1991-92 phase of Project ICIP, the investigator was able to determine that these teachers represented a full range of years of teaching experience, level of computer training/experience, and amount

of reported current computer use in their classrooms. Such maximum variation sampling is based on the principle that any common patterns that emerge from great variation will provide a powerful representation of the core experiences, central themes, and shared aspects of the subjects under investigation (Patton, 1990).

The field notes, when combined with teacher interviews, provide thick, descriptive, context-grounded data which enable the reader to compare to other computer-use classroom contexts for possible transfer of identified management practices. The richer the description, the more confident the investigator and case study reader can be that this context does or does not match the context to which transfer is being considered (Geertz, 1973; Lincoln & Guba, 1985). Yin (1989) referred to the generalization resulting from case study research as analytic generalization in which a previously developed theory is used as a template to compare the empirical results of the case study. If two or more case studies support the same theory, Yin believed that replication can be claimed. In this study the theoretical template used as a framework to develop and compare the eight case studies was the classroom management theory of Kounin (1970) and several others who built upon his theory.

Dependability

Because the investigator was concerned about the dependability (reliability) of the data, the overlap method, a form of triangulation described by Webb, Campbell, Schwartz, and Sechrest (1966), was employed. Overlap methods included observation followed by discussion

of the observation with the teacher, and word processing teacher interview responses as well as audiotape-recording the interviews. Using the audit trail procedure suggested by Guba (1978), the field notes, teacher interview notes, and the investigator's daily introspective journal provided a paper trail which peers or other readers could access. Such a paper trail also provides valuable information regarding the logic and ongoing reasoning processes which influenced the direction of the study.

Confirmability

Because naturalistic inquiry requires that the investigator, as the observation instrument, must deal with the multiple realities of a subject and the role of the inquirer's personal dispositions or biases, Scriven (1971) recommended shifting the burden of neutrality from the inquirer to his or her data. That is, rather than the inquirer being concerned about certifying himself or herself or the methods used, data were confirmed by triangulation. Triangulation involved collecting data from multiple teacher observations and follow-up interviews, the investigator's daily journal, and other dependent measures such as teacher attitude scales gathered during the teachers' 1991-92 participation in Project ICIP. On the other hand, Reinharz (1979) pointed out that while research reports discuss the problem and method, it is equally important in a naturalistic study to discuss the investigator, documenting possible shifts or changes in his or her orientation during the study. By practicing reflexivity in the form of a daily journal of introspections about the teachers and other contextual factors of study, the investigator provided a means of revealing the underlying epistomological assumptions which

guided the formulation of emerging questions, research procedures, and findings.

After all the proposed safeguards were implemented, the investigator was aware that the naturalistic inquiry methodology might, nevertheless, be at risk for rejection because of its dependence on the observer as sole instrument and lens through which the teacher behaviors were reported and interpreted. However, the greater concern was that a solely quantitative study of a set of isolated and predetermined teacher behaviors in the computer-use classroom had the potential to produce incomplete or even misleading data. By collecting rich descriptions of teachers' attending behaviors, this naturalistic inquiry methodology provided an opportunity to study the subjective experiences of teachers. Such insight into the teachers' thoughts, feelings, opinions, goals, and philosophies provided an added dimension to the understanding of the teachers' behaviors in the computer-use classroom.

Thus, the naturalistic inquiry paradigm, using nonparticipant observation, allowed the investigator to consider both overt and covert aspects of teachers' attending behaviors. As Doyle (1978) stated, research which attends only to the overt behaviors of teachers has restricted our understanding of factors that influence instruction effects. Among other factors, it is the teacher's philosophy and attitude about computer use in his or her classroom that will influence and guide his or her management behavior in that computer-use classroom. Such abstract factors, which greatly influence teacher behavior, are not necessarily observable or quantifiable, but are, nevertheless, essential to a deeper understanding of effective teacher management behaviors in a

computer-use elementary special education classroom. The following case studies provide that deeper level of understanding.

CHAPTER IV

RESULTS

Overview

The purposes of this chapter are, first, to present case study profiles of eight computer-using teachers and, second, to compare teacher and student behaviors for the two Project Instructional Computer Integration Preparation (ICIP) training groups represented in this study. Data collected and synthesized from (a) classroom observations of teacher foci; (b) student off-task behavior rates; (c) observation field notes; and (d) teacher follow-up interviews provide the content for the case studies and training group comparisons, and form the basis for conclusions drawn about effective management of students in computer-use classrooms.

Case Studies

Each case study consists of (a) background information about the context, including a summary of observed computer student and noncomputer student off-task behavior rates; (b) a description of the computer-use management strategies observed; (c) a description of the teacher's instructional planning and decision-making strategies; and (d) a description of the observed relationship between teacher focus behavior and student off-task (or on-task) behavior, resulting in a set of

context-grounded assumptions regarding the management practices which seemed to be most effective in that particular setting.

Project ICIP Training Group Comparisons

One of the goals of this current study was to test and extend the Project ICIP hypothesis that training would have a differential effect on the quality of computer use among Project ICIP participants. The hypothesis was tested by comparing the Project ICIP control and integration training group participants on the following variables: (a) percentages of off-task behavior among computer and noncomputer students, (b) amount of computer-use time, (c) nature of teacher focus categories, and (d) commonalities and differences in computer-use management strategies and their relative effectiveness. These comparisons are presented after the case studies.

Individual Teacher Case Studies

Teacher 1

Background

Teacher 1 taught in a middle school (Grades 6 through 8), self-contained, special education classroom for students with mild mental impairments. He did not have a teacher's aide. His classroom was average-sized. It contained one computer in a study carrel and an additional large television monitor located directly behind and facing the teacher's desk. The monitor was connected to the computer, enabling the teacher to monitor the computer student's activity. Teacher 1 was

observed for 279 minutes across nine observations (see Table 2). Mean length of observations was 31.0 minutes (SD = 15.5). The large standard deviation was due to the loss of data from Observations 4, 6, and 9. Each observation actually ranged from 35 to 50 minutes in length. Computer use was observed in all nine observations for 229 of the 279 minutes observed (82% of the time). According to the teacher, computer use was planned during all observations. All observations took place during language arts periods when students were either receiving language arts instruction from the teacher or working at their desks or the computer on independent tasks, some of which were related to language arts. There was an average of 12 students in the classroom. Most of the time one student used the computer while other students worked at their desks or in small groups with the teacher. During four observations, several students were involved in computer use at the same time.

Across observations, mean percentage of off-task behavior for the computer student(s) was 9.5% (SD = 29.5), while off-task behavior among concomitant noncomputer students was 16.9% (SD = 28.1) (see Table 4). Across observations, there was wide variation in off-task rates among both noncomputer and computer students.

Teacher focus data (see Table 5) revealed that when Teacher 1 was conducting small-group noncomputer-based instruction, he seldom monitored the independent computer student (see Observation 2). On the other hand, when all students were working independently and there was one computer student (see Observation 3), he focused a proportionate time on the computer student.

Table 4

Computer Student (CS) and Noncomputer Student (NCS) Off-Task Behavior for Teacher 1

Length of observation		Number of students in classroom				Percentage of students off-task	
		NCS		CS		NCS	CS
Obs. no.	Minutes[a]	n	%[b]	n	%[b]	M (SD)	M (SD)
1	42	9	71.4	0	28.6	46.3	0.0
		10	28.6	1	71.4	(42.0)	(0.0)
2	35	8	7.4	0	7.1	12.1	38.5
		9	71.4	1	92.9	(18.0)	(50.0)
		10	14.3				
		11	7.1				
3	50	0	5.9	0	29.4	1.9	25.0
		3	5.9	1	70.6	(4.0)	(45.2)
		6	5.9				
		10	58.8				
		11	23.5				
4	16	0	14.3	1	14.3	39.6	0.0
		8	85.7	4	85.7	(24.3)	(0.0)
5	34	0	100.0	5	100.0		0.0
							(0.0)

Table 4--Continued

Length of observation		Number of students in classroom				Percentage of students off-task	
		NCS		CS		NCS	CS
Obs. no.	Minutes[a]	n	%[b]	n	%[b]	M (SD)	M (SD)
6	5	0	100.0	5	100.0		0.0
							(0.0)
7	46	1	25.0	0	12.5	1.6	0.0
		10	6.3	1	62.5	(45.3)	(0.0)
		12	56.3	12	25.0		
		13	12.5				
8[c]							
9	15	5	60.0	0	40.0	0.0	0.0
		6	40.0	1	60.0	(0.0)	(0.0)
10	36	6	38.5	0	23.1	30.0	0.0
Grand mean						16.9	9.5
						(28.1)	(29.5)

[a]Rounded to nearest minute. [b]Percentage of time n students were in classroom during observation. [c]Missing case due to unreadable observation file.

During computer-based small-group instruction (see Observation 4), Teacher 1 focused intermittently on noncomputer students primarily

Table 5

Relative Percentage and Frequency of Focus Categories for Teacher 1

Obs. no.	Students/ computer		Students/ no comp.		Nonstudents		Materials		No focus/ Unable to determine		Out of room	
	%	n[a]	%	n[a]	%	n[a]	%	n[a]	%	n[a]	%	n[a]
1	11.0	5	71.1	67	1.5	3	4.3	4			12.0	2
2	0.1	1	83.1	17	10.3	3	7.9	6				
3	9.4	8	77.7	57	1.4	3	3.2	6			7.4	1
4	90.5	8	12.1	5								
5	95.8	8	0.4	2			2.3	1				
6	91.0	6			3.2	1						
7	35.7	8	53.6	57	1.7	2	5.5	11			3.8	1
8[b]												
9	0.9	1	98.9	5	1.7	1						
10	27.2	12	51.7	45	1.0	1	2.8	4			16.8	2
Grand mean[c]	31.2		56.7		2.3		3.7				6.0	

[a]Number of times focus was observed during session. [b]Missing case due to unreadable observation file. [c]Based on total minutes by category divided by total observation minutes (n = 279).

in response to off-task behavior. Field notes and follow-up interview notes documented use of the following strategies to manage his computer-use classroom.

Instructional Use Strategies

Teacher 1 used the computer for review and mastery of grammar and math skills. He said it enhanced his teaching because, "It reinforces everything I teach and drills the students rather than me doing it." He believed that computer-directed drill and practice activities are more reinforcing to the students than the same teacher-directed activity.

Teacher 1 reported having "piles" of programs. Many of them contained multiple skill levels, making it possible to assign single computer programs that had levels appropriate for all students. He chose the program or portion of a program prescriptively for each student and students progressed through the levels until they reached mastery. During most observations Teacher 1 and/or students were observed using one or two drill and practice language arts programs (for group work) and one drill and practice math program (during independent computer use).

Instructional Format Strategies

Two instructional formats were used by this teacher. Three days a week students worked on "contracts" which included approximately 60 independent learning and review tasks which had to be completed by Friday. Included among these were five or six computer-related tasks. Field notes from Observation 4 indicated, "Teacher is at the computer

helping student get started on his contract requirements. He is seated at computer and is booting the disk and telling the student what to work on." As these tasks were completed, they had to be checked and signed off by the teacher. At the beginning of each class, there was a transition time when students were getting task directions from the teacher. During this time, there was often higher off-task behavior observed among noncomputer students while the independent computer student tended to begin work right away.

While students were working on independent tasks, the teacher conducted small-group language arts instruction which occasionally involved the computer. Small-group instruction which involved the computer was centered on a vocabulary-building drill and practice program. While other students were working on other contract tasks, Teacher 1 worked with a group of 3 to 12 students at the computer. He always did the keyboarding, essentially running the program and coaching students as they needed help. While he was watching the computer screen, the students were seated around the large television monitor, in turn calling out their answers as he typed responses into the computer. Field notes for Observation 8 documented the following: "He is sitting at the computer working the game, talking to students about how they are doing. The game ends and he tells them they have earned 255 points." When asked why he did the keyboarding rather than assigning that task to students, he said that most of his students do not know the keyboard well enough to do the keyboarding. Points were awarded during small-group computer-based instruction for being ready to answer and giving the correct answer. If a student was not ready or made a

mistake, another person could get his or her points. Also, if a person was not ready, the whole group might lose a point. When asked about the competitive aspect of this practice, he said, "They love the competition."

During small-group computer-based instruction, computer students were generally on task; however, in Observation 4, noncomputer students were observed off task approximately 40% of the time. For Observations 5 and 6, Teacher 1 changed his management strategy by removing all noncomputer students from his classroom to work in another special education classroom, when he was conducting a small-group computer-based lesson. During Observation 10, when noncomputer students were again in the room during small-group computer-based instruction, relatively high noncomputer student off-task behavior was again observed.

Teacher 1 attended to the independent computer students periodically; however, this occurred almost exclusively during independent work time. For example, Observation 10 field notes revealed, "He is seated at his desk with his back to the computer student but in direct view of the big computer monitor. He looks up to monitor the computer student's progress, giving him a procedural direction to help him get his score printed." When he was conducting small group instruction which did not involve the computer, he did not attend to the independent computer student at all. As can be seen in Observations 2 and 3, computer student off-task behavior was observed more frequently than at other times. Field notes from Observation 2 stated, "He (the teacher) is in a position in which he can neither see the computer student or the

large TV monitor which projects the computer screen image. The computer student continues to call out to other independent workers and the observer for help."

When Teacher 1 conducted whole-group noncomputer-based instruction, he did not allow independent computer use because, he said, "I'm trying to get the same information to all the kids, so I don't want them on the computer." He believed that using the "contract" format 3 days a week (using computer for independent tasks and small-group instruction) and whole-group instruction (with no computer use) 2 days a week allowed: (a) the students the variety they needed and (b) him the opportunity to deliver the content they needed and touch base with all students.

Activity Flow Strategies

The students' goal of "contract" completion regulated much of the activity flow in this classroom 3 days of the week. The other 2 days Teacher 1 reported using lecture format. This format was not observed because it did not involve computer use. When asked why he used the contract format, Teacher 1 said, "When we do lecture, kids don't like to listen." When all students were working independently, Teacher 1 most often sat at his desk, calling individuals up to give independent instruction or monitor their progress. He answered individual questions called out to him, and often walked to students' desks to answer questions or monitor their progress. When asked about the practice of allowing students to interrupt him, he said, "They know what bothers me and what doesn't. I just touch base with a kid. Sometimes it just takes a

couple of minutes. It doesn't bother me. In a serious situation, I would not let anybody interrupt us." When Teacher 1 did not have specific students to work with, he walked around, monitoring the progress of all students. Whether seated at his desk or walking around the room, Teacher 1 used the large television screen to monitor the progress of the computer student, often glancing up and commenting on the student's progress or offering a suggestion.

When he conducted small-group computer-based instruction, other independent workers (noncomputer students) tended to be more off task while students in the compute-use group demonstrated low off-task rates (see Observations 4 and 10 on Table 4). Noncomputer students seemed to be more interested in the computer activity than in their independent work, often calling out answers to the computer-use group. To avoid this disruption, when possible, Teacher 1 removed noncomputer students to study in the other special education classroom. This was effective, as seen in Observations 5 and 6 when he removed noncomputer students vis-a-vis in Observations 9 and 10 when he did not. When he conducted small-group instruction while another independent worker used the computer for a contract task, he did not attend to the computer student, focusing his attention on the small group, visually scanning the other independent workers only if he heard a disruption. In fact, he often positioned himself during small-group instruction so that he could not see the computer student or the large television monitor. When asked about his choice of not monitoring the computer student during small group instruction, Teacher 1 said of a particular student, "He knows what to do. He has his contract to work on, but he just

needs to get a lot of attention." During two observations, the same student was observed remaining at the computer when he could not understand the task, calling out to independent workers around him for help. He was ignored by the students and teacher. As can be seen in Table 4, these two observations in which this particular student was the computer student (Observations 2 and 3) represent the only computer student off-task behavior observed during nine observations.

In addition to instruction-related strategies, two underlying strategies were used to foster on-task behavior. Points were awarded for contract completion on Friday. Everyone went to the bowling alley, and those who had completed their contracts could bowl, while those who had not completed contracts would sit and watch. Of this practice, Teacher 1 said, "It keeps the kids hopping!" Second, throughout the day during seatwork time, Teacher 1 took random variable interval on-task counts, awarding points to individuals for on-task behavior. With these points students could buy pop and other treats on Friday. He reported that it worked with most kids because they wanted the pop.

Instructional Planning and Decision-Making Strategies

When asked if he thought instructional computer use enhanced his teaching, Teacher 1 said that he used it to reinforce everything he teaches. By carefully checking contract completion, he monitored closely the students' computer tasks, most often by requiring computer printouts of their current scores. Observation 4 revealed, "Teacher is helping student print out his progress on Word Attack." He kept track of small-group computer-use progress via the record-keeping system built into his

computer programs. Many times he was observed talking to individual computer students about their most current scores, and complimenting computer-use groups about how well they were progressing with their vocabulary skills.

When asked whether he thought his current computer usage was effective, Teacher 1 immediately pointed to the improvement of scores among students using various skill-building programs. When asked why he did not use other kinds of software such as word processing, he questioned their usefulness while wondering aloud whether he had the time to learn how to best integrate other kinds of software into his instruction. On another occasion, when discussing some possible adaptive devices for his hearing impaired student, Teacher 1 indicated that he had the resources to purchase necessary software and adaptive equipment.

Summary

Teacher 1 used the computer during 82% of the total observation time. Across observations, Teacher 1 used the computer for drill and practice of previously learned language arts and math skills. He assigned portions of programs to students to complete independently during contract work time and directed small-group computer-based drill and practice sessions. He monitored results of all computer-based work via computer printouts of scores or personal contact with students following computer task completion. He conducted contract work and small group instruction 3 days per week and used whole-group lecture format on the other 2 days. When Teacher 1 conducted small-group

noncomputer-based instruction, individual students could use the computer for contract-related computer tasks; however, they were expected to either complete the task independently or move on to another task if they could not do so. When this strategy did not work for a student, he did not alter the strategy.

When Teacher 1 conducted computer-based instruction with three or more students while other students ostensibly worked independently on contract assignments, noncomputer student off-task behavior was relatively high. To solve this problem, his strategy was to remove the noncomputer students to another special education classroom to study. Observations 5 and 6 reflected the absence of noncomputer students while he worked with five computer students. This adjusted strategy was effective, as it eliminated the noncomputer students altogether.

Finally, when all students were working independently on contract tasks, Teacher 1 monitored students visually and proximately, including the computer students. This strategy was observed to have inconsistent effects on student behavior, as can be seen by comparing off-task rates in Observations 1 and 3 when he utilized this strategy (see Table 4). While noncomputer student off-task behavior occurred across observations, when asked whether he felt his current computer use was effective, Teacher 1 talked about improvement in skills as evidence of its effectiveness. And while he felt his current computer-based instruction was effective, he questioned the value of expanding computer use in his language arts class.

Teacher 4

Background

Teacher 4 taught in a special education upper elementary categorical room for students with emotional impairments. She did not have a teacher's aide. The classroom was one-half the size of an average elementary school classroom and contained one computer located behind a divider. Teacher 4 was observed for 404 minutes across 10 sessions (see Table 2). Mean length of observation was 40.4 minutes (SD = 7.6). Observations 6 through 10 were intentionally shortened because a clear and consistent pattern of instructional computer integration had developed by Observation 5.

Computer use was observed in 5 of 10 observations, for approximately 88 of the 404 minutes observed (22% of the time). According to Teacher 4, computer use was planned to occur during all observations. All observations were done during language arts period. During the period Teacher 4 usually conducted a whole-group expressive writing lesson while individual students used the computer for 15 to 20 minutes. There were usually 8 to 12 students in the room with up to 4 students gone at one time for mainstream classes.

Mean percentage rate of off-task behaviors among computer students was 0.0% (SD = 0.0), while mean percentage for noncomputer students was 1.3% (SD = 6.5), which is notably little off-task behavior (see Table 6). These data suggested that use of the computer did not foster increased off-task behavior of students.

Table 6

Computer Student (CS) and Noncomputer Student (NCS) Off-Task Behavior for Teacher 4

Length of observation		Number of students in classroom				Percentage of students off-task	
		NCS		CS		NCS	CS
Obs. no.	Minutes[a]	n	%[b]	n	%[b]	M (SD)	M (SD)
1	47	7	6.3	0	100.0	0.0	
		8	68.8			(0.0)	
		9	25.0				
2	47	8	11.8	0	76.5	0.0	0.0
		9	5.9	1	23.5	(0.0)	(0.0)
		10	58.8				
		11	17.6				
		12	5.9				
3	51	6	5.9	0	64.7	0.0	0.0
		8	17.6	1	35.3	(0.0)	(0.0)
		9	23.5				
		10	17.6				
		11	29.4				
		12	5.9				
4	44	4	7.1	0	92.9	12.6	0.0
		5	14.3	1	7.1	(17.1)	(0.0)

Table 6--Continued

Length of observation		Number of students in classroom				Percentage of students off-task	
		NCS		CS		NCS	CS
Obs. no.	Minutes[a]	n	%[b]	n	%[b]	M (SD)	M (SD)
		7	50.0				
		8	21.4				
		9	7.1				
5	43	7	15.4	1	100.0	0.0	0.0
		8	84.6			(0.0)	(0.0)
6	33	7	23.1	0	61.5	0.0	0.0
		8	30.8	1	38.5	(0.0)	(0.0)
		9	15.4				
		10	30.8				
7	31	0	7.7	0	100.0	0.0	
		6	7.7			(0.0)	
		7	7.7				
		9	53.8				
		11	23.1				
8	44	7	33.3	0	100.0	0.0	
		8	40.0			(0.0)	
		9	26.7				

Table 6--Continued

Length of observation		Number of students in classroom				Percentage of students off-task	
		NCS		CS		NCS	CS
Obs. no.	Minutes[a]	n	%[b]	n	%[b]	M (SD)	M (SD)
9	33	6	8.3	0	100.0	0.0	
		8	66.7			(0.0)	
		9	25.0				
10	31	6	9.1	0	100.0	0.0	
		8	63.8			(0.0)	
		10	27.3				
Grand mean						1.3	0.0
						(6.5)	(0.0)

[a]Rounded to nearest minute. [b]Percentage of time n students were in classroom during observation.

Teacher focus data for Teacher 4 indicated that she focused very little on the individual computer students (see Table 7). She focused primarily on the noncomputer students to whom she was usually delivering a direct instruction lesson. Focus percentages for materials were relatively high, representative of the time she spent at the end of each language arts hour checking students' daily work. During the initial teacher interview, Teacher 4 reported that she did not change her classroom management procedures during computer-use time because, she

Table 7

Relative Percentage and Frequency of Focus Categories for Teacher 4

Obs. no.	Students/ computer		Students/ no comp.		Nonstudents		Materials		No focus/ Unable to determine		Out of room	
	%	n[a]	%	n[a]	%	n[a]	%	n[a]	%	n[a]	%	n[a]
1			72.1	65	0.2	1	26.8	30				
2	0.9	1	85.7	70			13.4	18	0.1	1		
3	3.2	8	84.0	67	1.0	2	6.5	8			6.0	6
4			77.0	55	23.3	11						
5			96.8	24	1.9	2	2.0	2				
6	4.0	3	84.7	37	3.3	2	7.7	6				
7			96.7	21	3.0	1	0.5	1			0.8	1
8			94.3	68	1.7	4	3.1	4				
9			86.5	33			13.5	13				
10			98.9	57			2.1	2			0.5	1
Grand mean[b]	0.8		86.9		3.5		8.0		0.0		7.4	

[a]Number of times focus was observed during session. [b]Based on total minutes by category divided by total observation minutes (n = 404).

said, "My class has always been regimented." Teacher 4 was observed using the following strategies to manage her computer-use classroom:

Instructional Use Strategies

Teacher 4 used the computer for drill and practice of skills already learned. She chose to use the computer for this purpose because, she said, "It makes me able to keep them interested. It's highly motivating; they don't know they're working." She reported using about 15 different programs, mostly drill and practice. She chose the program to be used on Monday through Thursday, and allowed students to choose on Friday, if they had all their work done and had earned enough points. She required that they choose an instructional program. While Teacher 4 reported that students also used a word processing program, they were not observed doing so. Students were also observed using several different math drill and practice programs during language arts class.

Instructional Format Strategies

Students used the computer individually during language arts period (and throughout the instructional day) while the rest of the class was involved in whole-group instruction and independent practice. During computer-use observations, one or two students used the computer individually for a 15-minute period, thus missing a portion of the language lesson. When asked if the student(s) were still responsible for the language arts lesson, Teacher 4 said, "I will do the lesson with him later." Students could use the computer individually at most times during the day if (a) they were assigned to use it, and (b) their regular

work assignments were done. They could use the computer alone or work with a partner during earned time or indoor recess, if they had earned enough points. No off-task behavior was observed among students working independently at the computer.

Activity Flow Strategies

Teacher 4 was observed to focus very little on the computer student, focusing predominately on large-group instruction of noncomputer students (see Table 7). She said, "I expect my students to keep track of their own computer-use schedules. They know when to use the computer."

To ensure that students knew when they were to use the computer (and all other mainstream activities), Teacher 4 placed a weekly schedule on each student's desk. The half-sheet of paper listed, by day, all mainstream classes, special classes, and computer times for the week. Across computer-use observations, Teacher 4 was observed focusing on computer students 12 times, representing approximately 0.8% of the total observation time, as she conducted instruction involving all but the computer student. In one case, for example, she intervened regarding a complaint by another student that the computer student was humming.

Every student was assigned 15 or 20 minutes of computer time per day. Students were responsible to get themselves to the computer at their assigned times. Teacher 4 did not remind them and did not appear to monitor whether or not they had used their time. For example, in Observation 8, she was observed asking the class if anyone had

been on the computer that day. During observations, students missed computer time for such reasons as the following: (a) other tasks, such as filling out junior high entrance forms, took precedence; (b) they chose to finish other incomplete assignments; or (c) they were absent or suspended. Field notes for Observation 6 revealed, "Teacher says most people chose to not use the computer this morning because they did not have their work done, and that they can choose to use the computer this afternoon if their work is done."

Computer students consistently used the timer to regulate their computer use. When asked why she used this strategy, Teacher 4 said, "The first few weeks when we didn't use the timer, they were embarrassed when the next student came over to tell them their turn was up and they had not finished the program. This way they don't feel like they're being watched."

To help the students be independent computer users, Teacher 4 reported that she taught them to use the programs they would be assigned. Once a student was at the computer, she did very little visual or proximate monitoring of that student (see percentage of time spent focusing on computer students in Table 7), rather focusing her attention on small-group instruction. The computer student was responsible for setting the timer for a 15- to 20-minute time segment, using the computer, and returning to his or her seat when the time segment was up, regardless of whether he or she had or had not completed the computer task. The computer students handled this responsibility very well, as indicated by their very high on-task behavior rates. However, a few students were observed to spend much of their computer time gaining

access to and finding their way to the assigned part of the program, getting very little actual drill and practice time, although they remained "on task." For example, field notes from Observation 5 revealed, "Computer student is supposed to be playing a math game, but his time is up and he is still trying to get the program set up in order to play."

Another strategy she used to foster smooth activity flow was requiring that students wear earphones when using the computer in order to avoid distractions caused by sounds made by the computer program. Field notes indicate consistent use of earphones. Teacher 4 also placed a divider between the computer student's seat and the rest of the student desks in order to decrease distraction of other students. While the use of this divider did avoid potential distractions for noncomputer students, it also created a visual barrier for the teacher. In a follow-up interview, this was discussed with her, and she subsequently moved the divider to an angle which allowed her to directly view the computer student when she stood in the front of the classroom. Additionally, Teacher 4 placed at the computer table a ring of cards which provided general computer-use directions. Finally, although there was no apparent system of contingencies for appropriate behavior and work completion, Teacher 4 occasionally alluded to loss of Friday party privileges, and when asked, said that she also gave students rewards at the end of the day for good behavior. There did not seem to be any clear relationship between those contingencies and students' performance on the computer, perhaps because computer use and completion of computer tasks was not closely monitored by the teacher.

Instructional Planning and Decision-Making Strategies

When asked what she saw as the purpose of the computer in her classroom, Teacher 4 said, "It makes students familiar with new technology, teaches them skills that they would resist learning by other means, and it reinforces lessons I have already taught." She further stated that it is the most useful tool ever to come to her classroom. She described her decisions regarding how to use the computer appropriately in her classroom as trial and error, adjusting use according to the current group of students, whether they could work together, and had the fine motor skills to do the computer tasks. She monitored her students' progress on certain programs she assigned. For example, when she assigned Spell-It, she said she required that students show her their score when they were finished. Use of this program was not observed. When asked if she had changed her computer-use strategies from those used the previous year, she indicated that she had not. Further, she felt that her computer-use strategies were not as effective this current year because this group of students had more behavior problems than last year's group had. In the final interview, she indicated that she had just received 11 new computer programs. When asked how those programs were chosen, she said that she had no input in their selection.

Summary

Teacher 4 used the computer during 22% of the total observation time. She employed several effective strategies, including use of (a) a weekly schedule which allowed students to monitor their own

computer-use time; (b) a timer, set by students, to gauge their own computer-use time; (c) a divider to separate the computer student from all other students; and (d) a set of ringed cards containing computer-use instructions. Additionally, although this was not observed, Teacher 4 reported that she taught computer programs before students used them to ensure successful independent use. Finally, there was apparently some underlying behavior management system of contingencies, although it was not directly observed.

The effectiveness of her computer-use management strategies was indicated by consistently low off-task behavior observed among both computer and noncomputer students. However, it is noteworthy that of the eight computer students observed over the four computer-use observations, two computer students, while they were "on task," never got to the assigned drill and practice exercise because they could not navigate the program. Presumably, because they were expected to be independent computer users, these students did not ask for help. Further, because she seldom monitored computer students, Teacher 4 was apparently unaware of their difficulty. This breakdown in computer-use effectiveness was not reflected in computer student off-task behavior, but likely affected the degree to which the students profited from their computer use.

Of further interest are the off-task rates from Observation 4 in which an adult came into the classroom to consult with the teacher for one-quarter of the observed time. During this time, noncomputer students were observed to be off task for 12% of the time, while the computer student remained on-task. While it is not uncommon for

computer students to demonstrate greater on-task behavior than non-computer students, the higher off-task behavior of the noncomputer students could in this case have been due to the fact that computer students were expected to function independently in this class, while noncomputer students were most often involved in teacher-directed instructional activities or independent work which was either directed or closely monitored by the teacher. In this case, when the teacher attended to the other adult, there was higher off-task behavior observed among noncomputer students who were more accustomed to having the teacher's attention.

Teacher 10

Background

Teacher 10 taught in an upper elementary (Grades 4 through 6), self-contained classroom serving students with learning disabilities. The classroom was average-sized, containing two computers, one centrally located and one behind a bifold divider. Teacher 10 was observed 395 minutes across 10 observations (see Table 2). Mean length of observation was 39.5 minutes (SD = 14.8). While Teacher 10 planned to use the computers during every observation, computer use was actually observed during nine sessions, for 131 of the 395 minutes observed (33% of the time). During observations, there were 4 to 10 students in the room, with several going out for mainstream classes at one time. All observations were done during language arts periods. Sessions usually began with a whole-group lesson followed by small-group instruction.

During small-group instruction, independent students completed several tasks, two of which were computer-based. Teacher 10 had a full-time aide who was absent (with a substitute provided) during 4 of the 10 observations.

Across observations, mean percentage of off-task behavior for computer students was 0.6% (SD = 2.8), and 1.2% (SD = 5.7) for noncomputer students (see Table 8), which are notably low off-task rates. Except during Observation 8, a computer lab class, students used the two computers individually. Most often, one computer, the one designated for drill and practice activities, was in use during observations.

Table 8

Computer Student (CS) and Noncomputer Student (NCS) Off-Task Behavior for Teacher 10

Length of observation		Number of students in classroom				Percentage of students off-task	
		NCS		CS		NCS	CS
Obs. no.	Minutes[a]	n	%[b]	n	%[b]	M (SD)	M (SD)
1	59	1	4.3	0	87.0	34.2	0.0
		3	8.7	1	8.7	(11.8)	(0.0)
		4	21.7	2	4.3		
		7	34.8				
		8	30.4				

Table 8--Continued

Length of observation		Number of students in classroom				Percentage of students off-task	
		NCS		CS		NCS	CS
Obs. no.	Minutes[a]	n	%[b]	n	%[b]	M (SD)	M (SD)
2	31	3	16.7	0	58.3	0.0	0.0
		4	25.0	1	41.7	(0.0)	(0.0)
		7	33.3				
		8	25.0				
3	43	6	6.7	0	100.0	3.8	
		8	53.3			(5.6)	
		9	40.0				
4	12	4	100.0	0	100.0	0.0	
						(0.0)	
5	48	9	26.7	0	73.3	0.0	0.0
		10	73.3	1	26.7	(0.0)	(0.0)
6	45	4	12.5	0	62.5	0.8	0.0
		7	63.0	1	31.3	3.1	(0.0)
7	53	5	5.9	0	64.7	0.0	0.0
		6	11.8	1	35.3	(0.0)	(0.0)
		7	23.5				
		8	58.8				

Table 8--Continued

Length of observation		Number of students in classroom				Percentage of students off-task	
		NCS		CS		NCS	CS
Obs. no.	Minutes[a]	n	%[b]	n	%[b]	M (SD)	M (SD)
8	31	0	100.0	5	9.1		2.4
				6	18.2		(5.4)
				7	63.6		
				8	9.1		
9	50	0	37.5	0	62.5	0.0	0.0
		6	62.5	1	37.5	(0.0)	(0.0)
10	23	6	20.0	0	50.0	0.0	0.0
		7	40.0	1	30.0	(0.0)	(0.0)
		10	27.3				
Grand mean						1.2	0.6
						(5.7)	(2.8)

[a]Rounded to nearest minute. [b]Percentage of time n students were in classroom during observation.

Teacher focus data indicated that Teacher 10 focused primarily on noncomputer students, with the exception of Observation 8, a computer lab session she conducted for her whole class (see Table 9). The numbers of focus changes represented in her computer student and

Table 9

Relative Percentage and Frequency of Focus Categories for Teacher 10

Obs. no.	Students/ computer		Students/ no comp.		Nonstudents		Materials		No focus/ Unable to determine		Out of room	
	%	n[a]	%	n[a]	%	n[a]	%	n[a]	%	n[a]	%	n[a]
1			83.3	61	11.3	12	4.1	7			1.5	1
2			96.9	7	1.8	2	2.1	2			0.7	1
3			99.0	87	0.9	3	1.0	3				
4			100.0	1								
5			95.8	59	2.0	3	2.3	6				
6	2.2	2	70.5	50	12.2	8	15.0	15				
7	1.1	1	85.8	52	6.8	5	7.1	12				
8[b]	93.8	62			6.7	5	0.9	2				
9			89.3	29	4.2	6	7.5	8				
10	0.1	1	88.9	25	3.0	4	9.1	5				
Grand mean[c]	7.8		81.5		5.7		5.4				0.3	

[a]Number of times focus was observed during session. [b]Computer lab session. [c]Based on total minutes by category divided by total observation minutes (n = 395).

noncomputer student categories indicated that she monitored all students. Teacher 10 was observed using the following strategies to manage her instructional computer use:

Instructional Use Strategies

Teacher 10 used her computers for independent drill and practice of previously learned math and grammar skills, word processing of spelling and creative writing assignments, and occasionally for whole-group creative writing activities (in the lab). She stated that computer use was highly motivating to her students, saying, "It provides them with success and immediate feedback." Her report that her students found computer use engaging was supported by low off-task behavior among computer students across all computer-use observations. Field notes from Observation 3 indicated the following: "Teacher continues with reading group. The room is very quiet, with no students talking except those the teacher is calling on in reading group. Other students are working independently through their center tasks." Because her students were highly motivated to use the computer, she reported that it was necessary to use the timer to control students' computer use time. Across observations, students were observed using the timer for the drill and practice programs while not using it for completion of word processing tasks. Teacher 10 reported using drill and practice and word processing programs for instructional purposes and using a database program for her personal classroom record keeping. Students were observed using several different math and grammar drill and practice

programs, a story-starter program, and a word processing program during observations.

Instructional Format Strategies

Two instructional computer formats were observed. Students used the computer daily on an individual schedule during independent work time as part of their folder work. While Teacher 10 was conducting small reading groups, students worked through several independent tasks ("centers") including one that involved computer-based drill and practice of grammar or math and one that involved word processing a previously written paragraph, story, or spelling sentences. Each of her two computers was designated for an instructional purpose: one for drill and practice and one for word processing of assignments. During instructional time, Teacher 10's focus was almost exclusively on the group she was instructing. Low off-task behavior among computer and noncomputer students indicated this management of independent workers was effective.

Twice a week Teacher 10 conducted half-hour sessions in the school's Macintosh lab. Since her class was relatively small, she had to share the lab with two other special education classes. Field notes indicated that while these classes were much noisier than hers, their noise did not seem to distract her students from their computer tasks, as low off-task behaviors for Observation 8 indicate. Teacher 10 used this lab time to (a) acquaint her students with the use of a network server, and (b) provide her students with a more concentrated time to do creative writing pieces. She was observed using a story starter program

with her students during Observation 8. Field notes documented high focus on computer students in the lab, describing the following: "She walks around between students monitoring their progress as she goes, giving directions and complimenting students on their progress." When discussing the value of the lab for her students, Teacher 10 said, "I would like more time in the lab to walk students through the word processing program more thoroughly and introduce them to such programs as KidPix (which is on the server), so that I could then use them in the classroom Writing Center."

Activity Flow Strategies

Daily "center" tasks regulated the flow of independent work in this classroom. When asked how students proceeded through the centers, she stated, "We start with a whole-group activity. Generally they have their folders and when they are done with group activity in the morning, they get their folders and they know where to begin." Their individual folder schedule indicated which centers to complete and where to begin, and they knew that if someone was at the center where they needed to be, they should go on to the next center assigned to them. When centers were completed, either Teacher 10 or her aide checked and signed students' work. Among the 10 centers were two computer centers. The word processing center was located in an area that was visible to all students, and the drill and practice center was located behind a divider that was next to the aide's desk. The teacher could not see the drill and practice computer when she was seated at her work table. When asked why the math center computer was behind

a divider while the word processing computer was not, she said, "because I find that the games are more distracting. At one time they were both behind there. When the kids play games, they all want to watch." While she stated that all folder work was monitored and students were required to complete both computer centers every two days, because the language arts hour usually began with whole-group activities, often students did not get to the computer centers during the observation time.

In order to ensure that students were familiar with programs they were expected to use at centers, Teacher 10 reported that she took students in small groups to teach them how to use new programs. Whenever possible, she used programs in her classroom that were also on the lab server so that students had continuity between lab and classroom programs. Since she had a Macintosh and an Apple II series computer in her classroom, students got experience with two somewhat different platforms.

While she had a point system which she used to get students in the habit of coming to the work table prepared with all needed tools, Teacher 10 did not have a similar protocol for computer use. She did, however, visually monitor computer students occasionally, commenting about their computer-use behaviors or computer products. For example, when asked why she made a positive comment to a computer student about her keyboarding behavior, she said, "I noticed that she wasn't using the home keys consistently and wanted to encourage her to use them." Across all observations when the computer was in use, students were observed to come and go from computer centers in a very

business-like manner. Further, their computer use and any accompanying program or printer noises did not seem to distract other students. When asked about their self-directed behaviors, Teacher 10 said, "I have had most of these students for two years and they know the routine."

Teacher 10 did not vary her management structure across computer and noncomputer-use times, which is consistent with her initial interview report that her management procedures were basically the same during computer- and noncomputer-use times. She stated, "My students know what is expected of them and go about their business." With the exception of the lab observation, her focus data and related field notes across observations indicated that, while she scanned her classroom periodically when she was conducting small-group instruction, she depended on her aide to monitor the progress of independent workers, leaving her free to give her full attention to the small group. This strategy was apparent in her focus percentages/numbers in Table 9. Field notes from Observation 2 revealed, for example, "The bell goes off in the Math Blaster center and the student comes out, raises his hand, goes back to the aide, while the teacher never looks up." On the few occasions when computer students were observed specifically needing her help, she interrupted her small-group instruction to help the computer student. Observation 8 took place in the computer lab, which accounted for her high computer student focus during that session. Also, of general note was the relatively large amount of time she focused attention on nonstudents. This was largely due to the attention she gave to her substitute aides in order to acquaint them with classroom activities as the day began (observations took place during the first hour

of the day when language arts instruction occurred). Additionally, relatively high focus on materials was due to her handling of instructional materials as she switched from one reading group to another.

Instructional Planning and Decision-Making Strategies

The monitoring system that was built into the "center" format Teacher 10 used in her classroom allowed her to monitor the progress of her students on computer-based tasks. She said that she no longer checked scores on the drill and practice programs her students used because she knew from monitoring scores the previous year that they had mastered the skills and must now just maintain them. She said, "The kids still tell me a lot of times. I use it so they get quicker. A couple of years ago I did keep close tabs. They're to a point now where I know what they can do." On the other hand, she monitored very closely the students' products from the word processing center. When asked what the criteria were for their word processed products, she said, "It's quite individualized; for lower kids it's more punctuation and for older kids it's more in their paragraphs. I'm looking for different things for different students."

While Teacher 10 felt that her current computer usage was effective, she said she would like to integrate computer use more into her instruction. She said, "I can see the potential of its enhancing my teaching, but I feel my efforts are weak." Further, she felt a lack of peer camaraderie related to instructional computer use in her building. When discussing computer training and in-service opportunities in her district, Teacher 10 said, "There are many in-service opportunities but most

teachers in my building haven't taken advantage of the opportunities and few are interested in integrating computer use into their instruction."

Summary

Teacher 10 used the computer 34% of the total observation time. She used the computers for drill and practice of previously-learned skills and word processing of various language arts assignments. Students used the computers on an individual daily basis in a "center" format. She taught the use of all programs before they were used independently. Students were required to sign off on all computer tasks as they were completed. While she monitored completion of drill and practice tasks, Teacher 10 no longer kept records of students' scores. She did, however, closely monitor students' word processing tasks. While she rarely directly focused on computer students, when she scanned the room periodically as she conducted small-group instruction, Teacher 10 included the computer students in that scan. It was evident in the few times when she actually focused on the computer student, that she was aware of what the student had been/was doing. During computer-use observations, she focused primarily on noncomputer students who were in the reading group which she was instructing.

Points were attached to completion of centers, and field notes indicated that students moved from center to center independently and with very little off-task behavior. The fact that there was no off-task behavior of computer students in the classroom setting, and little off-task of noncomputer students (with the exception of Observation 1 when the substitute aide required much of the teacher's attention)

indicated that the strategies used by this teacher were effective. While she reported feeling her current efforts at computer-based instruction were effective, she wanted to integrate computer use more in her instruction, but felt a need for more support. Throughout follow-up interviews, possible ways to further integrate computer use were discussed.

Teacher 15

Background

Teacher 15 taught in a self-contained elementary special education classroom (Grades 3 through 5) for students with emotional disabilities. She had a full-time teacher's aide who was very active in computer-use management. While this was a self-contained classroom, she described it as "more like a resource room" because she was placing her students in least restrictive environments within the building. Hers was an average-sized classroom containing from two to eight computers, depending on the kind of session observed. All classroom observations were conducted during language arts periods. Usually Teacher 15 was conducting small-group instruction while other students completed independent tasks, a few of which were computer-based.

Teacher 15 was observed 411 minutes across 10 observations (see Table 2). Mean length of observation was 41.1 minutes (SD = 11.6). Computer use was observed in all 10 sessions, for 344 of the 411 minutes observed (84% of the time). During most observations, there were three to seven students in the classroom, with up to four students out of the classroom at one time for mainstream classes.

During two observations, when she included general education students in computer-use instruction (she referred to these sessions as "computer labs"), there were 13 general education students in her classroom in addition to one or more of her own students.

Across observations, mean percentage of off-task behavior for noncomputer students was 9.9% (SD = 24.6), while mean percentage of off-task behavior for computer students was 3.1% (SD = 14.9). Noncomputer and computer student off-task behavior was highest during observations that involved general education labs (see Table 10).

Table 10

Computer Student (CS) and Noncomputer Student (NCS) Off-Task Behavior for Teacher 15

Length of observation		Number of students in classroom				Percentage of students off-task	
		NCS		CS		NCS	CS
Obs. no.	Minutes[a]	n	%[b]	n	%[b]	M (SD)	M (SD)
1	36	1	50.0	0	14.0	2.4	8.3
		2	35.7	1	57.1	(8.9)	(28.9)
		3	14.0	2	28.3		
2	49	1	6.3	0	12.5	10.4	7.1
		3	68.8	1	68.8	(26.4)	(28.9)
		4	25.0	2	18.8		

Table 10--Continued

Length of observation		Number of students in classroom				Percentage of students off-task	
		NCS		CS		NCS	CS
Obs. no.	Minutes[a]	n	%[b]	n	%[b]	M (SD)	M (SD)
3	51	0	38.9	0	11.1	15.5	10.5
		1	5.6	2	5.6	(30.4)	(26.6)
		3	22.2	5	66.7		
		4	5.6	7	16.7		
		5	22.2				
		8	5.6				
4	54	2	22.2	0	33.3	4.6	0.0
		3	55.6	2	38.9	(13.8)	(0.0)
		4	22.2				
5	55	0	5.3	10	10.5	40.7	17.9
		1	42.1	11	52.6	(42.8)	(4.5)
		2	42.1	12	36.8		
		3	10.5				
6	43	0	77.8	12	66.7	0.0	0.0
		1	22.2	13	33.3	(0.0)	(0.0)
7	29	3	20.0	0	10.0	2.5	0.0
		4	50.0	1	80.0	(7.9)	(0.0)

Table 10--Continued

Length of observation		Number of students in classroom				Percentage of students off-task	
		NCS		CS		NCS	CS
Obs. no.	Minutes[a]	n	%[b]	n	%[b]	M (SD)	M (SD)
		5	30.0	2	10.0		
8	37	3	15.4	0	15.4	1.5	4.6
		4	30.8	1	69.2	(5.6)	(15.1)
		5	53.8	2	15.4		
9	38	3	33.3	0	50.0	1.7	8.3
		4	8.3	1	16.7	(5.7)	(20.4)
		5	33.3	2	33.3		
		6	25.0				
10	19	3	36.4	1	18.2	3.0	0.0
		4	63.6	2	72.7	(10.0)	(0.0)
Grand mean						9.9	3.1
						(24.6)	(14.9)

[a]Rounded to nearest minute. [b]Percentage of time n students were in classroom during observation.

Teacher focus data indicated that Teacher 15 focused often on computer students and noncomputer students, monitoring computer and

Table 11

Relative Percentage and Frequency of Focus Categories for Teacher 15

Obs. no.	Students/ computer		Students/ no comp.		Nonstudents		Materials		No focus/ Unable to determine		Out of room	
	%	n[a]	%	n[a]	%	n[a]	%	n[a]	%	n[a]	%	n[a]
1	23.6	3	55.8	25	5.3	5	13.5	12			2.5	1
2	7.7	9	84.0	38	3.0	7	5.0	9			0.8	1
3	71.5	63	20.6	25	5.8	10	1.7	3			1.0	1
4[b]	38.0	32	55.9	35	1.3	3	4.7	6				
5[b]	80.9	70	15.8	20	1.0	3	2.3	4				
6	98.3	43			0.6	2	0.6	1				
7	6.3	5	86.8	33	6.8	6	1.2	2				
8	23.7	16	63.3	29	2.2	5	9.7	11			0.0	1
9	21.5	12	67.8	30	2.4	4	3.3	6			4.9	1
10	8.0	6	92.8	11								
Grand mean[c]	42.9		49.3		0.4		4.2				0.9	

[a]Number of times focus was observed during session. [b]Computer lab sessions. [c]Based on total minutes by category divided by total observation minutes (n = 411).

noncomputer students proportionately equally (see Table 11). Teacher 15 focused more on the computer students when all students were doing independent work vis-a-vis when she was engaged in small group instruction. While her high computer student focus percentages/ numbers in Observations 5 and 6 reflected the computer lab format in which almost all students were computer users, other observations in which computer student focus was also high simply reflected her integrated use of computers on a day-to-day basis during language arts time. Field notes and follow-up interviews documented use of the following computer-use strategies:

Instructional Use Strategies

Teacher 15 used the computer in the following ways: (a) for individual maintenance of previously learned grammar and math skills; (b) for word processing of language assignments, creative pieces, and social studies and sciences reports; (c) for small- or whole-group instruction of specific computer program use; and (d) for small- or whole-group creative writing activities. Teacher 15 stated, "By using the computer as a drill and practice tool, I am able to boost the students' skills to a greater degree than I, otherwise, would have time to do." When asked why she included word processing in students' learning activities, Teacher 15 stated, "Their learning to word process has motivated them to write more and better pieces and has boosted their self-esteem as they have mastered the word processing program." She reported using approximately 10 different programs during her weekly regular self-contained classroom instruction, including word processing programs,

drill and practice, and keyboarding programs. Teacher 15 used drill and practice and word processing programs daily, integrating them into students' assignments.

Instructional Format Strategies

Teacher 15 was observed using three computer-use instructional formats for several different purposes. She used small- and whole-group instruction to (a) introduce new programs (e.g., introduction of a new drill and practice or application program), (b) introduce specific applications of programs (e.g., explaining how to adjust margins and use tabs in the word processing program to complete an assignment from their grammar textbook), and (c) teach a language arts lesson (e.g., whole-group persuasive piece). She used dyad activities most often when she was teaching new programs. This format allowed students to help each other learn. Additionally, when she taught new uses for programs, she closely monitored students' related independent practice, as Observation 4 field notes revealed, "Teacher pulls students together to review procedures involved in using the program. When they are spread out around the room at their own machines, she calls out to them as a group and to individuals when she needs to share some information with them." Individual computer use was assigned in conjunction with two or three independent tasks daily. In addition to the cognitive goal inherent in the computer task, Teacher 15 said, "Computer use forces them to be independent learners, a skill I otherwise wouldn't have time to teach them"

Activity Flow Strategies

Teacher 15 used several specially designed management strategies when computers were in use, which seemed inconsistent with her statement in the initial interview in which she said, "I've always had a pretty structured program, so the introduction of the computer didn't change things." She also stated that, when she first began using computer-based instruction, it was hard, but now that she had it streamlined, it did not get in the way (of other instruction).

Field notes across observations indicated that when Teacher 15 was conducting small-group instruction which did not involve computer use, she focused less on the computer student(s) and all other independent students, expecting the aide to help individual students. This difference in focus during small-group instruction vis-a-vis whole-group independent work times can be seen in comparing Teacher 15's computer student foci in Observations 1 and 2, in which she conducted small-group instruction, to Observations 3 and 4 in which she was monitoring whole-group independent workers. When Teacher 15 was conducting small-group instruction which did not involve the computer and the aide was busy helping another student, she was observed asking independent computer students (and other independent workers) if they needed help, when their hands were raised or they were off-task.

Because computer use was an integral part of many daily assignments, Teacher 15 had developed a few key strategies to foster student clarity regarding how and when they were to use the computer. Before any program was used by students, she taught students, by

demonstration and guided practice, how to use the program. Teacher 15 then observed students as they practiced using the program. Field notes for Observation 4 indicated that, in a situation in which five of her students were all working on computers, "She calls out reminders to whole group as one student experiences a problem that she thinks all students will experience." After Teacher 15 had taught a program, she allowed her more capable students to help other students, as help was needed. Although she closely monitored students during independent practice time with new programs, she believed that it was important, when teaching a new program, not to help students too much during practice time so that they could think and problem-solve for themselves.

Once students were capable of using a program, it was assigned as a part of completing a specific task (e.g., word processing a spelling assignment). Students knew that they were to use the computer to complete the assignment because Teacher 15 placed a circled "c" after all computer-use assignments on the daily assignment board. If the assignment was drill and practice in nature, students knew which part of the computer program to complete (e.g., what level) because Teacher 15 placed a card inside the disk envelope which listed each student's current level. Students updated this card each time they completed a drill and practice assignment.

When Teacher 15 was not conducting small-group instruction, she walked around students' desks as they worked, monitoring both non-computer and computer students equally. While she intermittently visually monitored independent students when she was conducting small-group instruction, she depended on her aide to help independent

students. Teacher 15 also placed her two most-often used computers close to her teaching table so that she was within 10 feet of independent computer students as she conducted small-group noncomputer-based instruction. Field notes from Observation 9 indicated the following: "It is easy for her to help both computer students because they are seated at computers which are situated right next to her reading table." Whether Teacher 15 was visually or proximately monitoring students, field notes revealed that she monitored every student approximately equally.

Another strategy Teacher 15 used with students to promote efficient time management was setting a timer for computer students, thus making them aware that their work time was passing. When asked why she used this strategy, Teacher 15 said that, while she does not use the timer with all students, she has two students "who would take forever" if she did not time them. Whether Teacher 15 was focused on teaching a small group or moving among students' desks, she monitored students verbally by asking quietly, to the student next to her or across the room, how he or she was doing with the assignment. For example, Observation 1 field notes revealed, "She walks over to monitor a word processing student, sits down next to him, and reads aloud what he has written."

In addition to strategies employed with students in her self-contained class, Teacher 15 used a few other strategies when she was teaching general education students basic computer usage skills, drill and practice, and word processing programs (she called this setting a "lab"). While Teacher 15 used the same strategies of teaching the skill,

and monitoring students while they practiced, she used the following additional strategies: (a) She divided the eight computers into four stations and trained and assigned two capable general education peer helpers to help at two stations, while she and her aide monitored the other two stations; (b) as her own students returned from the mainstream during these sessions, Teacher 15 gave them priority use of computers as they needed them, moving the general education students around to accommodate her own students' computer needs; (c) because her students have special emotional difficulties including distractibility, Teacher 15 was careful to monitor their progress as they returned to work among the general education computer lab users, allowing her students to work in separate, small offices (lining one wall of her classroom) if they were distracted by the lab activities; (d) as her own students completed their daily work, she invited them to help general education lab students learn the computer programs. Field notes from Observation 5 indicated, "One of her own independent students needs a computer, so she has to move two single lab students onto a computer together." Teacher 15 reported that this opportunity for her students to interact with and help general education students provided a very reinforcing and motivating experience for her special education students.

Despite her special effort to alleviate the distractions this lab setting created for her own students, off-task percentages/numbers for her students were higher during these lab settings than when Teacher 15 was running her self-contained classroom with computer use. These higher off-task rates were most notable in Observation 5 (Table 10). Teacher 15 did not see these off-task behaviors as a problem, but rather

saw the positive aspects of general education student role models being in her room and the opportunity for her students to help these students as providing an overwhelmingly positive experience for her students. Of her students, Teacher 15 stated, "They seem to be more in tune (with the programs) than some of the regular education kids. They are really on task when they do that kind of activity. Later in that activity, my more capable students went around and helped the regular education kids." A side benefit of conducting the general/special education labs was that she had use of several additional computers on lab days, making it possible for her own students to access a computer as they needed it to complete daily assignments.

Instructional Planning and Decision-Making Strategies

In describing how instructional computer use had enhanced her teaching, Teacher 15 said, "It not only motivates my students, but also motivates me, making my job more exciting." She evaluated her current computer usage as effective, pointing to her students' skill improvement and the fact that computer use has become a usual, integrated part of instruction and learning to the point that it does not interfere with other things going on in the room.

When asked if her instructional computer use had changed from the previous year, Teacher 15 said that she was using the computer less for reinforcement and more as an integrated tool. She also indicated that she had been reviewing and ordering many new programs that she intends to integrate into her classroom instruction in the future. Teacher 15 alluded to support of her building principal as being a very motivating

factor for her. When talking about the money he had provided for her to buy software and upgrade hardware for her classroom and lab settings, Teacher 15 said "I know he would give me more money for software and hardware if he could."

Summary

Teacher 15 used the computer approximately 84% of the total observation time. Overall, both computer and noncomputer students' off-task behaviors were low, with the notable exception of Observation 5 (see Table 10), when her special education students had difficulty returning to task independently when they returned to the room from mainstream classes and she and her aide were busy with computer lab students. Teacher 15 focused on independent computer students at a rate similar to all other independent workers, more often when all students were working independently and less often when she was conducting small-group instruction. Instructional uses included drill and practice, word processing of a variety of language arts activities, and lab practice/instruction in basic computer use. Her instructional formats for computer-use included independent use, small-group computer-based instruction, and whole-group lab instruction.

Activity flow strategies Teacher 15 used included introducing computer programs one-on-one or in small groups/labs before students were expected to use them independently. When she was not conducting small-group instruction or labs, she walked among independent workers, monitoring their work and commenting on/encouraging their progress. While Teacher 15 did not use the timer with all students, she

used it with a few students to help them focus on timely task completion. Finally, she used two strategies to provide computer-based task clarification: (1) an encircled "c" next to assignments to be completed via computer, and (2) a card in the program disk sleeve denoting at what level each student was to work in the program. Overall, these strategies together were effective, as evidenced by overall low off-task behaviors for computer and noncomputer students.

Teacher 18

Background

Teacher 18 was a teacher consultant who saw 39 kindergarten through fifth grade students per day. Only 16 of these students with learning disabilities or emotional impairments were actually on her caseload. The other 23 students were "at risk" general education students she had agreed to service. She had the help of a teacher's aide during lab and resource room classes. Teacher 18 was observed instructing 3 to 12 students at one time in her office-sized resource room, small computer lab, or their general education classroom. In her lab, situated in one corner of the library, Teacher 18 had four computers behind a large partition. When teaching in her resource room, she moved one lab computer to a wall just outside her room, since there was no space in her classroom for a computer. When she team-taught the general education class, she again moved one lab computer into the regular classroom.

Teacher 18 was observed 352 minutes across 10 observations (see Table 2). Mean length of observation was 35.2 minutes (SD = 6.7). Computer use was observed in all 10 sessions, for 239 of the 352 minutes observed (68% of the time). All observations occurred during language arts periods. Teacher 18 had indicated that she planned to use the computer during every observation period.

Across all observations, mean percentage of computer students' off-task behavior was 4.3% (SD = 16.6), while mean percentage of off-task behavior for noncomputer students was 0.5% (SD = 2.8) (see Table 12). Both computer and noncomputer students' off-task behavior was highest in the general education setting (see Observation 10).

Table 12

Computer Student (CS) and Noncomputer Student (NCS) Off-Task Behavior for Teacher 18

Length of observation		Number of students in classroom				Percentage of students off-task	
		NCS		CS		NCS	CS
Obs. no.	Minutes[a]	n	%[b]	n	%[b]	M (SD)	M (SD)
1	35	0	58.3	0	33.3	0.0	3.1
		2	8.3	2	8.3	(0.0)	(8.8)
		4	33.3	4	53.3		
2	37	0	100.0	5	100.0		1.7
							(5.7)

Table 12--Continued

Length of observation		Number of students in classroom				Percentage of students off-task	
		NCS		CS		NCS	CS
Obs. no.	Minutes[a]	n	%[b]	n	%[b]	M (SD)	M (SD)
3	33	0	60.0	0	21.4	0.0	0.0
		4	40.0	1	78.6	(0.0)	(0.0)
4	42	0	46.2	0	61.5	0.0	0.0
		4	53.8	4	38.5	(0.0)	(0.0)
5	33	2	63.6	0	27.3	0.0	0.0
		3	9.1	1	9.1	(0.0)	(0.0)
		4	27.3	2	63.6		
6	42	0	7.1	0	14.3	0.0	0.0
		1	35.7	1	42.9	(0.0)	(0.0)
		2	42.9	2	35.7		
		3	7.1	3	7.1		
		4	7.1				
7	43	0	69.2	0	15.4	0.0	0.0
		1	7.7	1	7.7	(0.0)	(0.0)
		3	7.7	3	7.7		
		4	15.4	4	69.2		

Table 12--Continued

Length of observation		Number of students in classroom				Percentage of students off-task	
		NCS		CS		NCS	CS
Obs. no.	Minutes[a]	n	%[b]	n	%[b]	M (SD)	M (SD)
8	25	3	25.0	0	72.7	0.0	0.0
		4	75.0	1	27.3	(0.0)	(0.0)
9	38	1	63.6	0	45.5	0.0	16.7
		3	36.4	1	27.3	(0.0)	(40.8)
				2	27.3		
10	24	6	33.3	0	22.2	3.7	26.2
		7	11.3	1	22.2	(7.4)	(33.1)
		8	22.2	2	33.3		
		10	11.1				
		12	22.2				
Grand mean						0.5	4.3
						(2.8)	(16.6)

[a]Rounded to nearest minute. [b]Percentage of time n students were in classroom during observation.

Teacher focus data for Teacher 18 (see Table 13) indicated that she focused on computer students almost continuously when teaching in her lab (see Observations 1, 2, and 3). When she was working in her

Table 13

Relative Percentage and Frequency of Focus Categories for Teacher 18

Obs. no.	Students/ computer		Students/ no comp.		Nonstudents		Materials		No focus/ Unable to determine		Out of room	
	%	n[a]	%	n[a]	%	n[a]	%	n[a]	%	n[a]	%	n[a]
1[b]	69.5	39	31.5	2								
2[b]	73.7	40			1.4	1	23.8	11				
3[b]	63.1	12	25.2	2	12.3	3						
4	24.2	14	59.1	14	17.7	8						
5[b]	9.0	7	71.4	15	14.0	5	7.4	3				
6	13.4	5	79.6	10	4.9	4	1.4	2				
7	54.9	34	10.3	1	5.1	6	30.5	3				
8	12.2	2	85.2	6	2.2	2	1.0	1				
9	3.1	3	87.1	9	9.4	5						
10	20.8	5	77.3	25								
Grand mean[c]	34.8		51.5		7.2		6.7					

[a]Number of times focus was observed during session. [b]Computer lab session. [c]Based on total minutes by category divided by total observation minutes (n = 352).

resource room with noncomputer students (see Observations 4 and 6 through 9), Teacher 18 focused intermittently on computer students. Focus percentages for nonstudents represented interactions with her aide and will be discussed in a later section of this chapter.

In her initial interview, Teacher 18 indicated that computer use required major changes in her classroom management in order to ensure that all students had opportunities to use her many computer-related tools. Field notes and follow-up interview data documented utilization of the following strategies to manage computer use:

Instructional Use Strategies

In the lab setting, Teacher 18 used the computers to (a) demonstrate use of software and hardware which students would later operate independently, (b) conduct whole-group instruction of such tasks as database development and report writing, and (c) allow students time for guided practice of computer tasks they would later complete independently. Her lab instruction integrated such activities as word processing, database management, telecommunication with students throughout the United States, information networking, and numerous multimedia activities (using such tools as CD ROM, digital camera, VCR, and scanner). For example, field notes from Observation 4 indicated, "Teacher begins to introduce database to students. She explains how information in phone books is like a database, a collection of information."

When conducting small-group instruction in her resource classroom, Teacher 18 used the computer for individual or small-group work which was monitored in the hall by her aide. When she was

team-teaching in the general education setting, Teacher 18 used the computer to give students an opportunity to word process their creative stories and reports. While Teacher 18 stated that she preferred to conduct most drill and practice exercises directly with students rather than via computer (and did so 4 days a week), she occasionally assigned drill and practice programs to students if they needed the additional independent practice. All computer-based activities were designed to reinforce learning objectives in the students' general education classrooms.

Instructional Format Strategies

Teacher 18 used several instructional formats, which varied with her three instructional settings. When she taught in the lab, she began with whole-group instruction and moved to independent or small-group work on computers and other related equipment, cycling students through all equipment and/or activities. Many of these lab projects were long-term because lab work could only be done on Friday, when the library was available to her. Field notes from Observation 2 indicated, "She begins to explain the activity they will start today. She goes through the previous activities that have led up to this current activity in which they are using a blank book and the scanner today." When asked how students handled the longer-term computer projects, Teacher 18 said, "They are fine and it gives me an opportunity to expose them to many different computer-related applications in each activity." This format was effective, as indicated by little off-task behavior in Observations 1, 2, 4, and 6 (see Table 12).

When Teacher 18 taught in her resource classroom, she used a small-group format, cycling two groups of two or three students each through two activities: (1) a teacher-directed drill and practice exercise addressing spelling skills; and (2) an aide-directed computer-based activity, either related to skill remediation or a long-term project they had begun in the lab. In Observation 5, "She calls name of two students to come and work with her in the room while other two stay at computer and work with aide in computer activity." Of this format Teacher 18 commented, "Long-term projects will go for a few months because I only have 30 minutes with the kids, plus keeping them up on their weekly spelling lists. I have my own routine, but I am flexible if a teacher asks me." In this format noncomputer and computer student off-task behaviors were low, as seen in Observations 3 and 5. Finally, Teacher 18 conducted noncomputer instruction inside her small room while the aide monitored the computer students' work in the hallway immediately outside her classroom door.

Teacher 18 was concerned about what she felt was the weakest component of her computer-based instruction, the general education classroom in which she team-taught. While she referred to this experience as team-teaching, actually it was two teachers taking one-half of the students and doing separate, unrelated instructional activities at the same time. On the day Teacher 18 was observed in this classroom (see Observation 10), she went into the classroom with a computer-based lesson prepared, and found that the teacher had changed the makeup of her computer group so that the student dyads which had been working together were broken up. This change made continuation of her planned

activity difficult, if not impossible. Field notes for Observation 10 indicated, "There is some confusion because the classroom teacher has switched activities on her, causing her computer grouping to get mixed up." As Teacher 18 talked about such problems, she expressed frustration because she knew it impaired her effectiveness with these students. Of this particular situation she said, "I don't know if you noticed it, but I don't know what happened today. When she (the other teacher) switched the groups around, it just threw a damper in there. They are usually excited and cooperative and look forward to what we're doing." Her concern was verified by higher computer and noncomputer student off-task behavior during the observation in that general education classroom. These off-task behavior mean percentages are higher than all other off-task percentage data gathered during observations in Teacher 18's lab or resource classroom.

Activity Flow Strategies

Because Teacher 18 conducted computer-based instruction in three very different settings, her management strategies changed across those settings, as indicated by the focus percentages (see Table 13). In lab observations, computer student focus percentages and numbers appeared very high because all students were using a computer. In contrast, when she taught in her resource classroom, she focused mostly on the noncomputer students while the aide did much of the computer student monitoring. When Teacher 18 was teaching in the general education classroom, again, her noncomputer student focus numbers were high because she was helping several dyads, only one of

which was using the computer at any given time (there was only one computer in the general education classroom).

Teacher 18's nonstudent focus percentages were relatively high because she interacted often with her aide during instruction. This interaction was essential due to the key role her aide played in her technology integration. Additionally, her materials focus was high because she often adjusted and added pieces of peripheral equipment, especially during lab sessions. For example, Observation 2 field notes indicated, "She picks up a scanned picture of herself to show students, and begins to explain the scanning procedure."

Teacher 18 used four strategies to foster an uninterrupted flow of computer-use activity. First, before students used hardware or software independently, she demonstrated its use, walking students through its use, physically prompting their hands/fingers as necessary, watching as each student took a turn practicing its use, then assigned her aide to monitor as students used the new hardware and/or software independently. Field notes from Observation 2 indicated, "She works on computer with student, guiding his hand to the menu he needs for the next step. Continues to guide the student's hand with the mouse, explaining to whole group what and why she is doing things, and tells this student he has done a good job."

Second, Teacher 18 planned computer-use activities that were engaging and guaranteed students' success. Of this strategy she said, "I have less behavioral problems when I give them something they can do and focus on their accomplishments, and we're there to help each other." Teacher 18 highlighted students' strengths by allowing them to

help other students whenever they were able. On those very few occasions when she needed to correct a student's behavior, she quickly and quietly corrected the behavior and immediately focused the student's attention back on his task. Observation 1 field notes revealed, "She walks over to another student to talk to him about being loud, then continues talking to him about his task."

Because behavior management seemed very secondary to her instruction, the investigator asked Teacher 18 to talk about her ideas regarding behavior management. Teacher 18 said, "As far as discipline, when a child is feeling good about what they [sic] are doing, they [sic] are not going to have problems with their [sic] behavior, or if they [sic] are frustrated and they [sic] act up to get out of it. I try to get kids to feel good about themselves. If I see something they are doing to keep themselves or others from learning, I talk to them." Further, field notes in Observation 7 indicated that when that same student did something successfully, Teacher 18's acknowledgment of that student's accomplishment was deliberate and very public. For example, during Observation 3 as she prepared the whole group to return to their regular classroom at the end of their lab time, Teacher 18 complimented a student on his work and how he was able to solve a sharing problem on his own that day.

The third strategy Teacher 18 used was training and using her aide very effectively. She reported spending many hours teaching her aide how to do all the tasks and use all the hardware and software her students would be using. Further, during lab and class times, Teacher 18 monitored her aide, encouraging her and helping her as needed. This

ongoing communication with the aide was indicated by high nonstudent focus rates across all observations during which her aide was present. An example of this interaction was recorded in Observation 9 field notes, "She responds to question from aide and tells her she needs to come back after finding missing student because today's instruction will be new to her." Teacher 18 was already planning additional roles that her aide could play next school year, as indicated in an interview, "There's a lot of new strategies I'm planning for next year. With the training she's got now, I can use her more. There's a lot of time I spend setting up the equipment, and you don't see that."

Finally, across all three instructional settings, Teacher 18's visual and proximate monitoring of computer students was high, as indicated by focus rates for computer students. Field notes indicated that by remaining proximate to computer students in the lab and general education classroom, she was able to anticipate problems and compliment students' accomplishments immediately. When teaching in her resource room, Teacher 18 visually monitored computer students who were working with the aide in the hall. An example of this strategy was recorded in Observation 5, "She comes into hallway and asks how students are doing, checks their work, and returns to her room with her two spelling students." When asked if she could see the computer student(s) when she was working in her classroom, Teacher 18 said, "I always try to position myself in such a way that I can see the computer student and aide while I'm working with the other students." Additionally, Teacher 18 was observed walking out into the hall periodically to closely monitor the computer students' progress, often asking them to

tell her about their progress. As indicated by her students' overall low off-task rates across all observations (with the exception of Observation 10), Teacher 18's strategies effectively fostered computer and noncomputer student on-task behavior.

Instructional Planning and Decision-Making Strategies

When asked if she thought instructional computer use enhanced her students' learning, Teacher 18 replied, "It helps them produce their thoughts with a tool other than paper and pencil, its multisensory features motivate students, it provides them with additional, nonjudgmental feedback, and it provides them with a tool they can use as adults." She further stated that computer use enhanced her teaching because it allowed her to quickly and efficiently monitor what the students were doing, and provided her a tool for preparation of teaching materials and presentation of instruction. Teacher 18 indicated that her increased use of computer and related technology had "definitely" required her to change her classroom management procedures, pointing to the big problem of figuring out how to schedule student use because of limited equipment. Teacher 18 further stated, "I also had to teach the students to be independent workers, and give them strategies to help each other."

Throughout observations and follow-up interviews there were many indications of ongoing planning and evaluation of her instructional computer use. When asked if she had changed her computer use in any ways since last school year, Teacher 18 described this year's computer use as "a whole new setup" in which she used many more

computer-related tools, requiring her to expand her lab area.

Although Teacher 18 did not have a formal evaluation system by which to evaluate the effectiveness of her computer usage, she said "I feel my current usage is effective when I observe for and see students developing specific computer use and cognitive skills and then generalizing their use to their daily work in their general education classrooms." Regarding day-to-day planning, for example, Teacher 18 once stated that she had planned a more independent activity for her noncomputer (spelling) students, knowing that she would have to monitor the computer student and aide in the hall more closely because of the difficulty level of the computer task. In addition, her strategy of having students develop a portfolio (a blank book which they were filling with all of their computer-generated products) provided a reliable method of evaluating their computer-use progress over time.

In discussing longer-range planning, Teacher 18 stated, "There's a lot of new strategies I am planning for next year. With the training she's [her aide] got not, I can use her more in the general education rooms next year too. There's a lot of time I spend setting up the equipment. She can do more of that now." When discussing administrative support, Teacher 18 stated that, while she was working very hard at technology integration, she felt her administrators were encouraging her to continue moving forward, and she said, "I feel like we are on the road to something good, so I will just keep going." On numerous occasions during follow-up interviews, Teacher 18 commented on the level of freedom and monetary support her special education administration was giving her, approving the purchase of everything she had requested to date.

Summary

Teacher 18 used the computer during approximately 68% of the total observation time. Off-task behavior for computer and noncomputer students was low, with the exception of Observation 10 which took place in the general education setting where Teacher 18 had less control over the setting events of her computer-based instruction. Teacher 18 used the computer for (a) instruction of new software use, (b) small-group instruction of a variety of integrated language arts activities involving multimedia, (c) individual student project work, and (d) occasional drill and practice. Her instructional formats included whole-group lab instruction, small group computer-based assignments, and individual computer-based assignments. Her strategies which fostered uninterrupted computer-use activity included: (a) teaching the hardware and software use in advance and guiding the students' practice as they began using hardware and software, (b) consciously planning computer-use activities that were engaging and guaranteed student success, (c) training and utilizing her aide as an active member of her instructional team, and (d) constantly visually and/or proximately monitoring both her computer and noncomputer students. These strategies were effective, as indicated by overall low percentages of student off-task behaviors. It is noteworthy that her overall attitude about her students' learning and her role in their learning was focused on student success, as indicated in interview documentation. This attitude was apparent in her planning for and interactions with students.

Teacher 31

Background

Teacher 31 taught in an elementary self-contained classroom serving kindergarten through fifth grade students with mild mental impairments (including mental impairments, physical and other health impairments, and learning disabilities) and trainable mental impairments. She had a full-time teacher's aide. All observations were done during language arts periods. Teacher 31's classroom was average-sized and contained one computer located behind a divider to minimize distractions. She was observed 371 minutes across 10 observations (see Table 2). Mean length of observation was 37.1 minutes (SD = 9.9). Computer use was observed during 9 observations, for approximately 164 of the 371 minutes observed (44% of the time). In her initial interview, Teacher 31 indicated that she planned to use the computer during all observation sessions. Teacher 31 was observed most often working with small reading or language arts groups while other students worked at their desks or the computer on independent tasks. During observations, there were 3 to 10 students in the room, with several gone at one time attending mainstream classes.

Across observations, noncomputer students' mean percentage of off-task behaviors was 10.6% (SD = 18.2), while computer students' off-task mean percentage was 1.8% (SD = 13.3), with all computer student off-task behaviors occurring during one observation (see Table 14). While the large standard deviation suggested a wide range in percentage of off-task students, Table 14 indicates that some degree of

Table 14

Computer Student (CS) and Noncomputer Student (NCS) Off-Task Behavior for Teacher 31

Length of observation		Number of students in classroom				Percentage of students off-task	
		NCS		CS		NCS	CS
Obs. no.	Minutes[a]	n	%[b]	n	%[b]	M (SD)	M (SD)
1	46	5	26.7	0	53.3	5.9	0.0
		6	60.0	1	46.7	(8.7)	(0.0)
		7	13.3				
2	42	6	71.4	0	21.4	11.4	9.1
		7	28.6	1	78.6	(22.0)	(30.2)
3	51	2	5.6	0	100.0	0.0	
		3	33.3			(0.0)	
		4	38.9				
		5	16.7				
		6	5.6				
4	40	7	21.4	0	64.3	9.2	0.0
		8	28.6	1	35.7	(12.4)	(0.0)
		9	28.6				
		10	21.4				

Table 14--Continued

Length of observation		Number of students in classroom				Percentage of students off-task	
		NCS		CS		NCS	CS
Obs. no.	Minutes[a]	n	%[b]	n	%[b]	M (SD)	M (SD)
5	44	3	13.3	0	66.7	17.0	0.0
		7	13.3	1	33.3	(10.2)	(0.0)
		8	66.7				
		9	6.7				
6	32	3	41.7	0	50.0	35.1	0.0
		6	16.7	1	50.0	(36.8)	(0.0)
		7	16.7				
		8	25.0				
7	32	3	27.3	0	72.7	1.8	0.0
		4	18.2	1	27.3	(6.0)	(0.0)
		5	54.5				
8	40	0	7.1	0	42.9	11.9	0.0
		1	21.4	1	57.1	(16.0)	(0.0)
		2	7.1				
		5	28.6				
		6	21.4				
		7	14.3				

Table 14--Continued

Length of observation		Number of students in classroom				Percentage of students off-task	
		NCS		CS		NCS	CS
Obs. no.	Minutes[a]	n	%[b]	n	%[b]	M (SD)	M (SD)
9	24	3	55.6	0	11.1	4.4	0.0
		5	33.3	1	88.9	(8.8)	(0.0)
		6	11.1				
10	20	5	57.1	0	42.9	12.1	0.0
		6	14.3	1	57.1	(11.5)	(0.0)
		7	14.3				
		8	14.3				
Grand mean						10.6	1.8
						(18.2)	(13.3)

[a]Rounded to nearest minute. [b]Percentage of time n students were in classroom during observation.

noncomputer student off-task behavior was present in every observation.

Focus data indicated that, across observations, Teacher 31 attended to computer students less consistently and less often than noncomputer students (see Table 15). In the initial interview, Teacher 31 indicated that her classroom management practices did not change during computer-use versus noncomputer-use times. She stated, "Because I use the computer as part of my workshop, it doesn't affect

Table 15

Relative Percentage and Frequency of Focus Categories for Teacher 31

Obs. no.	Students/ computer		Students/ no comp.		Nonstudents		Materials		No focus/ Unable to determine		Out of room	
	%	n[a]	%	n[a]	%	n[a]	%	n[a]	%	n[a]	%	n[a]
1	6.1	6	46.0	39	2.3	5	24.3	15	4.2	2	2.2	1
2	18.5	14	69.9	63	4.3	3	5.0	7			3.1	2
3			69.5	68	8.9	17	17.5	17	2.1	2	2.0	3
4	3.2	4	82.1	76	3.5	4	10.8	11				
5	7.0	7	80.5	96	3.0	5	9.3	14				
6	13.3	10	64.8	38	19.3	11	3.4	5				
7	11.7	3	55.6	41	15.5	12	16.1	8				
8	7.4	11	68.1	67	9.5	10	14.1	11	1.0	1		
9	0.1	1	54.4	21	19.1	7	15.4	7			8.9	2
10	13.5	3	72.0	26	3.6	3	11.5	7			0.3	1
Grand mean[b]	7.8		68.4		8.2		13.1		0.9		1.5	

[a]Number of times focus was observed during session. [b]Based on total minutes by category divided by total observation minutes (n = 371).

my management plan much." However, data from field notes and follow-up interviews documented use of the following strategies to manage computer use:

Instructional Use Strategies

Teacher 31 used the computer for (a) drill and practice of skills already taught, and (b) word processing spelling words and creative stories. She reported using approximately six different language arts and math drill and practice programs and one story-starter program on a weekly basis. She chose the program to be used, taking advantage of various skill levels built into the programs, and utilized her aide and university practicum students to help less capable students use the computer. When asked whether she selected software in advance of its use, she said, "No, I just have a few different programs that are English, and I just try to rotate the ones I use. I examine all programs before I use them to see if they go with the students' goals and instructional objectives."

Instructional Format Strategies

Teacher 31's computer use followed two instructional formats, both involving individual computer users. While she was conducting small-group instruction of language arts, independent workers completed workshop tasks which included a computer-based task, most often grammar or math drill and practice programs. Her more capable, upper-grade students worked independently at the computer, while younger and/or less capable students worked at the computer with the aide or

practicum student. When the practicum student and aide worked with computer students, Teacher 31 monitored their progress. Observation 9 field notes revealed, "Teacher gives practicum student a prompt regarding computer operation," and Observation 10 revealed, "Teacher answers question of aide about use of computer program with student." These formats were effective as indicated by no computer student off-task behaviors across all but Observation 1 (see Table 14). Teacher 31 reported that all students completed the computer task "almost every-day." She stated that she chose their computer task to support her students' goals and instructional objectives. Regarding how she addressed the multiple ability levels in her classroom, Teacher 31 said, "Some of the software has different levels and other times I have to go back and put a different program in." Field notes from Observation 5 revealed, "She gives final directions to language group, tells them she will put 'Capitalization' in for them when their assignment is done."

Activity Flow Strategies

Four strategies and one additional, impinging external factor regulated the general flow of activity and computer use in Teacher 31's classroom. First, before students used a program, she taught individuals or small groups how to use the program. Teacher 31 said, "I teach the higher functioning students how to use the program, and then they teach the less capable students how to use it. Then I don't have to go back there every time. It is good for them to learn to pass it on to someone else. It teaches them responsibility."

Second, Teacher 31's "workshop" format regulated her students'

independent work time (including computer use) while she taught small-group instruction. When asked how students knew when they could use the computer, Teacher 31 said, "They just follow the steps of the workshop." When asked whether the students got to the computer everyday, Teacher 31 said, "Yes, but if they are having a really bad day, they can't go to the computer. I use it as a tool. They love it."

Third, during Observation 9, it was noted that a computer-use schedule was written on the blackboard near the computer. When asked about this, Teacher 31 said her aide had suggested it, feeling it would help the students if they could read it rather than ask her.

Fourth, Teacher 31 auditorily monitored her students, providing prompts to return to task or begin a task, while she conducted small-group instruction or worked with instructional or other materials. Indeed, her primary form of monitoring all students was visual monitoring in response to sensing a noise or movement, followed immediately by verbal monitoring such as calling out to the computer student, "You need to do Seasons." When asked what prompted her response in that particular case, Teacher 31 said she could hear by the sound of the program that the computer student was in the wrong spot in the program. In this case, Teacher 31 had identified a noise, looked up to verify what she had heard, and called out a procedural prompt to the computer student. This is a procedure Teacher 31 used often during observations, whether she was conducting small-group instruction, correcting papers at her work table, or helping another student.

When asked about her preferred style of monitoring, Teacher 31 said that she did not monitor the classroom visually a great deal

because, she said, "By now the kids have been in the classroom long enough that they know what I expect and I don't want the kids to think I am watching their every move; they need to be independent." This strategy was effective for the computer students who usually had the help of the aide; however, it was less effective for the noncomputer students, as evidenced by their relatively higher off-task behavior across all observations, ranging from approximately 2% to 12% of students at any given time (see Table 14).

Finally, Teacher 31 reported that unpredictable schedules of her students' mainstream teachers made it difficult for her to know when her students would leave and return to her room. The fact that this was a distraction for her was evident in her focus percentages in Observations 1, 2, 3, 9, and 10, that show her "out-of-room" in the hall looking for mainstream students, and focusing on nonstudents, as she asks her aide if she has seen a certain student or if she will go find a mainstream student. For example, Observation 3 field notes revealed, "She looks back out into hall, watching for student she has just asked the aide about." While Teacher 31 was very tolerant of these schedule inconsistencies, her preoccupation with her mainstream students' schedules decreased her instructional time and affected her vigilance in monitoring her other students.

Instructional Planning and Decision-Making Strategies

While Teacher 31 believed that students' learning was enhanced by computer use, she reported feeling "pulled in too many directions," because her students represented so many learning levels and needs.

Although Teacher 31 stated that her current computer usage was effective, she said, "My system of monitoring the computer student's progress from wherever I happen to be in the classroom is kinda' haphazard. I don't always have time to print out report forms that document their progress but I always check scores at the end of the lesson."

Summary

Teacher 31 was observed using the computer approximately 44% of the observation time. When noncomputer students' were working independently, their off-task behaviors were relatively higher than computer students' off-task behaviors. In all but one of the computer-use observations, there was no recorded computer student off-task behavior. Teacher 31 used the computer for drill and practice of previously-learned skills and word-processing of language arts activities. She chose the program either in advance of computer use, or on the spot in cases in which the program was inappropriate for the user. Computer-use formats included independent use or aide-assisted use while the teacher was conducting small-group instruction. This strategy was effective for the computer students, as evidenced by the low off-task behavior of computer students.

Teacher 31's behavior management system was a token economy. The primary strategy Teacher 31 used to maintain uninterrupted activity flow was the workshop format which included a computer-based activity. Though Teacher 31 stated that students knew how to proceed through the workshop activities, field notes indicated that she was often

observed answering questions, correcting work, or prompting students about going to the computer or another workshop task. In discussing this with Teacher 31, she indicated that due to most students' lack of ability to complete tasks independently, she was often interrupted. These interruptions often took Teacher 31's focus away from small-group instruction. In addition, the unpredictable schedules kept by mainstream teachers created many uncertain minutes for Teacher 31, often causing postponement or shortening of language arts instructional time, and interfering with her monitoring of ongoing classroom activity. This distraction combined with interruptions and/or distractions related to independent workers' need for task direction often co-occurred with off-task behavior among noncomputer students, but did not impact computer students who were usually assisted by the nearby aide or a practicum student.

Teacher 36

Background

Teacher 36 taught in an elementary special education resource room for second through fourth grade students with learning disabilities. She did not have a teacher's aide. Teacher 36 was observed 429 minutes across 10 observations (see Table 2). Mean length of observation was 42.9 minutes (SD = 14.6). Computer use occurred in all 10 observations, for 250 of the 429 minutes of observation (58% of the time). In the initial interview, Teacher 36 indicated she planned to use the computer during each observation. During classroom observations

there were three to six students in the room for the whole period. Her classroom was approximately twice the size of a typical elementary classroom and was located in the basement of the school. Two observations took place in the school's computer lab. During Observation 8, she conducted a computer lab for five of her students. During Observation 10, when she shared the computer lab with a general education class, there were 22 students, 3 of whom were her mainstreamed students.

A second resource teacher occupied one-half of this room. Despite the additional distractions this arrangement could potentially have caused, her students did not seem to be affected by the noise and activity of the other class. Teacher 36 had one computer and an LCD panel which were centrally located in her classroom. All observations were done during language arts periods. During most observations Teacher 36 instructed the whole class during the first part of the hour, and worked with small groups or individuals while all other students worked alone or in small groups on independent tasks. The computer was used either by Teacher 36 for instruction or by her students most of the time.

Across observations, off-task behavior mean percentages were 6.8% (SD = 17.8) for noncomputer students and 7.2% (SD = 23.2) for computer students (see Table 16). In observations when three students were using the computer together, off-task behavior was higher than all other computer-use times (see Observations 7 and 9). Overall, computer students were much less off task than noncomputer students.

Teacher focus data indicated that Teacher 36 attended proportionately equally to computer students and noncomputer students (see

Table 16

Computer Student (CS) and Noncomputer Student (NCS) Off-Task Behavior for Teacher 36

Length of observation		Number of students in classroom				Percentage of students off-task	
		NCS		CS		NCS	CS
Obs. no.	Minutes[a]	n	%[b]	n	%[b]	M (SD)	M (SD)
1	46	3	46.2	0	15.4	9.6	0.0
		4	38.5	1	46.2	(21.7)	(0.0)
		5	15.4	2	38.5		
2	59	3	7.1	0	85.7	8.6	0.0
		4	7.1	1	7.1	(21.8)	(0.0)
		5	85.7	2	7.1		
3	58	3	5.3	0	89.5	6.6	0.0
		4	84.2	1	10.5	(20.1)	(0.0)
		5	10.5				
4	42	2	5.6	0	7.1	2.4	7.7
		3	33.3	1	92.9	(8.9)	(27.7)
		4	38.9				
		5	16.7				
		6	5.6				

Table 16--Continued

Length of observation		Number of students in classroom				Percentage of students off-task	
		NCS		CS		NCS	CS
Obs. no.	Minutes[a]	n	%[b]	n	%[b]	M (SD)	M (SD)
5	30	4	20.0	0	70.0	0.0	0.0
		5	10.0	1	10.0	(0.0)	(0.0)
		6	70.0	2	20.0		
6	59	4	52.6	0	21.1	19.1	3.3
		5	26.3	1	26.3	(24.0)	(12.9)
		6	21.1	2	52.6		
7	32	0	66.7	2	22.2	0.0	11.1
		1	22.2	3	77.8	(0.0)	(33.3)
		2	11.1				
8	37	0	100.0	5	100.0		0.0
							(0.0)
9	51	3	68.8	0	25.0	0.0	27.8
		4	6.3	2	6.3	(0.0)	(39.8)
		6	25.0	3	68.8		
10	15	1	100.0	22	100.0	0.0	6.4
						(0.0)	(7.6)

Table 16--Continued

Length of observation		Number of students in classroom				Percentage of students off-task	
		NCS		CS		NCS	CS
Obs. no.	Minutes[a]	n	%[b]	n	%[b]	M (SD)	M (SD)
Grand mean						6.8 (17.8)	7.2 (23.2)

[a]Rounded to nearest minute. [b]Percentage of time n students were in classroom during observation.

Table 17). During Observations 8 and 10, Teacher 36 attended almost exclusively to computer students because the sessions took place in a computer lab. Nonstudent focus rates were higher due to frequent interruptions from mainstream teachers and students. Teacher 36 focused on materials relatively often because she often escorted students to and from their general education classrooms in another part of the building and then spent the beginning of instructional time locating materials needed for that hour.

When asked in her initial interview whether she thought instructional computer use required her to change her classroom management procedures, Teacher 36 answered that it did not, and in fact, computer use made management easier because, she stated, "It is a center the students really enjoy." Field notes and follow-up interviews documented her use of the following strategies to manage her computer-use classroom and computer lab:

Table 17

Relative Percentage and Frequency of Focus Categories for Teacher 36

Obs. no.	Students/ computer		Students/ no comp.		Nonstudents		Materials		No focus/ Unable to determine		Out of room	
	%	n[a]	%	n[a]	%	n[a]	%	n[a]	%	n[a]	%	n[a]
1	37.1	32	26.7	23			3.9	4				
2	8.1	10	76.5	29	5.6	4	9.9	9				
3			77.0	26	4.8	5	18.9	13				
4	32.7	21	48.9	28	3.7	4	15.3	5				
5	13.2	4	82.8	13	1.8	1	1.9	2				
6	23.1	28	67.7	101	1.3	3	7.9	17				
7	36.5	20	5.2	3	16.5	5	15.6	12	12.4	2		
8[b]	72.8	46	13.7	6	11.6	10	2.1	3				
9	19.8	22	76.7	31	1.4	3	2.3	4				
10[b]	81.5	29	3.7	2	13.7	4						
Grand mean[c]	26.7		54.5		5.0		8.7		0.9			

[a]Number of times focus was observed during session. [b]Computer lab session. [c]Based on total minutes by category divided by total observation minutes (n = 429).

Instructional Use Strategies

Teacher 36 used the computer for three purposes: (1) drill and practice of language arts and math skills; (2) a "publishing center" where students could word process their edited drafts of a creative piece, a report, or a class newsletter piece; and (3) instruction regarding use of a computer program (e.g., instruction on the use of The Children's Writing and Publishing Center, or related to specific language arts skill development (e.g., instruction in the writing of haiku). When conducting whole-group instruction, Teacher 36 used an LCD panel which projected the computer screen image onto a large screen, enabling her to demonstrate specific procedures and skills to all students at one time, or word process a group story as students composed the story together. For example, field notes from Observation 2 revealed, "She is using the computer, LCD, and software to instruct the lesson. She gives each student a hard copy of one screen students will encounter in program." There was no noncomputer student off-task behavior observed during these LCD-based lessons. Teacher 36 reported using about seven programs each week, depending on the ability levels, subject area, and needs of the students that came to her each hour.

Instructional Format Strategies

The computer-use formats that Teacher 36 used were (a) individual independent, (b) small-group independent, (c) small-group instructional, and (d) whole-group instructional. She used the computer as a center for individual and small-group tasks such as drill and practice of

grammar and math skills, and "publishing" student writing when they were in the classroom and computer lab. She believed it was very important to help students learn to work successfully in groups, and used the computer to teach this objective. Teacher 36 was observed numerous times supporting the cooperative learning efforts of computer students. For example, Observation 9 field notes revealed, "After prompting students to figure out how to include all three students in the keyboarding and editing process, she walks back to computer and compliments one student on the way she is sharing the tasks." On another occasion in Observation 9, field notes indicated, "She walks over to a group that has asked for her help, and tells them they need to work out their problem by themselves, and reminds them of their half-hour time limit." On that same occasion, Teacher 36 said, "Either you all win or you all lose." She then walked away, continuing to monitor them as she began another task.

Individual students could also use the computer to "publish" their final drafts of written pieces. Teacher 36 did not allow students to compose at the computer because she felt that the task of keyboarding was enough challenge for them to handle at this point. She believed that they would be able to compose at the computer by the end of the school year. Teacher 36 stated, "I want them to strive for perfection of the piece before they get to the computer." She wanted the product they take away from the computer to be as close to perfect as possible so that they could be proud of their work while at the same time bring closure to the task.

Small groups used the computer to do drill and practice exercises and publish pieces they had written as a group. Computer group makeup was determined by lottery, with an occasional override by the teacher. When groups were sent to the computer to do drill and practice exercises, Teacher 36 stressed that it was a group effort that would get them the best score, reminding them that it was not a competition. When asked why she allowed one computer group to go on so long in disagreement, Teacher 36 said, "I thought maybe I would have to change that group because it was going to be a problem, but I was remarkably impressed with them. One of the big things about LD kids is they need to learn to work in groups because they will always need a group." In another interview, Teacher 36 commented, "If they had a problem getting along, they would have been pulled off and the next group would have gone." Additionally, dyads were sent to the computer to word process a piece written by one member of the dyad. The purpose of the second student was to help the author with keyboarding concerns such as spacing, indenting, and editing of typing errors. She was often observed prompting students regarding their roles. For example, Observation 2 indicated, "She then tells a finished student to go back and help spell for the computer student."

Whole-group computer use centered around the introduction of a program or the teaching of a language arts skill. The activity proceeded from whole-group instruction to student practice in dyads on the computer. On other occasions, the whole-group activity did not require the computer while the follow-up small-group activity was centered at the computer. For example, Teacher 36 led a whole-group discussion

comparing several characters in a story they were reading. She then assigned small groups the task of (a) writing a rough-draft description of their favorite character, (b) editing the draft and getting her approval, then (c) word processing their piece cooperatively.

Activity Flow Strategies

Since the overarching activity format in her classroom was "centers," the flow of activity was based on the completion of those centers. Teacher 36 utilized from two to four centers during most observations. At the beginning of the hour, she spent time explaining the centers and conducting any instruction relative to the centers. One center involved a computer activity (either individual or small-group), one was teacher-directed in small groups, and others were completed by the students individually.

Because Teacher 36 was usually working with a small group when students were using the computer center, she employed several strategies to foster uninterrupted computer use. Before students used a program independently, Teacher 36 introduced the program to them, demonstrating its use and allowing students to practice and demonstrate to other students various aspects of the program. Field notes from Observation 1 revealed, "One student is demonstrating as teacher gives directions and asks questions while other students are listening and providing answers to questions." As Teacher 36 was demonstrating the program, she also gave students a sheet of paper containing a set of brief, written directions for them to use, referencing that sheet as she demonstrated. Students could then keep and reference the sheet of

directions as they began to use the program independently.

Teacher 36 also provided a "cue card" for every program students used. She placed the card by the computer monitor and often reminded students to use the cue card before they asked her a procedural question. On this card she also wrote the levels/parts of the program each student should be working on. As the student completed the assigned part of the program, he or she penciled in his or her highest score on the card next to his or her name. Of this strategy Teacher 36 commented, "It saves me a whole lot of heartache. I also have which programs or part of the program they are supposed to do." That strategy was another example of Teacher 36's effort to help her students become independent learners, able to find their own answers to problems they encountered and evaluate their own progress.

Finally, because her students were always anxious to use the computer, Teacher 36 had devised a logical strategy to determine the order of turn-taking on days when "center" structures did not impose an automatic order. As Teacher 36 approved students' rough drafts, she numbered them in the order in which they were approved, and that is the order in which they then used the computer. Of this strategy Teacher 36 said, "I find it helps them keep on task."

While Teacher 36 orchestrated a very high-activity-level learning environment, she too was active, continually monitoring students' activities either visually, proximately, or verbally, as indicated by her high focus percentages and numbers for computer students and noncomputer students (see Table 17). Further, her monitoring of computer students (in her classroom setting) was proportionally high compared to other

foci. For example, Table 17 shows in Observation 1 (a classroom observation), 32 of a total 59 foci observed were computer students.

Generally, when her students were off-task during observations, field notes and focus data indicate that Teacher 36 was monitoring their behavior either visually or proximately. When asked about this, she said, "I like them to work out their problems by themselves, if possible." Overall, when considering the numbers of computer students and noncomputer students available to observe, Teacher 36 attended to computer students at a proportionately higher rate than her noncomputer students, visually monitoring them often when she was conducting individual or small group instruction, and monitored them proximately and verbally when she was not occupied by individual or group instruction (see Table 17). An example of visual monitoring occurred in Observation 1, as field notes indicated, "She looks up at projection screen (LCD panel) to see how computer student is doing." The fact that their off-task behaviors were relatively low is an indication that Teacher 36's strategies to foster uninterrupted computer use were effective.

Teacher 36 focused her behavior management on behaviors needed by students to get the task done. Regarding computer-use rules, she said, "It is part of their quality world. This is your classroom and if you don't take care of it, it is not going to be there for you. We have gone over the rules a lot. They want to work at the computer, so they are willing to follow the rules." Because Teacher 36 structured most independent learning activities for groups, she utilized peer pressure and peer monitoring. Of one particular case using this strategy, Teacher 36 said, "I let them handle that student and they wouldn't let him eat lunch

with them. They wouldn't talk to him during lunch. Sometimes kids can surprise you. You can't assume they can't do it. If they have a problem getting along, they need to work it out. I am a firm believer in closure. The choice is not whether you want to do the work, but when; you can do it on your time or mine."

Instructional Planning and Decision-Making Strategies

When asked if she believed her instructional computer use enhanced her students' learning, Teacher 36 pointed to the following indicators: (a) it teaches them to be independent learners, (b) the drill and practice firms up their skills, (c) with the school newspaper, it motivates them to perfect and publish their work. She talked about the positive experience her class had when they wrote and published the school newspaper and bound books containing their own writings. Teacher 36 said, "They produce better work when they use the computer. It makes learning more fun and rewarding for them and more motivating for me."

Summary

Teacher 36 was observed using the computer approximately 58% of the total observation time. In most observations, noncomputer student off-task behaviors were higher than computer students' off-task behaviors. One notable exception was the higher off-task behaviors of computer students in Observation 9. Across observations, most computer and noncomputer student off-task behaviors were related to students resolving small disagreements before they could begin their

small group activities on or off the computer. Field notes reflected that this was, for the most part, constructive off-task behavior in which Teacher 36 was purposely not immediately intervening so that a lesson in group cooperation could be learned.

Across observations, Teacher 36 monitored computer students often when she was working with small groups and when she was monitoring independent work time. She used the computer for a variety of instructional purposes including computer-based instruction, drill and practice, and word processing. Preceding independent use of programs, Teacher 36 gave instruction and guided practice in program use. Students had use of cue cards for every program they used. In addition, Teacher 36 stated that students knew that she consistently monitored the progress of their computer use via daily records and continuous intermittent direct observation. Her use of the LCD panel during whole-group computer-based instruction fostered relatively high student on-task behavior when compared to her whole-group computer-based instruction without the LCD panel.

Formats for Teacher 36's computer use included individual, small-group, and whole-group. The majority of computer use involved two or more students because she used the computer specifically to teach the skill of working together in groups. While this learning process may have created higher off-task behavior for both computer and noncomputer student groups, it reflected a planned aspect of Teacher 36's computer use instructional goals and management.

The most noteworthy aspect of her activity flow strategies was the high rate of monitoring computer students. Across all instructional

formats, her occurrences of computer student and noncomputer student foci were high (see Table 17). While Teacher 36 monitored very closely, she purposely did not always intervene at the point where she could have prevented off-task behavior.

Teacher 45

Background

Teacher 45 taught in an upper elementary, self-contained classroom of students with emotional impairments. The classroom was an average-sized room containing one computer located in a study carrel. Teacher 45 had a full-time teacher's aide. Teacher 45 was observed 453 minutes across 10 observations (see Table 2). Mean length of observation was 45.3 minutes (SD = 11.8). Computer use was observed in 5 of 10 observations for 153 of the 453 minutes of observation (34% of the time). All observations were done during language arts periods. Teacher 45 indicated that she planned to use the computer during each observation. During observations, there were two to eight students in the classroom, with several going to and from mainstream classes at one time. Teacher 45 usually began the hour conducting whole-group instruction followed by small-group instruction while other students worked independently at their desks or the computer.

Across observations, off-task behavior percentages for both computer and noncomputer students were low (see Table 18). Mean percentage of off-task behavior for noncomputer students was 3.7% (SD = 11.1), and 1.9% (SD = 13.9) for computer students. Several

observations contained no off-task student behavior. Computer student off-task behavior occurred in only one of the five computer-use observations.

Table 18

Computer Student (CS) and Noncomputer Student (NCS) Off-Task Behavior for Teacher 45

Length of observation		Number of students in classroom				Percentage of students off-task	
		NCS		CS		NCS	CS
Obs. no.	Minutes[a]	n	%[b]	n	%[b]	M (SD)	M (SD)
1	49	2	5.9	0	100.0	10.8	
		3	88.2			(24.3)	
		4	5.9				
2	54	3	7.1	0	100.0	6.4	
		4	7.1			(10.7)	
		5	85.7				
3	58	3	40.0	0	40.0	0.0	0.0
		4	15.0	1	60.0	(0.0)	(0.0)
		5	45.0				
4	22	0	11.1	0	100.0	0.0	
		4	11.1			(0.0)	
		5	77.8				

Table 18--Continued

Length of observation		Number of students in classroom				Percentage of students off-task	
		NCS		CS		NCS	CS
Obs. no.	Minutes[a]	n	%[b]	n	%[b]	M (SD)	M (SD)
5	36	3	100.0	0	100.0	2.0 (8.0)	
6	50	3	5.9	0	100.0	7.9 (14.3)	
		4	47.1				
		5	47.1				
7	52	6	11.1	0	33.3	2.4 (5.5)	0.0 (0.0)
		7	66.7	1	66.7		
		8	22.2				
8	31	3	50.0	1	100.0	0.0 (0.0)	0.0 (0.0)
		4	50.0				
9	55	6	42.1	0	36.8	1.5 (6.6)	8.3 (28.9)
		7	36.8	1	63.2		
		8	21.1				
10	46	3	6.7	0	60.0	2.7 (7.0)	0.0 (0.0)
		4	46.7	1	40.0		
		5	40.0				
		6	6.7				

Table 18--Continued

Length of observation		Number of students in classroom				Percentage of students off-task	
		NCS		CS		NCS	CS
Obs. no.	Minutes[a]	n	%[b]	n	%[b]	M (SD)	M (SD)
Grand mean						3.7 (11.1)	1.9 (13.9)

[a]Rounded to nearest minute. [b]Percentage of time n students were in classroom during observation.

At first glance, teacher focus data revealed that Teacher 45 focused on noncomputer students much more than she did computer students (see Table 19). Focus on computer students in Observations 3, 7, 8, 9, and 10 represented attention to only one student in each observation. However, when comparing computer and noncomputer student focus percentages in relationship to the number of students who used the computer, the computer student received proportionally equal attention.

In the initial interview, Teacher 45 indicated that her classroom management did not change during computer-use versus noncomputer-use time, stating, "I guess I don't feel a particular connection with specific management strategies and computer use." However, field notes and follow-up interviews documented utilization of the following strategies to manage computer use in her classroom:

Table 19

Relative Percentage and Frequency of Focus Categories for Teacher 45

Obs. no.	Students/ computer		Students/ no comp.		Nonstudents		Materials		No focus/ Unable to determine		Out of room	
	%	n[a]	%	n[a]	%	n[a]	%	n[a]	%	n[a]	%	n[a]
1			94.6	50	4.1	5					0.9	1
2			84.7	85	5.3	7	6.2	6			3.0	1
3	3.7	6	92.9	65	1.8	5	0.8	1				
4			97.3	17			2.2	1				
5			93.2	4	7.0	4						
6			93.8	83	3.5	5	3.8	7				
7	5.2	8	91.0	52	2.5	4	0.8	1				
8	5.0	4	85.5	14	8.5	3						
9	3.8	4	89.6	73	2.4	5	4.8	4				
10	10.4	9	81.6	38	3.5	3	4.8	3				
Grand mean[b]	2.9		90.2		3.8		2.5				0.5	

[a]Number of times focus was observed during session. [b]Based on total minutes by category divided by total observations minutes (n = 453).

Instructional Use Strategies

Teacher 45 used the computer for (a) drill and practice of math and grammar skills, and (b) word processing of creative writing pieces and reports. She was observed assigning two drill and practice programs, one for math "place value" mastery, and one for language arts "main idea" mastery, and a word processing program for final drafts of written pieces. Teacher 45 knew exactly what each computer student was using the computer for. For example, in an interview, when asked what programs the student was using, Teacher 45 said, "Read 'N Roll. He was working on main idea, a passage geared to his level." Teacher 45 used these programs very prescriptively, removing programs from students' work schedules once they demonstrated mastery. In an interview, Teacher 45 said, "Basically, most of the time the people who are on that day will go on. This week I changed things because there are some students who have not mastered the place value program, and the plan is that they will get on and they will not get off until they have mastered it." Teacher 45 allowed students to determine when they were ready to use the word processor. Her students were observed using only the three programs she initially indicated they used.

Instructional Format Strategies

The instructional computer-use format used by Teacher 45 was individual computer use. While she was conducting small-group instruction, students could use the computer to complete their drill and practice or word processing assignments. Teacher 45 permitted students to

decide (a) if they needed to use their computer time, and (b) whether they wanted to leave group instruction in order to use their computer time. In one instance, Teacher 45 was observed overriding a student's decision regarding computer use, which is consistent with her comment that if she felt the student was making an incorrect decision, she would override his decision and explain her reasoning. Students could also use the computer during independent work time for prescribed uses only. On one occasion, when students had to stay in the classroom for recess due to inclement weather, two students asked and received permission to use the computer to play a math drill and practice game together.

Activity Flow Strategies

Field notes indicated that Teacher 45 attended to students (both computer and noncomputer) minimally during small-group instruction, expecting her aide or the "computer person" to help students during that time (see Table 19). She stated, "I know that if I'm focused on one group, I'm not focused on the others. I put my focus where I know the need is to put it and I accept that I don't have to know everything that's going on all the time. I think I'm a focused person." However, when Teacher 45 was not involved in small-group instruction, she attended to individual students briefly and often, using visual, proximate, and verbal monitoring extensively, as indicated by proportionally high computer and noncomputer student focus percentages.

Teacher 45 used three strategies to foster uninterrupted computer use. First, she assigned specific students to use the computer each day with specific computer-based tasks to complete. She posted this weekly

assignment sheet above the computer. On any given day, Teacher 45 assigned two or three students to use the computer.

Second, Teacher 45 assigned a weekly "computer person" to supervise computer activity. Of this strategy she said, "It is the computer person's responsibility to ask me what program I want in and he needs to know in what sequence he should have the kids on the computer. He gets it set up, calls them over, and tells them when their time is up. Also if a child is having a problem, the first person they [sic] ask is the computer person." When asked if all students were able to do this job, Teacher 45 said, "It's a job that every child enjoys." Students were observed taking this responsibility very seriously and performing it according to her expectations. In two instances, computer persons left small-group instruction in order to help a computer student get started on his computer assignment. Observation 8 field notes indicated, "The computer person has left the webbing group and is helping the computer student boot a different program. Teacher continues to work with webbing group and does not appear to be attending to what is going on at the computer." In both instances, when the computer person returned to small-group instruction, Teacher 45 took time to bring him up to date on what had transpired in the group. For example, Observation 8 field notes indicated, "As computer person comes back to group, teacher brings him up to speed on the webbing task they are doing." Teacher 45 followed the same procedure when a computer student returned after missing a portion of her small-group instruction.

When asked if there were any drawbacks to using the computer person role, she said, "If they aren't interested, then they don't move on

it, and I have to move in. The second one would be that the student who has trouble staying on task could abuse the role. If the computer person gets called over, he can stay there because he doesn't want to do his work, and it's hard for me to tell him to get back to his seat when he can justify that someone needs his help." The effectiveness of assigning students to computer use with specific assignments and the support of a computer person was an effective combination of strategies, as indicated by low off-task behaviors among both noncomputer and computer students across computer-use observations.

The final strategy Teacher 45 employed was to monitor the computer student herself. While she stated that she preferred to leave the monitoring to the computer person, Teacher 45 was observed on a few occasions during independent work time proximately and verbally monitoring the computer student, at times giving procedural or academic help, or complimenting a student on his well-written paragraph or high drill and practice score. For example, in Observation 10, field notes indicated, "She walks over to computer student and asks him if he had to use the blackboard to get his answers. She asks him if he is understanding the problems." Since most of the computer-use monitoring was done by the computer person, Teacher 45 required computer students to turn in their products (e.g., drill and practice score print-out or word processed piece) to her for evaluation.

Teacher 45 supported her classroom management strategies with a behavior management token system. She explained, "Students accumulate tickets and buy free time or things from a store. They have a bank account we keep. I control how often tickets are given. I use it

when I feel a need for it. Tickets may be used to buy free time." Of this she said, "They don't have to interrupt me. They can fill out the check and fill out their starting and ending time. If they go over the time on their own, we deduct the amount from the bank." Teacher 45 indicated that if students took free time during work time, they were still responsible for all assignments.

Instructional Planning and Decision-Making Strategies

When asked if she thought computer enhanced her students' learning, Teacher 45 said that it helped some of her students, but not others, depending on how interested they were in the computer. She felt that a few of her students were too emotionally impaired to benefit from instructional computer use. However, in answer to the question regarding whether she believed instructional computer use enhanced her teaching, Teacher 45 replied, "It's like another hand in the room, or another vehicle to achieve objectives." She also commented that she had found the computer to be a helpful teacher resource.

When asked if she was using the computer in different ways than she had last school year, Teacher 45 said that she was using it less often and more prescriptively, monitoring computer students' progress by collecting printouts of computer-generated records and printouts of word processed assignments. In discussing possible future uses, Teacher 45 said she would like students to do more word processing, but first needed to get a better word processor and do some instruction in its use. Of this plan, she said, "There is a lot they don't know about it [word processor]. They have learned how to operate regular

instructional programs in other classes, but not word processing programs. So I will be working on that with them." Rather than just doing drill and practice, Teacher 45 indicated that she wanted them to have to problem-solve the use of a computer program, and wanted to get a more sophisticated word processing program for this purpose.

Regarding the effectiveness of her current computer management strategies, Teacher 45 said, "I like it and the students love it. They clearly know their role. I know how much more I had to be involved before there was a computer person. And they are learning a lot too." As indicated by low off-task behaviors among computer and noncomputer students, the strategies she used to foster uninterrupted computer use were effective.

Summary

Teacher 45 used the computer during approximately 34% of the total observation time for independent, individual drill and practice of skills for maintenance purposes. Computer use was assigned on an individual-needs basis. She developed a weekly computer-use chart and assigned a computer person to manage day-to-day computer use, intervening only if either the computer user or computer person was unable to handle his task independently. When conducting instruction, Teacher 45 seldom monitored the computer student, assuming the computer person would do this task. However, when she was not engaged in instruction, Teacher 45 monitored computer students often, but briefly, much as she monitored all students. As with all her monitoring, the purpose of computer student attending was to monitor and

encourage task progress. Overall, low off-task behaviors for computer and noncomputer students across all observations indicated effective management of instructional computer use in her classroom.

Summary of Classroom Management Strategies Used by Participants

Across teachers many computer-use management strategies were observed. Most were effective; however, a few were not. Strategies are summarized in the following section.

Instructional Use Strategies

Across the eight participants, instructional computer use most often observed was drill and practice of previously learned skills. Additionally, six teachers assigned the computer for word processing of (a) creative writing pieces, (b) grammar assignments, (c) spelling words (lists or sentences), and (d) science and social studies assignments. One teacher assigned the computer as a central component of multimedia tasks such as writing a report based on a database which students developed by using a CD-ROM encyclopedia resource. All teachers reported improvement in basic math and grammar skills as the reason for using drill and practice programs. Similarly, teachers who assigned word processing tasks said that they assigned the computer for this use primarily because, in using the word processor, students were motivated to complete qualitatively and quantitatively better products.

Teachers varied greatly regarding (a) the degree to which they integrated computer use with the curriculum, and (b) their levels of

expectation regarding completion of computer-based tasks. A computer-based task was considered to be curricular integrated if it related to a learning objective and would, at some point in the language arts hour or independent work time, be completed by most of the other students in the room. Levels of integration observed in these eight classrooms fell into the following categories: (a) unrelated, in which a student was assigned computer time to work on a drill and practice program which was unrelated to any other learning activities/objectives that had been assigned to other students and was not consistently monitored by the teacher; (b) stand-alone, in which a student(s) was assigned a computer task which was related to learning tasks assigned to other students, but was not the same assignment other students were working on, and was not monitored consistently by the teacher; (c) stand-alone/monitored, in which student(s) were assigned a computer task which was related to a learning objective assigned to other students, and progress and completion were monitored by the teacher; (d) integrated, in which students were assigned computer-based tasks, which all students would be completing and that were integrally connected to a larger learning task, such as word processing a creative piece written by each student in an earlier language arts session; and (e) integrated/multimedia, in which students were assigned computer-based tasks that were integrally connected to a larger learning task which all students would be completing, and involved use of the computer as well as other technologies such as laser disc and CD-ROM.

Teachers who practiced greater levels of computer integration also required the same accountability regarding completion of

computer-based assignments and behavior for computer students as for noncomputer students and noncomputer-based tasks. Likewise, they attended more to computer students than did teachers whose computer use was not curricular integrated.

All teachers reported improvement in basic math and language arts skills as the reason for using drill and practice programs. Similarly, teachers who assigned word processing of language arts assignments said they assigned the computer for this use primarily because, when using word processors, students were motivated to complete qualitatively and quantitatively better products than when they used paper and pencils to complete language arts assignments.

Instructional Format Strategies

All teachers assigned the computer on an independent, individual task basis. The nature of these assignments ranged from tasks that were totally unrelated to tasks on which other students were working, to tasks that were integrally related to a larger task on which all students were working. Several teachers assigned student dyads to computer-based tasks. The two major reasons cited for assigning dyad tasks were: (a) the efficiency afforded by peers helping each other, and (b) the specific objective of students learning to work successfully in groups.

Teacher-directed instructional formats used by these teachers were (a) one-on-one, (b) small-group, and (c) whole-group computer-based instruction. The three teachers who used one-on-one computer-based instruction often utilized their aides and/or practicum students for

this purpose. When aides and practicum students were used, the purpose was either to (a) teach the use of specific programs, or (b) help lower-functioning students use the computer.

Small-group computer-based instruction of two to five students was used by four teachers for such varied instructional tasks as teaching specific program use, composing a group story, and learning to use Lego Logo. When this format was used, other students were either out in mainstream classes or working independently, under the supervision of an aide. Whole-group computer-based instruction was used by four teachers. Three of the four teachers used a computer lab while the fourth implemented this format using an LCD panel and one computer to engage all students in the group. In two cases, whole-group lab instruction was conducted in the school's computer lab on a biweekly basis. The activities in these labs were either word processing or exploring new programs. In both cases, the teachers had to manage their lab instruction while one or more other classes also used the lab. In the third case, the teacher developed her own lab, located in the corner of the library, containing four computers and many peripheral, multimedia tools. This lab, though very small in size, offered a private learning environment for her students.

Activity Flow Strategies

In addition to decisions and plans regarding instructional use and instructional formats, teachers used a variety of strategies to foster uninterrupted instructional computer use, including (a) utilizing systematic behavior management systems, (b) teaching students how to use

assigned computer programs, (c) assigning computer use, (d) clarifying computer tasks, (e) monitoring computer use, (f) requiring computer students to use earphones, (g) requiring computer students to use a timer, (h) utilizing other personnel, (i) employing group contingencies, and (j) structuring computer activities for success. These activity flow strategies are described further below.

Utilizing Systematic Behavior Management Systems

Seven teachers employed a token, point, or reward system to help maintain on-task behavior. Some of these systems rewarded appropriate social behaviors, while others focused on assigned task completion. In one case, computer use was contingent on appropriate behavior; in another case, computer use was contingent on completion of other assigned daily tasks. In both cases, the teachers reported that the contingent computer use strategy was effective because students wanted to use the computer. In the two cases in which behavior management systems were used inconsistently and somewhat ambivalently by the teachers, the noncomputer students' off-task behavior was higher than in other cases. One teacher did not utilize a systematic behavior management system, but chose to focus on careful planning of instruction and learning activities to ensure success, believing that misbehavior results primarily from frustration over inability to complete the task. This strategy was effective for her until she encountered a situation in which an intervening event made it impossible for her to carry out her well-planned, highly engaging computer-based activity. Four teachers who used task completion with a check-off system as

prerequisite for computer use achieved both high task completion and low computer student and noncomputer student off-task behaviors.

Teaching Students How to Use Assigned Computer Programs

All teachers reported teaching computer programs before students used them independently. While all teachers reported a preference for teaching a new program to the whole class, few were able to do this because they did not see all students at one time during the day. Two teachers who had use of the school's computer lab were able to introduce new programs to all students at the same time. One teacher used an LCD panel and screen to introduce programs to the whole class. Other teachers reported or were observed teaching a program to one to three students at a time, then depending on those students to teach other students. Teachers who used the latter method said that the opportunity for students to teach other students was not only motivational, but enhanced students' self-esteem.

Three teachers were observed providing guided practice with close monitoring as students used various programs. These teachers were those whose level of curricular integration was greatest and who spent more time observing computer students than did other teachers. While a fourth teacher did not, herself, monitor students, she assigned a "computer person" to be available as computer students required help (see case study of Teacher 45). As a supplement to teaching computer programs, one teacher provided written instructions on program use which she gave to students as she taught the programs.

Teachers who taught students how to use the software and followed up with guided practice also monitored preventively (visually), making it difficult for the investigator to determine which instructional format (whole- or small-group) was most effective. It was noteworthy that among the teachers who did not visually monitor computer student use, more computer student off-task student behavior was observed (see Teachers 1 and 4) than among those who taught program use in whole-group and small-group formats, followed by guided practice.

Assigning Computer Use

Three teachers used centers or workshops to structure students' independent tasks. In all three cases, the center or workshop tasks included one or more assigned computer-based tasks. Two teachers who provided students with clear task instructions (written and oral) and clear expectations regarding computer task quality and completion had low computer student and noncomputer student off-task rates. The third teacher who did not provide clear task instructions, task order, or expectations regarding completion had higher noncomputer student off-task behaviors than the other two teachers who used the center format. Another structuring strategy utilized by one teacher was assigning contracts which listed approximately 60 tasks students had to complete weekly in order to receive a Friday reward. Task completion was high and computer student off-task rates were low; however, noncomputer student off-task behavior was relatively high.

Finally, in order to help students negotiate the school day independently, one teacher provided a weekly schedule which included (a) all

mainstream classes; (b) music, art, and physical education classes; and (c) computer-use times. Students were not further monitored regarding use of the computer. This strategy was effective as long as the students knew how to use the programs. When they could not navigate through the programs, they wasted their assigned computer time attempting to figure them out. Another teacher wrote the daily program-use schedule on the chalkboard so students would not interrupt her to ask which program they should use. Nevertheless, this teacher was observed consistently (a) giving students directions about which program or program part to use, and (b) loading programs for students, thus interrupting her instructional time.

Clarifying Computer Tasks

One teacher used two strategies to clarify task order and procedures. First, so that students knew which of their assigned tasks were computer-based, she included an encircled "c" after the assignments (written on the chalkboard) which required computer use. Second, so that students would know where on a program they should begin, she and/or her students maintained a card in the sleeve of the disk listing student names and level and/or place on the disk where each student was currently working. Students were seldom seen asking computer task procedure questions in this classroom. On the few occasions when students asked, the teacher referred them to the card in the disk sleeve.

Monitoring Computer Use

Monitoring appeared to be the key complement of all other effective strategies. Four monitoring modes, visual, verbal, auditory, and proximate, were observed to be variably effective. All teachers used the following: (a) visual monitoring, that is, watching students; (b) verbal monitoring such as asking students how they were doing, complimenting students' progress, or telling students what they should be doing; and (c) proximate monitoring, or moving closer to students working on the computer. The duration and degree to which teachers used these strategies, however, varied widely.

While all teachers reported (and were observed) using auditory monitoring to some degree, two teachers were observed to use auditory monitoring as their primary system. Their strategy was to listen, as they worked with other student groups or at their desks, and respond when they heard a disruption first by looking up, then by commenting about the disruption with a correction, direction, or statement regarding the behavior involved. This strategy usually allowed for correction rather than prevention of off-task behavior. Noncomputer student off-task behaviors for these teachers were higher than other teachers. However, because teachers who used auditory monitoring also assigned the computer as an individual, independent task, the computer students tended to remain on-task, while the noncomputer students in these two classrooms demonstrated more off-task behaviors than computer students across observations.

By contrast, six teachers used periodic visual monitoring as their major mode of managing classroom behavior, sometimes scanning the entire classroom, and other times looking up to observe a specific student or activity. This allowed them to monitor preventatively, usually entering a situation before correction was necessary. Then they often used proximate monitoring, moving close to the student(s) to observe or simply let their presence be known, followed by verbal monitoring, if direct intervention was necessary. Overall, fewer off-task behaviors were observed among these teachers' students compared to teachers who did not use this approach. When there was occasionally off-task behavior observed, it was equally distributed across noncomputer and computer students, because the expectations and tasks were the same for both groups of students.

Requiring Computer Students to Use Earphones

One teacher required students to use earphones when using the computer. This strategy created less distraction for other students; however, since this teacher did not visually or proximately monitor the computer students, by eliminating the sound, she also eliminated her capability to monitor computer use auditorily.

Requiring Computer Students to Use a Timer

Two teachers were observed using kitchen timers to regulate computer-use turns. One teacher stated the reason was to alleviate embarrassment her students felt at having to be told by other students that their computer time was up before then had completed their

program. The second teacher used the timer because students would monopolize the computer if their use was not regulated.

Utilizing Other Personnel

All five teachers who had teacher aides used them to monitor independent workers, including computer students. Higher nonstudent focus percentages among these teachers reflected the integral way in which they included their aides in instructional management and related decision-making. In addition to the focus minutes given to the aide, one teacher reported that she spent time outside of class conferring with and teaching her aide the programs and related technology so that the aide could help students complete integrated activities while the teacher conducted small-group instruction. Because one teacher assigned a "computer person" to monitor computer use, that teacher's attention to the aide was related to noncomputer student activities.

In all except one case, independent computer and noncomputer student off-task behavior rates were low during times in which aides were monitoring independent workers and teachers were instructing. In the exceptional case, because this teacher used her aide to monitor one independent student at a time (computer or noncomputer student), the aide's interventions did not directly impact the behavior of more than one student at a time.

Employing Group Contingencies

Three teachers organized all classroom activity around cooperative learning methods. They reported that the computer was a good tool to

facilitate cooperative learning because it required more than one process or task (e.g., keyboarding and editing). All three teachers stressed the importance of students supporting each others' efforts, publicly complimenting students when they helped each other. This created a higher activity level in the classroom and thus more activity for the teacher to monitor; however, it did not usually cause increased off-task behaviors because students took seriously the responsibility of helping each other. One teacher also set group contingencies for task completion, requiring that the group plan the process by which they would complete the task, and then complete the task as a group to get credit for it. The process of working out individual differences in order to come up with one product with which all group members were satisfied did foster some off-task behavior. However, since this was part of her objective, the fact that students came up with an acceptable computer-based group product would indicate that this strategy was effective in meeting her cooperative learning objective.

Structuring Computer Activities for Success

In addition to decisions regarding the kind of program and instructional format to be used, two teachers were observed making further structuring adjustments in order to foster uninterrupted computer-based and noncomputer group learning. One teacher was observed radically adjusting the group structure of his classroom by removing a group of noncomputer students who were off-task when he conducted small-group computer-based drill and practice. He was able to place the noncomputer student group in another special education classroom

during that time. While this adjustment solved the immediate problem, the investigator was unable to determine whether the noncomputer students who were removed to another classroom demonstrated fewer off-task behaviors in the new room compared to the original classroom in which computer instruction was occurring. Although the adjustment made by another teacher was not apparent to the investigator during the observation, during the follow-up interview, the teacher explained that she had selected a very "easy" computer task for the session because she knew she had to devote her attention to noncomputer student instruction that day. This was effective, as indicated by low off-task behavior among computer students during that session.

Instructional Planning and Decision-Making Strategies

During interviews, teachers' thinking was probed in order to understand the bases on which they made their decisions and plans for instructional computer use. Further, through observations the investigator sought to determine (a) the congruency of the teachers' reports with their behavior in the classroom, and (b) the consistency with which teachers used various strategies.

All teachers reported that they judged the effectiveness of their instructional computer use by their students' skill gains. However, not all teachers consistently monitored students' computer use products. Two teachers closely monitored noncomputer students but did not consistently monitor computer student products or progress. Lower off-task noncomputer student behavior was observed among teachers who consistently monitored the products of their computer students and

noncomputer students compared to teachers who did not. However, among teachers who did not consistently monitor products, computer student off-task behavior was similar to students in monitoring teachers' classrooms. It may be that computer use was inherently reinforcing enough to maintain on-task behavior, while noncomputer students required students' awareness that the teacher would be reviewing products in order to keep them on task.

All eight teachers reported using printouts of drill and practice records or hard copies of students' work to evaluate computer-based products. This evaluation strategy was observed in all but one case. As indicated in the earlier discussion of monitoring, several teachers also utilized visual monitoring in order to check for understanding of and progress with computer-based tasks.

When teachers were queried regarding ongoing self-evaluation of their computer use, five teachers indicated that they had not changed their methods of computer use from the previous year. Three of these teachers did not indicate any future plans to change their computer use. Four teachers indicated a desire to increase/expand computer integration in the next school year, and one of these teachers had a clear outline of the changes she planned to make. Overall, half of the teachers demonstrated ongoing active self-evaluation of their computer use. The teachers who were actively self-evaluating were the teachers who most closely monitored their students' computer use and products.

Teachers uniformly reported that they used computers because of their facility to reinforce previously taught skills and their highly motivating features. All teachers viewed computers as tools to support their

instruction. Four teachers cited cognitive benefits leading to improved skills. Five teachers cited benefits in the process, pointing to improved self-esteem, independent working skills, and problem-solving skills as a result of their students' computer use. Those five teachers who recognized the value of the process were those who most closely monitored their students. Because they valued the process of computer use, they were motivated to monitor students during the process rather than only at the point when a product was completed or a problem developed.

Comparisons by Training Group

Teachers in this study had previously participated in Project ICIP, a technology integration study discussed in an earlier chapter. Four teachers had participated in the control group, and the other four in the integration training group. Control teachers received no training, while integration training teachers received three in-service sessions focusing on strategies and methods of computer integration in elementary special education classrooms. To draw comparisons between the two groups of teachers in this current study, individual teacher data were combined by group, and computations were done on (a) total computer-use time, (b) teacher focus, and (c) computer and noncomputer student off-task behavior rates. The following pages present a brief report of the results of these comparisons.

Computer-Use Time and Computer Student Focus Minutes

Computer-use time was calculated by subtracting the percentage of intervals during each observation in which there was no computer

student from 100, and multiplying the resulting percentage by the total number of minutes in that observation. In using the resulting figure, it was assumed that at least one computer student was present during the whole 3-minute interval. Computer student focus minutes were calculated by summing the duration of each computer student focus interval observed per session. Table 20 shows a comparative summary by teacher and by training group. These minutes were not calculated for purposes of finding statistically significant differences, but as a gross indicator of trends in (a) each teacher's focus across approximately 10 observations, and (b) each group's focus across approximately 40 observations per group.

Computation of the four control teachers' (Teachers, 1, 4, 10, and 31) computer use across 29 observations revealed a total computer-use time of approximately 612 minutes, or 42% of the total observation time for those teachers, compared to approximately 986 minutes, or 60% of the total observation time for integration training teachers (15, 18, 36, and 45). The percentages of computer-use time are particularly interesting because all teachers indicated that they planned to use the computer during every observation session.

While integration training teachers used the computer more than control teachers, Table 20 also shows a wide range in number of minutes computers were used within groups. The range in computer-use time for control teachers was 141 minutes compared to 101 minutes for integration training teachers, indicating that within both groups there was a large disparity in degree of computer use. In both groups, there was one teacher who used the computer notably less than the other

Table 20

Comparison of Computer Use and Computer Student Focus Percentages by Teacher and ICIP Training Group

Teacher	Total observation minutes	Computer use		Computer student focus	
		Minutes	%	Minutes	%
Control group					
1	279	229	82	87	38
4	404	88	22	2	2
10	395	131	33	31	24
31	371	164	44	29	18
Total	1,449	612	42	149	24
Integration training group					
15	411	344	84	176	51
18	352	239	68	119	50
36	429	250	58	114	46
45	453	153	34	13	12
Total	1,645	986	60	422	43

teachers. In the case of Teacher 4 (control group), field notes and follow-up interviews indicated that while computer use was assigned daily to students, other activities often took precedence and computer

use was not monitored by the teacher. In the case of Teacher 45 (integration training group), field notes and follow-up interviews documented that she used the computer judiciously for specific students and specific objectives only, and closely monitored their scores and products. Teacher 45 reported in the initial interview that she was assigning computer use much less than the previous year and monitoring student scores and products very carefully, increasing and decreasing computer time as needed. In contrast, Teacher 4 reported in the initial interview that she was using the computer in the same way she had used it the previous year. Indeed, the following trends related to the use of computers emerged, distinctly differentiating the two groups.

During the initial interview, all four control teachers reported using the computer in the same way they had used it the previous year, while three integration training teachers described changes they had made in their computer use from the previous to current year, explaining why they made those changes. These initial reports were borne out through subsequent observations in their classrooms, as reported in individual case studies.

Teacher Focus Comparisons

Analysis of computer use and computer student focus percentages indicated that during the approximately 612 minutes computer use was observed in control teachers' classrooms, control teachers focused on computer students for approximately 149 minutes, or 24% of the time. By comparison, of the approximately 986 minutes of computer-use time observed in integration training teachers' classrooms, these

teachers focused on computer students approximately 422 minutes, 43% of the time (see Table 20).

The range in computer student focus minutes during computer-use time for control teachers was 85, compared to 419 minutes for integration training teachers. While there was a large disparity in computer student focus among control teachers, the notably large range among integration training teachers was of interest because they all received the same integration training which focused on strategies for effective instructional computer integration. Follow-up interviews and field notes indicated that the degree of computer use and computer student focus reflected the teachers' beliefs and attitudes regarding (a) the value of computers to their curricular instruction, (b) the purpose of computer use in their instructional sequence, and (c) the teachers' role in the students' computer use.

Computer and Noncomputer Student Off-Task Percentages

Time sampling data were recorded at the end of every 3 minutes of observation on: (a) the total number of computer students, (b) the total number of noncomputer students, (c) the number of computer students off task, and (d) the number of noncomputer students off task. Percentages of off-task computer students and off-task noncomputer students were computed for each interval.

To determine whether there were differences in mean percentages of off-task behavior rates between computer students and noncomputer students and control and integration training teachers, several *t* tests were conducted. First, an independent *t* test was conducted (see

Table 21) to compare the rates of off-task computer student behavior by ICIP training group. Results indicated that there was no significant difference in off-task rates among control teachers' computer students (M = 4.29%, SD = 0.20) and integration training teachers' computer students (M = 4.11%, SD = 0.17), $t(396) = 0.11$, $p > .05$.

Table 21

Comparison of Mean Percentages of Off-Task Computer Student Behavior by ICIP Training Group

Group	n	M	SD	t	p
Control	216	4.29	0.20		
				0.11	.913
Integration	379	4.11	0.17		

Likewise, an independent t test (see Table 22) comparing off-task rates of noncomputer students by ICIP training group revealed no significant difference between control teachers' noncomputer students (M = 6.60%, SD = 0.17) and integration training teachers' noncomputer students (M = 5.87%, SD = 0.18), $t(983) = 0.66$, $p > .05$. This suggested that when looking only at overall off-task behavior rates for computer students or noncomputer students, there was no difference in control and integration training teachers' classes. However, several additional paired t tests shed further light on the issue.

First, a paired t test was conducted on intervals in which both computer and noncomputer students were observed, representing 479 of the 1,106 intervals coded (see Table 23). The mean percentage of

Table 22

Comparison of Mean Percentages of Off-Task Noncomputer Student Behavior by ICIP Training Group

Group	n	M	SD	t	p
Control	480	6.60	0.17		
				0.66	.510
Integration	506	5.87	0.18		

noncomputer students' off-task behavior (8.76%, SD = 0.19) was significantly greater than the computer students' off-task behavior (4.62%, SD = 0.21), $t(478) = -3.15$, $p < .005$, revealing that across all teachers, when there were both computer and noncomputer students in the room, noncomputer students exhibited greater off-task behavior than computer students.

Table 23

Comparison of Mean Percentage of Off-Task Student Behavior for All Teachers by Type of Student

Type of student	n	M	SD	t	p
Computer	479	4.62	0.19		
				-3.15	.002
Noncomputer	479	8.76	0.21		

A second paired t test (see Table 24) was conducted to compare differences in off-task rates among control teachers' computer students

Table 24

Comparison of Mean Percentages of Off-Task Student Behavior Across Control Teachers

Type of student	n	M	SD	t	p
Computer	184	4.35	0.20		
				-2.89	.004
Noncomputer	184	10.95	0.22		

(M = 4.35%, SD = 0.20) and control teachers' noncomputer students (M = 10.95%, SD = 0.22), $t(183) = -2.89$, $p < .01$. This test revealed that noncomputer students were significantly more off-task than computer students. In comparison, off-task rates among integration training teachers' computer students (M = 4.79%, SD = 0.19) compared to their noncomputer students (M = 7.39%, SD = 0.21), $t(294) = -1.64$, $p > .05$, indicated no statistically significant differences (see Table 25). Results indicated that in control teachers' classes there was significant discrepancy between computer and noncomputer student off-task behavior rates, whereas in integration training teachers' classes, similar rates of off-task behavior were observed among computer and noncomputer students.

Thus, although overall rates of off-task behavior did not differ between students in control and integration training teachers' classes, when a computer was in use and both computer students and noncomputer students were in the room at the same time, control teachers' noncomputer students had higher off-task behavior than integration

Table 25

Comparison of Mean Percentages of Off-Task Student Behavior Across Integration Training Teachers

Type of student	n	M	SD	t	p
Computer	295	4.79	0.19		
				-1.64	.102
Noncomputer	295	7.39	0.20		

training teachers' noncomputer students. Observation field notes from these classrooms supported the possibility that the disparity between control teachers' computer student and noncomputer student off-task means, and integration training teachers' computer student and non-computer student off-task means reflected differences in the strategies these teachers used to manage their computer-use classrooms. The following is a comparison of the strategies used by control and integration training teachers.

Comparison of Strategies Used

The qualitative data generated from this study were analyzed for purposes of comparing the management strategies of control versus integration training groups. When each of the four major management strategy categories were compared, differences in breadth of strategies used became apparent.

Instructional Use Strategies

All teachers used the computer for drill and practice, while one control teacher and all integration training teachers used the computer for word processing. Moreover, one integration training teacher used the computer as an integral component of multimedia-based learning. Overall, integration training teachers used computers for more diverse tasks than control teachers.

Instructional Format Strategies

All teachers assigned the computer on an independent, individual-use basis, while only integration training teachers used the computer for small-group independent learning tasks. Integration training teachers' computer use was more likely to be integrated with other learning tasks and, therefore, curricularly aligned with tasks that other students were working on contemporaneously.

Activity Flow Strategies

While seven teachers used a systematic behavior management system, integration training teachers were more likely to focus on the specific behavior needed to achieve the task rather than generic appropriate classroom behaviors. Additionally, three integration training teachers focused on cooperative learning and group contingencies in the completion of computer-based tasks. While all teachers taught program use prior to students' independent use, integration training teachers were more likely to (a) follow up with guided practice and (b) use peer

support during computer use. The way in which teachers monitored students differed in that integration training teachers monitored primarily visually, which allowed them to prevent off-task behavior, while control teachers were more likely to monitor auditorily and thus intervene after the disruptive behavior had occurred.

Instructional Planning and Decision-Making Strategies

While all teachers reported that they judged the effectiveness of computer use by improvement in students' skills, integration training teachers were more likely to consistently and formally evaluate both the process and products of their students' computer-based work. Moreover, control teachers reported no difference in the way they used computer-based instruction during the current year as compared to the past year, and indicated no future plans for changing their computer use. Three integration training teachers, on the other hand, (a) had changed and broadened their computer use over the previous year, and (b) had clear plans for increasing and broadening computer use the next school year.

Conclusion

While all eight teachers shared a common set of computer-use management strategies, field notes and interviews indicated a difference in the breadth of strategies used in each category, with integration training teachers using more effective strategies more consistently, resulting in significantly less off-task behavior among noncomputer students when computers were in use.

CHAPTER V

DISCUSSION

Summary and Conclusions

With the increasing use of computers in elementary special education classrooms has come the need for a management model for the computer-use environment. Because the classroom teacher is the primary implementer of instructional activity in the classroom, the success of computer integration is dependent on the teacher's effective management of computer use. Teachers need a set of day-to-day integration maintenance strategies which address the "how" of computer integration.

Current literature provides several models of effective classroom management. Further, a few studies have provided lists of "what" teachers do when a computer is used for instruction. This literature has informed the field that (a) preplanning is an essential element of effective classroom management, (b) adjustments must be made in teacher roles as contextual variables change, (c) adjustments must be made in management strategies as contextual variables change, (d) intrapersonal variables influence the planning and decision making of teachers, and (e) the contextual variable described as the "one-computer classroom" presents the greatest management challenge to computer-using teachers. However, the "how" of managing computer-use classrooms has not yet been adequately addressed. To provide information about how best

to manage computer-use classrooms, the study (a) identified and described teachers' computer-use management strategies, (b) determined the effect of those strategies on student task engagement behaviors, and (c) queried computer-using teachers about "why" they did what they did.

Eight special education, computer-using teachers participated in the study by allowing 10 classroom observations and participating in 10 follow-up telephone interviews. The resulting effective computer-use management strategies were sorted into four categories: (1) instructional use (kinds of programs used/purposes for use), (2) instructional formats (groupings of computer and noncomputer students during computer-use time), (3) activity flow (methods of fostering uninterrupted learning time), and (4) instructional planning and decision making (methods and means of monitoring students' computer-use progress/products and teacher's perceptions of instructional computer-use effectiveness). Within these four categories, the teachers, as a group, utilized a wide range of effective and ineffective computer-use management strategies. These are summarized in the following sections.

Project ICIP Integration Training and Control Group Comparisons

Comparing strategies used by Project Instructional Computer Integration Preparation (ICIP) control group teachers to integration training group teachers, it was found that all eight teachers employed a common core of strategies related to their instructional use, instructional formats, activity flow, and instructional planning and decision making. All teachers viewed the computer as a valuable instructional tool.

However, compared to control teachers, integration training teachers demonstrated (a) a wider variety of instructional uses and formats, (b) more and varied preventative and follow-up monitoring methods, (c) more consistent and purposeful monitoring and evaluation of students' computer-based processes and products, (d) more self-evaluation of their instructional computer use, and (e) higher noncomputer student on-task behavior, as seen in the following comparisons.

Comparison of Instructional Use Strategies

All teachers used drill and practice programs to reinforce language arts skills. All integration training and two control teachers assigned a variety of tasks to be word processed, and one integration training teacher assigned the computer in connection with multimedia-based language arts tasks. Only integration training teachers assigned word processing for other subject area tasks such as science and social studies report writing. All teachers indicated that drill and practice usage was effective because students' skills improved. Four integration training and one control teacher said word processing and multimedia tasks were effective because such tasks improved the quality of students' written expression. Integration training teachers reported (a) students' acquisition of word processing and multimedia skills seemed to improve their self-esteem, and (b) students felt proud of their skills and their ability to help their general education peers. In general, integration training teachers utilized a wider variety of instructional uses than did control teachers.

Comparison of Instructional Format Strategies

All teachers assigned computer use on an individual, independent student basis. When engaged in individual computer use, students exhibited very little off-task behavior. Only integration training teachers assigned independent groups of two or three students to computer-based tasks. While student off-task behavior rates were higher among independent groups in one classroom, this teacher considered the relatively higher off-task behavior acceptable because she believed it was part of the process of students learning to work together.

One-on-one computer-based instruction was implemented by one integration training and one control teacher. In both cases the teacher's aide was utilized for this instruction. Small-group computer-based instruction was attempted by one control teacher; however, his noncomputer student off-task behavior was so high that he decided to remove all noncomputer students to a neighboring special education classroom. While this format change decreased his level of distraction, the investigator was unable to determine its effectiveness for the noncomputer students placed in a different classroom. Small-group computer-based instruction was utilized effectively by two integration training teachers who used their teacher's aides to either (a) teach the computer group or (b) monitor independent noncomputer students while teachers worked with the computer group. Whole-group computer-based instruction was implemented by three integration training teachers using an LCD panel or computer labs. Using these formats, teachers were able to keep their computer students highly engaged. Again, integration training teachers

effectively used a wider variety of computer-use formats than control teachers.

Comparison of Activity Flow Strategies

Integration training and control group teachers utilized the following activity flow strategies to foster uninterrupted computer use.

Systematic Behavior Management Strategies. All control teachers and one integration training teacher used either token, point, or social reward systems to reinforce appropriate social behavior. Because they used these systems consistently, two control teachers and the integration training teacher facilitated high on-task behavior and variable levels of task completion. The two control teachers who, by their own reports, did not use their systems consistently, had relatively higher noncomputer student off-task behavior. Two control teachers and all integration training teachers also acknowledged students' task completion either by a check-off system or verbal praise. By also focusing on task completion, one control and one integration training teacher fostered both high task completion and high on-task student behavior. While the other control teacher had high on-task behavior among computer students, the students did not always complete the computer task, possibly because they were not monitored regarding completion.

Teaching Students How to Use Computer Programs. All teachers said they taught students how to use computer programs before assigning independent use of programs. Since this instruction was not observed in any control teachers' classrooms, its effectiveness can only be

inferred by the number of procedural questions asked by students as they used the programs. Based on this criterion, three of the four control teachers successfully taught the programs while one teacher did not. Three integration training teachers were observed (a) teaching or reviewing programs in small- or whole-group formats, and (b) following up with guided practice and closely monitored independent practice of the programs. Using this procedure, teachers subsequently encountered few procedural questions. The fourth integration training teacher, though not observed teaching computer programs, also had few interruptions from computer students. All integration training teachers offered additional means for students to get procedural questions answered, such as cue cards and a designated computer person. These strategies contributed to the low number of computer student questions in those classrooms, as students successfully used the cue cards and computer person.

Assigning Computer Use. All control teachers assigned computer-based tasks as part of daily workshops, centers, contracts, or schedules. For two control teachers this was effective because students knew what program or portion of the program they were to complete. Two control teachers had many interruptions because computer students did not understand the task. Integration training teachers had integrated word processing into a variety of curricular areas such as language arts, social studies, and science. Because the time when each student would need to word process assignments could not always be predetermined, students tended to interrupt three of the integration training teachers to ask

permission to use the computer more often than students working in the more predictable formats used by control teachers. One of these integration training teachers assigned numbers to students' papers as they were approved for word processing so that students did not need to ask when their turn was to use the computer.

Clarifying Computer Tasks. One integration training teacher used two strategies to clarify independent task order and computer-use procedures. First, she listed all daily tasks on the chalk board and designated via an encircled "c" tasks which were computer-based. Second, she placed cards in the program disk sleeves that listed students' names and levels or places on disks where students were currently working. By using these strategies, the teacher increased students' on-task behavior and decreased interruptions by computer students. No strategies were used by control teachers to clarify computer-based tasks.

Monitoring Computer Use. Four modes of monitoring student activity, visual, verbal, auditory, and proximate, were used in varying degrees and with variable effectiveness by all teachers. Integration training teachers and one control teacher used all four monitoring modes in combination. Their predominant mode was visual, followed by auditory, verbal, or proximate monitoring if further intervention was necessary. This strategy prevented most off-task behavior. Three control teachers monitored primarily via auditory mode and experienced relatively higher noncomputer student off-task behavior than teachers who were primarily visual monitors.

Requiring Computer Students to Use Earphones. By requiring computer students to wear earphones, one control teacher decreased distractions for noncomputer students and teacher. Unfortunately, since this teacher seldom visually, proximately, or verbally monitored the computer student, by also removing the auditory feedback the computer program provided, she had no way to monitor the computer student. However, since this teacher's goal was to decrease distractions to noncomputer students and teacher, the strategy was effective.

Requiring Computer Students to Use a Timer. The timer was used for two purposes. One control teacher used the timer to decrease students' embarrassment when computer tasks were not completed within the computer-use time allowed. A second control teacher and one integration training teacher used the timer to control the length of time students used the computer. Both of these strategies were effective in that they (a) freed teachers from having to intervene when a student's computer-use time expired, and (b) fostered self-regulating behavior among students.

Utilizing Other Personnel. Five teachers had teacher aides. All teachers who had aides used them to monitor independent (computer and noncomputer) students while the teacher was conducting small-group instruction. Of the two control teachers who had aides, one teacher utilized her aide to do one-on-one computer-based instruction, while the other's aide did not know enough about computers to help students. The control teacher who utilized her aide for one-on-one computer-based instruction while she was conducting small-group

instruction had high noncomputer student off-task behavior, in part, because the aide was monitoring only the computer student, leaving no adult to monitor the other students. All three integration training teachers who had aides used them integrally in computer-based activities, for small-group instruction, and monitoring independent workers.

Employing Group Contingencies. All integration training teachers indicated they believed the ability to learn cooperatively is important, and three integration training teachers believed computer-based activity is a good format to practice cooperative learning. Three of these teachers assigned independent small-group computer-based tasks and closely monitored and reinforced productive group efforts. The fourth integration training teacher chose not to use the computer for cooperative learning tasks, rather assigning individuals to the computer. Generally, student off-task behavior did not increase despite increased interactions between students using the computer during cooperative learning. However, in one classroom the teacher monitored, but chose not to intervene preventatively, so that students could learn to solve their own problems. In this classroom, computer student off-task was higher than in other integration training classrooms in which teachers intervened immediately. Control teachers did not assign small groups to independent computer use. In control group teachers' classrooms, if small- or whole-groups were at the computer, they were under the direct instruction of the teacher. Using this strategy, computer students were on-task while noncomputer students were often off-task.

Restructuring Activities for Student Success. Two teachers made adjustments in activity structures to decrease distractions, thus increasing student on-task behavior. One control teacher removed all noncomputer students to a neighboring special education classroom during small-group computer-based instruction because noncomputer students were often distracted and off-task during this time. While it could not be determined whether noncomputer student off-task behavior decreased because they were removed from the classroom being observed, their absence allowed the teacher to focus solely on computer-based instruction. An integration training teacher who utilized her aide for independent computer-based activity while doing small-group instruction, planned simultaneous activities so that only one of the two activities would require her ongoing attention. This strategy decreased interruptions and increased on-task behavior of all students. While control teachers used many strategies to foster uninterrupted learning and computer use, integration training teachers used a wider variety of effective strategies than control teachers.

Comparison of Instructional Planning and Decision-Making Strategies

During follow-up interviews, all integration training teachers often talked evaluatively about their instructional computer use. All had changed their computer use from the previous year and were anxious to get feedback from the investigator regarding how they could improve and/or increase their computer use. Their plans were not necessarily for increased use, but for more effective, appropriate curricular integration,

based on the needs of their students. Subsequent follow-up interviews revealed integration training teachers knew exactly how each student was performing on the computer, what he or she was working on, and why, because they not only planned, but closely and consistently monitored their students' computer-use processes and products. Integration training group teachers all (a) kept daily records of students' computer-based products and (b) monitored, or assigned someone to monitor, ongoing computer use.

By comparison, two control group teachers kept daily records and one consistently monitored ongoing computer use. The other two control group teachers kept no records and seldom monitored ongoing computer use. Control group teachers reported no change in their computer use from the previous school year, and only one control teacher expressed interest in further curricular integration of the computer. Integration training teachers demonstrated more consistent and purposeful evaluation of (a) students' computer use and (b) their instructional computer use than did control teachers.

Follow-up interviews indicated that all integration training teachers conceptualized the job of computer integration as one of careful planning, instruction, monitoring, and self-evaluation, whereas control group teachers, overall, viewed the computer as a very useful, stand-alone drill and practice and/or word processing tool. The generally disparate beliefs of these two groups were borne out in the teachers' computer-use management practices in their classrooms.

Comparison of Students' Off-Task Behavior Rates

Quantitative data on students' off-task behavior when both computer and noncomputer students were observed, revealed that control teachers had significantly more off-task behavior among non-computer students than did integration training teachers. At the same time, teacher focus data indicated that control group teachers attended more to their noncomputer students than to computer students. One explanation might be that because, for the most part, control group teachers' computer students were expected to use the computer independently for tasks unrelated to the teachers' activity while the teacher worked with noncomputer students, computer students did not get off-task as noncomputer students did when they lost the teacher's attention. By comparison, because integration training teachers had all students involved in daily curricularly integrated computer-based tasks, expectations for the behavior of computer and noncomputer students were the same, whether or not they were using the computer. This could also explain why integration training teachers' computer and noncomputer student off-task behavior rates were not significantly different as were control group students.

Apple Classrooms of Tomorrow (ACOT) study investigators (Dwyer et al., 1990; Fisher, 1989; Sandholtz et al., 1990) formulated a developmental model of management stages through which ACOT teachers seemed to progress, which included: (a) survival (self-adequacy and maintaining control), (b) mastery (anticipating problems with strategies prepared, and (c) impact (evaluating effects of computer

management system). Similarly, in this current study, all control teachers expressed "survival"-level feelings of inadequacy related to either their level of computer use, or methods of monitoring and evaluating computer users. Integration training teachers, on the other hand, tended to fall into the "mastery" and "impact" categories. They used many preventative strategies and consistently evaluated their students' computer use and the effects of their instructional computer use.

This disparity between the two groups could be due to many factors outside of ICIP training. While all teachers came into the study with similar kinds and amounts of computer backgrounds, they may have differed in variables such as the level of commitment they personally brought to the task of computer use before they were/were not exposed to integration training. However, random selection and assignment of participants in both ICIP and this current study should account for such variation. The key factor the ACOT study illustrated was that before a teacher can be an effective computer-use manager, he or she must first understand and manage himself or herself relative to any impinging contextual variables. Follow-up interviews clearly indicated a dichotomy between control and integration training teachers regarding the degree to which they had spent time evaluating themselves relative to their personal goals for computer use.

Effects of Computer Use on Classroom Management

This study found instructional use, instructional formats, activity flow, and instructional planning and decision making as the emergent categories of effective computer-use management. The categories

described and delineated in these eight case studies are very similar to those identified in earlier studies of general education classroom management conducted by Kounin (1970), Doyle (1980), Good and Brophy (1994), Evertson and Emmer (1982), and many others. All these authors stressed the importance of careful instructional planning and evaluation, clear expectations, and consistent monitoring of students as essential elements of effective classroom management. Further, Kounin's concepts of withitness and overlapping, explained in an earlier chapter, proved to be that which separated the more effective managers from the less effective in this current study. Indeed, a range of monitoring strategies seemed to be pivotal to the relatively greater effectiveness of integration training teachers.

The management strategies of the more effective teachers in this study were also very similar to those delineated by Cheney (1989) when she identified preplanned organizational a priori management of classroom elements (planning), and in vivo anticipation and redirection of student behavior (preventative monitoring), as two key elements of effective management in special education settings. As in Cheney's study, teachers who were most effective in this study implemented a consistent schedule of activities and devised procedures to handle classroom routines. Cheney also referred to teachers' visual, proximate, and verbal monitoring as specific behaviors related to effective instructional management. These behaviors were found, in combination and to the greatest degree, among the more effective teachers in the current study when the computer was and was not being used.

Because literature on computer use in classrooms has suggested that computer use places additional management demands on the teacher, one goal of this study was to describe what management looked like during computer-use versus noncomputer-use times in these classrooms. During initial interviews, only one teacher said her management changed during computer use times. She said the change was related to planning a schedule that would provide all students opportunities to use all computer lab equipment they needed to use during a project. The remaining seven teachers did not feel their management changed during computer-use times.

Contrary to the teachers' reports, classroom observations subsequently revealed that all teachers used at least a few strategies especially implemented to manage instructional computer use. The number of strategies increased as the degree of curricular integration increased. Also, as discussed earlier, the variety of instructional computer uses, instructional formats, activity flow, and instructional planning and decision-making strategies was greater among integration training teachers than control teachers.

It is interesting that even the teachers who employed many effective strategies specially designed by them to manage instructional computer use did not perceive these strategies as constituting a management change. In interview discussions with these teachers, they seemed to be equating their expectations for students' classroom behavior with what constituted their "classroom management." They were saying that what they expected of noncomputer students they also expected of computer students and, thus, their classroom management

practices did not change during computer-use time versus nonuse time. In stating that their management practices did not change, they were not considering the many strategies they employed to foster uninterrupted, on-task computer use because their expectations remained the same for all students during computer use and nonuse times.

Implications for Training

Several implications regarding technology training can be drawn from this study. They are: (a) Integration training affects the quality and quantity of computer use, (b) computer-use management is a process which should be taught, (c) case study teaching may be a viable method for computer technology training, and (d) there is a need for technology-use camaraderie. These are discussed in the following pages.

Integration Training Affects the Quality and Quantity of Computer Use

While the Project ICIP preliminary results suggested that training of any kind had an effect on teachers' subsequent computer use, the results were not conclusive regarding the relative effectiveness of traditional software training versus integration training (Bahr et al., 1993). This current study selected participants from the extreme groups of the ICIP study, selecting four control teachers and four integration training teachers. While the small sample prohibits any serious comparisons, this current study did reveal quantitative and qualitative differences in the computer-use management of teachers who had no training (control)

compared to those who had been exposed to Project ICIP integration training. However, since all teachers had previously been exposed to at least one computer in-service or preservice experience, as Table 1 indicates, it could be said that all had experienced traditional computer in-service training prior to Project ICIP, making integration training the experience that was unique to the integration group teachers in this study. Thus, it can be assumed that integration training contributed to the quantitatively and qualitatively different behaviors exhibited by integration training teachers versus control teachers.

Over three in-service sessions, integration trainers guided teachers through the process of identifying, defining, discussing, implementing, and evaluating strategies that fostered effective instructional computer integration in their classrooms. Throughout the training year, integration training teachers were (a) encouraged to develop strategies that would be effective in their unique settings, and (b) supported in their efforts to implement those strategies. In the current study, behaviors stressed during integration training were observed to a greater degree among integration training teachers than among control group teachers.

Computer-Use Management Is a Process Which Should Be Taught

Classroom management theorists generally believe that behaviors do not occur in isolation (Barro, 1977; Collis, 1988). Thus, it would follow that individual management strategies do not happen in isolation but are a part of a whole set of management behaviors that, when operating together, are more or less effective because of the parts. Kounin's (1970) idea that classrooms are orchestrated suggests that

many things happen simultaneously, requiring attention to multiple events at one time if teachers are to be effective. Perhaps classroom management theorists have erred by listing effective behaviors in a linear fashion rather than describing several behaviors that must function, not simply simultaneously, but synchronously, to be effective.

The most effective teachers in this current study did not plan, then implement, then monitor, and then evaluate. Rather, they planned while implementing, while monitoring, while evaluating, an ongoing, intra-active or synchronous process which occurred throughout their instructional and management day. This is integrated, or synchronous management behavior. Quantitative data from this study revealed that teachers who had integration training were (a) using the intra-active, synchronous process of managing computer use; and (b) more successfully fostering the on-task behavior of all students. The investigator concluded that significantly higher noncomputer student on-task behavior may have been achieved by integration training teachers versus control group teachers because (a) their computer use was curricularly integrated, involving all students, (b) their expectations for task completion and behavior were the same for computer students and noncomputer students, and (c) they employed more strategies that effectively supported noncomputer and computer students during computer use. Control teachers, by comparison, did not seem to have a sense of how the computer could be curricularly integrated. Rather, control teachers generally conceptualized computer use as an independent, drill and practice activity that was (a) used for skill-building, (b) usually unrelated to other classroom learning activities, and (c) often not monitored. Overall,

judging by higher on-task behavior of all students and greater quality and variety of instructional computer-use strategies utilized, this study revealed that teachers who had integration training were more effective instructional computer users than control group teachers.

The results of this study suggest that relatively effective computer-use management can be fostered through training that stresses instructional computer use as an integrative process involving careful planning, selective implementation, continuous monitoring, and ongoing evaluation. The most effective teachers were those who had thoughtfully developed a set of strategies to support instructional computer use. Since, in this study, an integrated or synchronous approach to computer-use management was most effective, it is reasonable to recommend that effective computer-use management strategies be taught as a synchronous set of behaviors rather than a list of isolated effective management behaviors. Training for effective instructional computer use should focus on building strategies to support <u>all</u> students during computer-use time. By viewing the computer as a curricularly integrated tool rather than a stand-alone or isolated activity, teachers will begin to see the need for developing strategies designed to support <u>all</u> students when computers are in use.

Behavior of teachers in this study also supported the notion, advanced by the ACOT study investigators, that effective computer-use management is a process which teachers move through as they use computers in their instruction. During classroom observations and follow-up interviews, control teachers demonstrated they were functioning at the survival level, uncertain that their computer use was effective

or appropriate while not spending much time evaluating or planning for computer use.

By comparison, integration training teachers demonstrated that they were at mastery and impact levels where their computer use was effective because they confidently and consistently planned and evaluated their computer use. This developmental process must be recognized in training, and suggests longer-term training and follow-up support in order to achieve effective curricular integration.

Case Study Teaching May Be a Viable Method for Computer Technology Training Programs

Recently, much support has been voiced for instruction which is based on the case study (Doyle, 1986, J. H. Shulman, 1992; L. S. Shulman, 1987; Stake, 1988). The case study is seen as a means of closing the gap between the reality of the classroom and the theoretical principles taught in teacher preparation programs. This gap between theory and practice has continued to cause widespread criticism of the quality of instruction in teacher preparation programs. Effective teachers do not act linearly, but rather deal with several events simultaneously. The case study format can present this phenomena of classroom management most effectively, and help the student begin to think like a teacher. J. H. Shulman (1992) believed the study of classroom management is an issue that is more stylistic than rule-governed, and must address general strategies, personal orientations, and habits of mind. Likewise, computer-use management is a complex task. The case study can reflect that complexity and provide the future computer-using

teacher an opportunity to think about and practice reacting to this complexity before he or she encounters the classroom. That which would otherwise be an abstract set of rules of effective computer-use management practices could be presented in real settings via case study teaching.

There Is a Need for Technology-Use Camaraderie

Throughout the study, during follow-up interviews, teachers often made references to their need to have another colleague to talk to regarding computer use issues, as well as technology support issues. Most teachers utilized this study as a means to better understand and evaluate their own computer-use management, often asking the investigator how their computer use could be expanded and adjusted to make it more effective. At the conclusion of data-gathering, the investigator distributed an information packet to all participants delineating the range of strategies used in each of the four major categories of management, so that the eight teachers could learn from each other's practices. Several teachers expressed interest in talking to other teachers in the study in order to learn more about how they had implemented a certain strategy or managed a certain computer-use format. These teachers clearly indicated, through their desire to interact with the investigator and other study participants, the need for an informal network of computer-using elementary special education teachers. These teachers represent a larger group of teachers who have completed the major portion of their schooling and will receive additional instructional computer-use information/support by attending one-shot in-services, or

enrolling in college-level courses which usually do not address in detail the day-to-day issues involved in instructional computer-use management. It seems the logical forum for such information/support networking would be an existing computer bulletin board regulated by a university such as Western Michigan University's Confer, or its K-12 Net. If the university were the host, a department such as Special Education, which is (a) currently actively involved in related technology research, and (b) currently implementing a master's level strand of study in technology, would be an appropriate entity to monitor the activities of such a network. Such a forum could potentially provide the support and camaraderie that teachers such as those in this study need.

Study Design Effectiveness

The major purpose of this study was to describe, in rich detail, the classroom management practices of eight computer-using teachers. According to Lincoln and Guba (1985), this method of inquiry, using the observer as the instrument of data collection, is effective to the degree that the trustworthiness standards were followed. The investigator observed and interacted with each teacher sufficiently to get a clear and consistent pattern of computer-use management practices in each case. Practitioners of the naturalistic inquiry approach agree that the investigator must be the judge of when enough inquiry has been done to develop and support a set of assertions about that which is being investigated. In this study, patterns became clear and consistent after several observations and follow-up interviews, in all eight cases.

The quantitative data collected in the form of teacher focus and computer and noncomputer student off-task behavior supported the qualitative data gathered from field notes and follow-up interviews. In essence, all data supported the finding that those teachers who used the greatest variety of management strategies and who consistently applied those strategies were most effective in managing the computer-use environment. As anticipated, the qualitative and quantitative data served to complement each other. In certain cases, if only quantitative data had been gathered, several key concerns would have been missed. For example, observation field notes reported that one teacher who had no computer student off-task behaviors across all computer-use observations, but did not monitor her computer students, had two instances in which computer students spent their 15 minutes of computer time trying to access the part of the program they were assigned to complete. Quantitative data alone would not have identified this problem. Similarly, several times in interviews, teachers said they utilized certain computer-use strategies, the use of which were subsequently not borne out by either quantitative or qualitative data. The use of this dual mechanism for collecting the same or similar data was very effective in verifying/corroborating findings.

This study investigated whether or not the management practices of teachers were influenced by the Project ICIP training they had received. While this very small sample and the data collected were not designed to answer the question of whether a relationship existed, differences in these two groups' instructional computer-use management could be seen in both qualitative and quantitative data. Qualitative data

suggested that integration training teachers demonstrated greater breadth and consistency in their management practices compared to control teachers. Further, quantitative data revealed that noncomputer students in control teachers' classrooms were more often off-task than computer students, indicating that control teachers had not developed strategies to effectively manage a diverse computer-use classroom.

Uniqueness of This Study

This study used qualitative/quantitative data complementarily to describe a set of management behavior categories that contained many specific effective computer-use strategies across a variety of levels of computer-use settings. The relatively thick description of each case enables the reader to select from the case studies one which is most like his or her classroom and implement one or more of the strategies used effectively by that teacher. The case studies also provide information about strategies which are ineffective in fostering on-task behavior.

While many other studies have produced lists of "what" teachers do in a computer-use classroom, this study described the "how" and "why" of those effective management behaviors. Its thick description, complemented by the quantitative data, provided corroborative support for how one might do what was effective, and why. Its case study format provided the additional component of an integrated picture of those effective teacher behaviors so that the reader could see how they fit together into the synchronous whole that fosters on-task student behavior in a computer-use classroom.

In summary, this study seemed to clearly reflect the teacher behaviors found previously in general and computer-use management research. In addition, it extended the specific strategies, by use of thick description of each case, to an explication of how and why the strategies were utilized. Its case study format provided a picture of the synchronous use of these strategies and a viable model for the teaching of such strategies. This study (a) clearly reflected the teacher behaviors found previously in general and computer-use management research and (b) extended the broad descriptions to specific strategies and teachers' decision-making related to the use of those strategies. By reading these case studies, the reader will see not only the "what" of effective strategies previously supported by classroom management research, but the "how" and "why" related to the effective (and occasionally ineffective) use of these strategies.

Study Limitations

In the course of this investigation a few limitations were found. First, generalizability, or transferability, of the findings of this study is limited due to its small sample size. It is left to the individual reader's discretion to determine, after reading the contextually rich description provided in each case study, whether the findings may be applicable to his or her particular setting.

A second limitation to be considered is that during member checking of case studies, one participant requested that a few revisions be made in the text of her case study, thus altering what the investigator believed (through careful triangulation of the data) to be previously

accurate information. While it is necessary to conduct member checks in order to maintain the trustworthiness of qualitative data, allowing revisions may also threaten the credibility of the case study. It should be noted that, although the text portion of her case was slightly altered, the quantitative data were not affected.

Finally, while the qualitative methodology utilized in this study provided contextually rich descriptions and did, indeed, extend the understanding of effective computer-use classroom management, the use of this methodology is time and labor intensive. The question must be raised regarding whether or not a methodology other than the one used in this study could have answered the study questions as thoroughly and efficiently. It is this investigator's belief that, given the nature of the questions asked (both "how" and "how well"), the qualitative/quantitative methodology, though it generated volumes of data, provided the contextually grounded data necessary in order to say, with confidence, that the given set of strategies worked effectively within and across these eight contexts. It is likely that the efficiency and effectiveness of a study such as this could be increased by the use of multiple investigators.

In conclusion, the limitations addressed in this section all relate to the unique aspects of qualitative methodology. As the number of studies using qualitative methods increases, limitations such as those found in this study will be addressed and accommodated and the credibility and efficiency of this valuable methodology will increase.

Implications for Future Research

During the course of this study, several issues surfaced that were not intended to be addressed within the scope of this study. These issues are briefly discussed in the following sections.

Determining the Most Beneficial Way for Teachers to Conceptualize Their Computer-Use Management

In the current study, integration training and control teachers seemed to conceptualize their computer-use management as a general expectation about computer-use behavior and did not seem to recognize their computer-use management strategies as a set of management behaviors especially implemented for computer-use time. Even teachers who developed and implemented a very effective set of computer-use strategies did not view this as constituting a change in their classroom management during computer-use time. In order to focus future computer-use management training, it would be beneficial to survey computer-using teachers regarding how and why they view the role of computer-use management strategies as they do. Whether the discrepancy found in the current study was semantic or conceptual is not known at this time. Before further research is done, this discrepancy between what teachers report they do and what they actually do should be clarified.

Verifying and Expanding the Findings of the Current Study

The purpose of the current study was to identify and describe a set of effective computer-use management strategies. The case study

format provided the reader with thick descriptions of the strategies and the setting in which the strategies were effectively or ineffectively used. This study used a very small sample because the purpose was to develop a rich picture of each computer-use classroom and identify and describe effective strategies used by teachers to foster students' on-task behavior during computer-use times. Now that a set of strategies has been described, research is needed which studies a larger sample of elementary computer-using teachers to determine (a) whether or not the strategies identified in this study are used effectively across a large sample, and (b) what other effective strategies are used by teachers in a larger sample. Using the strategy categories and/or specific strategies identified and described in the current study, the proposed study would (a) verify, via quantitative data, the use of these strategies, and (b) identify and describe, via qualitative field notes, other strategies teachers might use.

Comparing Elementary Special Education and General Education Teachers' Strategies

A few studies have addressed computer-use management in the one-computer general education classroom. However, these studies have not described how to implement specific strategies. Because many general education teachers must manage computer use for larger groups with only one computer in their classrooms, it would be worthwhile to study elementary general education teachers' classrooms to determine the similarities and differences in management strategies utilized by special and general education elementary computer-using teachers.

Determining the Relative Value of Longer-Term Training and Support

While this study revealed that integration training teachers were relatively more effective instructional computer-use managers than control teachers, it did not study the developmental aspect of becoming an effective instructional computer user that was identified in the ACOT studies and apparent in this study. A study is needed to determine (a) what length of time is optimal for curricular computer-use management training and follow-up support, and (b) how teachers can be best supported (e.g., formal training versus classroom observations and follow-up consultation) through each developmental stage to become effective instructional computer users.

APPENDICES

Appendix A

Investigator's Background

Investigator's Background

The concept of individual differences has always intrigued me. Born the last of five children, I spent my childhood observing four older siblings take very different paths through the process to adulthood. Through observing them, I learned how to live successfully in my family culture by learning from their successes and failures.

My curiosity with the uniqueness of individuals continued into my high school days where I learned quickly that teachers were also each unique. I discovered, in interacting with my high school teachers, that if I watched and listened carefully, I could learn more than just subject matter information from them. Each teacher approached the presentation of his or her subject matter differently, choosing to emphasize certain aspects over others, choosing certain methods to communicate their subject matter, and providing certain activities to foster our learning. I remember my sophomore English teacher's vociferous complaints about having to teach Shakespeare. Her discomfort became mine. And I remember my world history teacher disdaining the text, but coming to life as she showed slides and talked enthusiastically about the various factors that made one culture unique from all others. Her enthusiasm became mine! I learned that teachers communicate much more than subject matter when they teach; through their teaching behaviors they build a public profile of their personal beliefs, values, and philosophies.

My curiosity with the uniqueness of people led me to a profession which addresses learner differences, Special Education. As I began my first teaching job in an elementary special education classroom serving

students with emotional impairments, I quickly learned that observing differences was much easier than managing differences. Each student presented a unique set of needs, which, when melded together with several other students, gave me a very complex management job. Thus began my adventure into the ever changing world of classroom dynamics. Among the many lessons I learned in those first years of teaching in various special education settings, were these: (a) nothing works all the time; (b) no matter how hard I tried, certain strategies and tools were not effective when I used them; and (c) my teaching seemed to improve in direct proportion to the time I spent thinking about, talking about, and evaluating (thus understanding) what I was doing in the classroom.

When I began my doctoral studies, I was granted a teaching associateship which provided me the opportunity to teach university students who were studying to become teachers. I quickly realized that many of the same lessons I had learned as a student and later as a teacher of elementary special education applied to my university teaching. Furthermore, I discovered, in discussions with classroom teachers who had returned to do graduate work, that each teacher approached the task of teaching in ways unique to him/herself, given the complex and unique factors that comprised his/her classroom. It was no surprise, then, that while undergraduate students were asking for lists of things to know, teachers returning for graduate studies were saying, "No generic lists, please; let's talk about what we already do, what we might do, and how we might do it." In these discussions, teachers were essentially outlining case studies of their classrooms and posing the question, "Given this context, how am I doing and what could I be doing

differently, and how?" And, indeed, when they gave us a description of their teaching contexts, their fellow students and I were able to give them "context-wise" suggestions for improving or expanding their teaching behaviors.

One other recent experience I had as a doctoral research associate further reinforced the need for a more qualitative approach to describing effective teaching. As coordinator of a 3-year research grant in which I observed computer-using classroom teachers in vivo, I learned that collecting teacher behavior counts told the what but not the how and why of teachers' behaviors. Again, it was reinforced that the how and why could only result from providing (a) a fuller description of the context surrounding the behavior, and (b) an understanding of the teacher's personal intent in using that behavior.

My penchant for observing and valuing unique aspects of a person or situation combined with my belief that complete contextual descriptions offer the best forum/format for question-asking and -answering regarding teaching practices, have clearly led me to approach this current study via a naturalistic, qualitative paradigm.

Appendix B

Research Protocol Clearance Letter From Western Michigan University Human Subjects Institutional Review Board

Human Subjects Institutional Review Board

Kalamazoo, Michigan 49008-3899

WESTERN MICHIGAN UNIVERSITY

Date: October 23, 1992

To: Stephanie Kenney

From: M. Michele Burnette, Chair M. Michele Burnette JKB

Re: HSIRB Project Number 92-10-05

This letter will serve as confirmation that your research protocol, "Identification of Effective Classroom Management Practices Among Teachers in Elementary Education Computer-Using Classrooms" has been approved after full review by the HSIRB. The conditions and duration of this approval are specified in the Policies of Western Michigan University. You may now begin to implement the research as described in the approval application.

You must seek reapproval for any change in this design. You must also seek reapproval if the project extends beyond the termination date.

The Board wishes you success in the pursuit of your research goals.

xc: Bahr, Special Education

Approval Termination: October 23, 1993

Appendix C

Initial Teacher Interview Form

ID:_____

Date:_____

TAB Research Study
Initial Teacher Interview

General Information

Before beginning this portion of the interview, provide the teacher with a copy of his/her 1991-92 Project ICIP Teacher Application form.

1. Has any information you provided on your 1991-92 Project ICIP Teacher Application form changed? If so, please indicate the changes.

2. Do you use the computer during language arts instruction or language arts independent work time? If so, when and how often?

Classroom Management Issues

A. Attitude Toward Using Computers in the Classroom

1. Do you think using the computer enhances your students' learning?

   If so, in what ways?

2. Do you think using the computer enhances your teaching?

   If so, in what ways?

3. Do you think using computers in your instruction requires you to change your classroom management procedures/practices?

   If so, in what ways?

B. Current Practices

Before asking these questions, preview the three interviews done with this teacher during his/her 1991-92 participation in Project ICIP.

1. In 1991-92, you indicated you were using the computer in the following ways in your classroom_____.

   Has your computer use changed?

   If so, in what ways?

2. Do you think your current computer usage is effective?

   If yes/no, why?

Appendix D

Teacher Attending Behavior (TAB) Observation System

Teacher Attending Behavior
(TAB)
Observation System

The purpose of this observation system is to gather both qualitative and quantitative data which describe the attending behaviors of the teacher who integrates computers into his/her classroom instructional program. The system captures the FOCUS of each teacher attending behavior in real time. Each **new teacher attending behavior** will be defined as "any time the teacher indicates by voice or gaze that s/he has shifted the focus of his/her attention from one student, nonstudent, or material to another student, nonstudent or material."

Since one purpose of the observation system is to gather information regarding teacher attending behaviors when computers are in use versus when computers are not in use, the computer will allow the observer to record real-time use/nonuse of the computer. **Computer use** will be defined as "any time a person (teacher, student, other) is interacting with the computer".

In addition, at each three-minute interval, the system will ask the observer to record: (a) the total number of noncomputer students, (b) the total number of computer students, (c) the total number of noncomputer students who are off task, and (d) the total number of computer students who are off task at that moment. **Computer student** will be defined as "a student who is seated at the computer by assignment/choice and is either engaged in or preparing to engage in a task which involves the computer or its peripherals". **Noncomputer student** will be defined as "any student who is not defined as a computer student". **Off task** will be defined as "not waiting to do, preparing, doing, or putting away a given task".

After the focus the teacher attending behavior has been coded, the observer will type field notes, describing the nature of that attending behavior. Because teachers may engage in several interactions simultaneously, the field notes will enable the observer to unravel and describe such multiple attending behaviors. Given the possibility of multiple interactions and the dual nature of this observation system, it is likely that **every** attending behavior will not be captured. However, it is felt that by gaining both quantitative and qualitative information about the teacher's interactions, the system will provide the investigator with a rich description of each interaction that the observer is able to code.

During the observation, the focus of the observer will be on the classroom teacher. At the beginning of the observation session, the observer will enter the following information:

Teacher Code: (teachers will be given ID numbers)

Observation Number: 1, 2, 3, 4, 5, 6, 7, 8, 9, 10

Teacher Plan: 1-Comp. Use 2-Comp. Nonuse

Kind of Classroom: 1-Regular Ed., with mainstreaming
2-Special Ed., Self-contained
3-Special Ed., Resource
4-Computer Lab

During the observation, the focus of the observer will be on the classroom teacher. The observer will code first the focus of teacher attending behavior, then record descriptive field notes about the nature of the behavior observed. This will continue for 45 to 60 minutes. At the end of the observation, the observer will complete a portion of the observation journal entry documenting personal feelings, perceptions, and questions regarding the observation.

CATEGORIES AND CODES

LEVEL ONE: FOCUS OF THE TEACHER'S ATTENTION	REFERS TO PERSONS OR MATERIALS TO WHICH THE TEACHER IS ATTENDING EITHER VERBALLY OR NONVERBALLY
F-1 Student(s)/Computer(s)	**The teacher's attention is directed toward student(s) within the classroom, at least one of whom is using a computer.** Examples: a) The teacher is leading guided practice math class in which three students are working problems from the board and one computer student is working problems on a problem set from Math Masters. b) The teacher is monitoring a group of five students who are doing an independent writing assignment while two of the five students are using Childrens Writing and Publishing Center to complete their writing assignments.
F-2 Student(s)/ No Computer(s)	**The teacher's attention is directed toward student(s) within the classroom, none of whom are using a computer.(There may be a student using a computer; however, the teacher is not attending to that student.)** Examples: a) The teacher is leading a science lesson in which the entire class is involved in doing an experiment, with no student using the computer. b) The teacher is giving a spelling test to all but one student while that one student is at the computer playing a game. c) The teacher is giving directions regarding a visit to the library while the entire class sits at their desks and listens.
F-3 Nonstudent(s)	**The teacher's attention is directed toward nonstudents (adults and students from other classrooms).** Examples: a) The teacher is talking to the classroom aide while the students work independently. b) The teacher is talking to the principal while the aide monitors the class. c) The teacher is talking to a parent who walks into the classroom while the students work quietly in small groups. d) The teacher is talking to a student who has come from the office to collect

attendance sheets.

F-4
Materials

The teacher's attention is directed toward materials/objects within the classroom. Examples: a) The teacher is setting up the projector to show a film while most of the students are independently completing their journals and one student is using a word processing program. b) The teacher is loading a program in the computer while all students are waiting. c) The teacher is moving his/her chair back to the reading table while all students are independently putting assignments into their folders.

F-5
No Focus/
Unable to Determine

The teacher is in the classroom but is not overtly attending to anyone or anything, or the observer is unable to determine the teacher's focus of attention. Examples: a) The teacher appears to be daydreaming and is staring at the tiles on the floor. b) The teacher is blankly staring out the classroom window. c) The teacher is in the classroom, but the observer is unable to determine the teacher's focus.

F-6
Out of Room

The teacher is physically outside of the classroom with the focus of his/her attention outside of the classroom. Examples: a) The teacher is in the hall talking to the principal regarding a student. b) The teacher has gone to the office to respond to an intercom request. c) The teacher is in the hall talking to a parent.

F-9
Computer Use

At least one person (teacher, student, other, etc.) is interacting with the computer during the observation period. Examples: a) The teacher is using the computer for whole-class science instruction. b) A student is using the computer to do a math drill assignment. c) The aide and a student are using the computer to enter social studies facts into a database program. d) A student is booting a program which s/he is using.

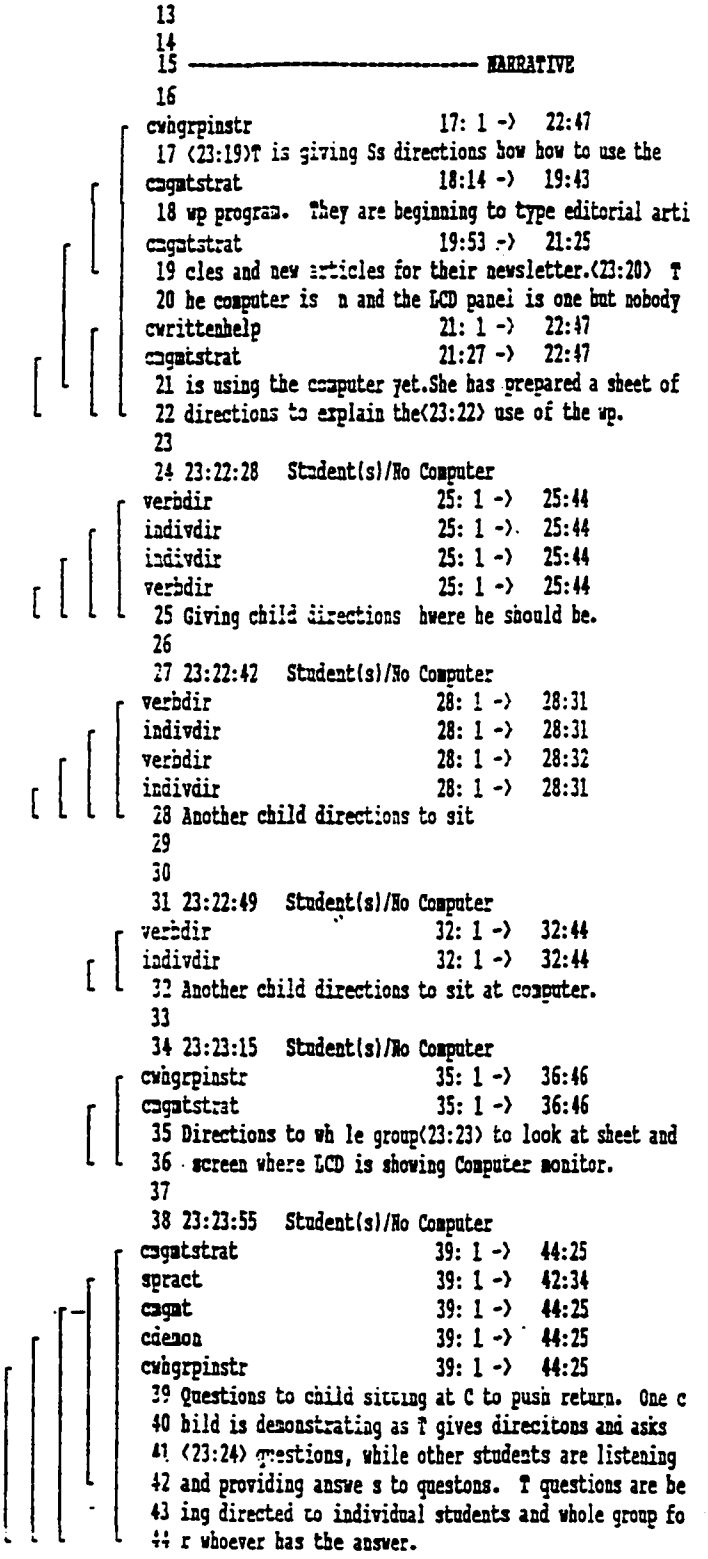
F-10
Computer Nonuse

The computer is not being used. Examples: a) The computer is turned off and no one is interacting with it. b) The computer and monitor are on but no one is

interacting with it. c) The computer and monitor are on and someone is sitting at the comptuer but not interacting with it.

Appendix E

Coded Page From Textbase Alpha Analysis of Observation Field Notes



Appendix F

Entry From Investigator's Journal

1-31-93

I'm reading through Textbase Alpha and have decided to begin to think about categories based on observations (O) and interviews (I). Such categories might be:

O/I Methods of monitoring (auditory, proximate, visual, verbal)

O Kinds of interactions with computer vs noncomputer students such as behavioral corrections, instructional (task related), task management, and social (task-unrelated)

O/I Viewpoints (attitudes) about such topics as management, computer use, students' learning, and students' self-management.

***I'm finding it very difficult to remain a nonparticipant observer, especially in my follow-up phone interviews when I'm talking about some particular thing a teacher does and that teacher asks me what I would do or how s/he could change to be more effective. Since this study does not include an intervention, I know I should not be participating, so I try to tell them we can talk at the end of the study; however, I'm not sure that's ethical (at least for me) to see a problem and not help the teacher deal with it??? If I were to design/do another similar study, I would allow myself the participant-observer role!

BIBLIOGRAPHY

Allen, J. D. (1986). Classroom management: Students' perspectives, goals, and strategies. American Educational Research Journal, 23, 437-459.

Bahr, C. M. (1991). Using computer assisted instruction effectively. In R. Gable (Ed.), Advances in mental retardation and developmental disabilities (Vol. 4, pp. 179-209). London: Jessica Kingsley.

Bahr, C. M., Kenney, S. L., & Hannaford, A. E. (1993). Inservice technology training: Overview of Project ICIP. In D. Carey, R. Carey, D. A. Willis, & J. Willis (Eds.), Technology and education annual (pp. 60-64). Charlottesville, VA: Association for the Advancement of Computing in Education.

Barro, S. M. (1977). An approach to developing accountability measures for public schools. In G. D. Borich (Ed.), The appraisal of teaching concepts and process. Reading, MA: Addison-Wesley.

Bickel, W. E., & Bickel, D. D. (1986). Effective schools, classrooms, and instruction: Implications for special education. Exceptional Children, 52, 489-500.

Bogdan, R. (1972). Participant observation in organizational settings. Syracuse, NY: Stanford University Press.

Borko, H., Cone, R., Russo, N., & Shavelson, R. (1979). Teachers' decision-making. In P. L. Peterson & H. J. Walberg (Eds.), Research on teaching: Concepts, findings, and implications. Berkeley, CA: McCutchan.

Bossert, S. T. (1979). Tasks and social relationships in classrooms. New York: Cambridge University Press.

Brophy, J. (1979). Teacher behavior and its effects. Journal of Educational Psychology, 71, 733-750.

Brophy, J. (1983). Classroom organization and management. Elementary School Journal, 83, 265-285.

Brophy, J. (1986). Teacher influences on student achievement. American Psychologist, 41, 1069-1077.

Carlberg, C., & Kavale, K. (1980). The efficacy of special versus regular class placement for exceptional children: A meta-analysis. Journal of Special Education, 14, 295-309.

Carleer, G. J., & Doornekamp, B. G. (1990, March). A teacher-centered implementation strategy for computer integration. Paper presented at the Seventh International Conference on Technology and Education, Brussels, Belgium. (ERIC Document Reproduction Service No. ED 325 085)

Cazden, C. (1986). Classroom discourse. In M. C. Wittrock (Ed.), Handbook of research on teaching (3rd. ed., pp. 432-463). New York: Macmillan.

Cheney, C. O. (1989, April). Preventive discipline through effective classroom management. Paper presented at the Preconvention Training Program of the 67th annual convention of the Council for Exceptional Children, San Francisco, CA.

Christenson, S. L., Ysseldyke, J. E., & Thurlow, M. L. (1989). Critical instructional factors for students with mild handicaps: An integrative review. Remedial and Special Education, 10(5), 21-31.

Clark, R. E. (1983). Reconsidering research on learning from media. Review of Educational Research, 53, 445-459.

Coleman, J.S. (1966). Equality of educational opportunity. Washington, DC: Office of Education.

Collis, B. (1988, July). Manipulating critical variables: A framework for improving the impact of computers in the school environment. Paper presented at the meeting of EURIT '88, Lausanne, Switzerland. (ERIC Document Reproduction Service No. ED 310 741)

Cosden, M. A. (1988). Microcomputer instruction and perceptions of effectiveness by special and regular education elementary school teachers. Journal of Special Education, 22, 243-253.

Cosden, M. A., & Abernathy, T. (1990). Microcomputer use in the schools: Teacher roles and instructional options. Remedial and Special Education, 11(5), 31-38.

Cosden, M. A., Gerber, M. M., Semmel, D. S., Goldman, S. R., & Semmel, M. I. (1987). Microcomputer use with microeducational environments. Exceptional Children, 53, 399-409.

Crabtree, B. F., & Miller, W. L. (Eds.). (1992). Doing qualitative research. Newbury Park, CA: Sage.

Cuban, L. (1985). Teachers and machines: The classroom use of technology since 1970. New York: Teachers College Press.

Doyle, W. (1978). Are students behaving worse than they used to behave? Journal of Research and Development in Education, 2(4), 3-16.

Doyle, W. (1980). Classroom management. West Lafayette, IN: Kappa Delta Phi.

Doyle, W. (1986). Classroom organization and management. In M. Wittrock (Ed.), Handbook of Research on Teaching (3rd ed., pp. 392-427). New York: Macmillan.

Dwyer, D. C., Ringstaff, C., & Sandholtz, J. (1990, April). The evolution of teachers' instructional beliefs and practices in high-access-to-technology classrooms. Paper presented at the 1990 meeting of the American Education Research Association, Boston, MA. (ERIC Document Reproduction Service No. ED 310 741)

The Education for All Handicapped Children Act of 1975, 20 U.S.C.A., § 1401 (1976).

Emmer, E., Evertson, C., & Anderson, L. (1980). Effective management at the beginning of the school year. Elementary School Journal, 80, 219-231.

Englert, C. S. (1984). Measuring teacher effectiveness from the teachers' point of view. Focus on Exceptional Children, 17(2), 1-14.

Evertson, C. M., & Bury, J. (1988). Capturing classroom context: The observation system as a lens for assessment. Paper presented at the annual meeting of American Educational Research Association, New Orleans, LA. (ERIC Document Reproduction Service No. ED 298 109)

Evertson, C. M., & Emmer, E. T. (1982). Effective management at the beginning of the school year in junior high classes. Journal of Educational Psychology, 72, 485-498.

Evertson, C. M., & Green, J. L. (1986). Observation as inquiry and method. In M. C. Wittrock (Ed.), Handbook of research on teaching (3rd ed., pp. 162-213). New York: Macmillan.

Fetterman, D. M. (1988). Qualitative approaches to evaluating education. Educational Researcher, 17(8), 17-23.

Fish, M. C., & Feldman, S. C. (1987). Teacher and student verbal behavior in microcomputer classes: An observational study. Journal of Classroom Interaction, 23(1), 15-21.

Fish, M. C., & Feldman, S. C. (1988). An observational study of teacher and student behavior under varied software conditions in microcomputer classes. Journal of Classroom Interaction, 24(2), 15-21.

Fisher, C. W. (1989). Student empowerment: The influence of high computer access on student empowerment (ACOT Report #1).

Cupertino, CA: Apple Computer, Inc. (ERIC Document Reproduction Service No. ED 316 199)

Fogart, J. L., Wang, M. C., & Creek, R. (1983). A descriptive study of experienced and novice teachers' interactive instructional thoughts and actions. Journal of Educational Research, 77, 22-32.

Foliart, H. H., & Lemlech, J. K. (1989). Factors affecting use of computers in elementary classrooms: Implications for preservice and inservice education. Presented at annual meeting of American Educational Research Association, San Francisco, CA. (ERIC Document Reproduction Service No. ED 319 356)

Gall, M. D. (1977). The importance of context variables in research on teaching skills. Journal of Teacher Education, 28(3), 43-48.

Geertz, C. (1973). Thick description: Toward an interpretive theory of culture. In C. Geertz (Ed.), The interpretation of cultures (pp. 3-30). New York: Basic Books.

Glaser, B. G. (1978). Theoretical sensitivity. Mill Valley, CA: Sociology Press.

Glaser, B. G., & Strauss, A. L. (1967). The discovery of grounded theory: Strategies for qualitative research. Hawthorne, NY: Aldine.

Good, T. L. (1979). Teacher effectiveness in the elementary school. Journal of Teacher Education, 30(2), 52-64.

Good, T. L. (1983). Classroom research: A decade of progress. Educational Psychologist, 18, 127-144.

Good, T. L., & Brophy, J. (1994). Looking in classrooms (6th ed.). New York: Harper and Row.

Guba, E. G. (1978). Toward a methodology of naturalistic inquiry in educational evaluation (CSE monograph series in evaluation, No. 8). Los Angeles, CA: University of California at Los Angeles, Center for the Study of Evaluation.

Guba, E. G. (1981). Criteria for assessing the trustworthiness of naturalistic inquiry. Educational Communication and Technology Journal, 29, 75-91.

Gump, P. V. (1967). Intra-setting analysis: The third grade classroom as a special but instructive case. In E. Williams & H. Rausch (Eds.), Naturalistic viewpoints in psychological research (pp.). New York: Holt, Rinehart and Winston.

Hanley, T. (1984). CAI in special education: Research directions. Peabody Journal of Education, 62(1), 22-38.

Hargreaves, D. H., Hester, S. K., & Mellor, F. J. (1975). Deviance in classrooms. Boston: Routledge and Kegan Paul.

Haus, G. (1989). A data collection and analysis program for use in qualitative and quantitative research: Technical report 301 (Project UPWARD: USDE Grant G008730208). Nashville, TN: Vanderbilt University, George Peabody College.

Johnson, L. V., & Bany, M. A. (1970). Classroom management: Theory and skill training. New York: Macmillan.

Jones, R. A. (1985). Research methods in the social and behavioral sciences. Sunderland, MA: Sinauer Associates.

Jorgensen, D. L. (1989). Participant observation: A methodology of human studies. Newberry Park, CA: Sage.

Kearsley, G. (1993, Spring-Summer). Educational technology: Does it work? ED-TECH Review, pp. 34-36.

Kounin, J. S. (1970). Discipline and group management in classrooms. New York: Holt, Rinehart and Winston.

Krathwohl, D. R. (1993). Methods of educational and social research. White Plains, NY: Longman.

Kulik, J. A., Kulik, C. C., & Bangert-Drowns. (1985). Effectiveness of computer-based education in elementary schools. Computers in Human Behavior, 1, 59-74.

Leinhardt, G., & Pallay, A. (1982). Restrictive educational settings: Exile or haven. Review of Educational Research, 52, 557-578.

Lincoln, Y. S., & Guba, E. G. (1985). Naturalistic inquiry. Beverly Hills, CA: Sage.

MacArthur, C. A., Haynes, J. A., & Malouf, D. B. (1986). Learning disabled students' engaged time and classroom interaction: The impact of computer assisted instruction. Journal of Educational Computing Research, 2(2), 189-198.

McKay, A. (1977). The Alberta studies of teaching: A quinquereme in search of some sailors. CSSE News, 3, 14-17.

Missouri Technology Center for Special Education. (1989). The one-computer classroom. Enable: Technology for Empowering Special Education, 7, 1-3.

Moore, P. R. (1990). Integrating microcomputers into special education classrooms: Analyses of changes in teacher and student behaviors, and the classroom instructional program (Doctoral dissertation,

Vanderbilt University, 1990). Dissertation Abstracts International, 52, 1993A.

Morine-Dershimmer, G. (1978-79). Planning in classroom reality: An indepth look. Educational Research Quarterly, 3, 83-99.

Newman, D. (1990). Opportunities for research on the organizational impact of school computers. Educational Researcher, 19(3), 8-13.

Niederhauser, D. S., & Stoddart, T. (1993). Integrating technology with elementary mathematics: Effects of training and support. Journal of Technology and Teacher Education, 1(1), 25-32.

Panyon, M. V., Hummel, J., & Jackson, L. B. (1988). The integration of technology in the curriculum. Journal of Special Education Technology, 9(2), 109-119.

Patton, M. Q. (1990). Qualitative evaluation and research methods. Newberry Park, CA: Sage.

Peterson, P. L., & Clark, C. M. (1978). Teacher planning, teacher behavior, and student achievement. Unpublished manuscript, University of Wisconsin, School of Education.

Phillips, W. R. (1983). How to manage effectively with twenty-five students and one computer. Computing Teacher, 10, 32.

Reid, O. R. (1992). Computer management strategies for text data. In B. F. Crabtree & W. L. Miller (Eds.), Doing qualitative research. Newberry Park, CA: Sage.

Reinharz, S. (1979). On becoming a social scientist. San Francisco, CA: Jossey-Bass.

Rieth, H., Bahr, C., Polsgrove, L., Okolo, C., & Eckert, R. (1987). An analysis of the impact of microcomputers on the secondary special education classroom ecology. Journal of Educational Computing Research, 4, 36-47.

Sandholtz, J. H., Ringstaff, C., & Dwyer, D. C. (1990, April). Teaching in high-tech environments: Classroom management revisited. Paper presented at the meeting of the American Education Research Association, Boston, MA. (ERIC Document Reproduction Service No. ED 327 172)

Scriven, M. (1971). Objectivity and subjectivity in educational research. In L. G. Thomas (Ed.), Philosophical redirection of the National Society for the Study of Educational Research (71st Yearbook of the National Society for the Study of Education, Part 1). Chicago: University of Chicago Press.

Shavelson, R. J. (1983). Review of research on teachers' pedagogical judgments, plans, and decisions. Elementary School Journal, 83, 392-413.

Shavelson, R. J., & Stern, P. (1981). Research on teachers' pedagogical judgments, decisions, and behavior. Review of Educational Research, 51, 455-498.

Sheingold, K. (1981). Study of issues related to the implementation of computer technology in schools (Final Report). New York: Bank Street College of Education, Center for Children and Technology.

Sheingold, K. (1991). Restructuring for learning with technology: The potential for synergy. Phi Delta Kappan, 73, 17-27.

Sheingold, K., & Hadley, M. (1990). Accomplished teachers: Integrating computers into classroom practice. New York: Bank Street College of Education, Center for Technology in Education.

Shrock, S., Matthias, M., Vensel, C., & Anastasoff, J. (1985, April). Microcomputers and peer interaction: A naturalistic study of an elementary classroom. Paper presented at the meeting of the American Educational Research Association Conference, Chicago, IL.

Shulman, J. H. (1992). Case methods in teacher education. New York: Teachers College Press.

Shulman, L. S. (1987). Those who understand: Knowledge growth in teaching. Educational Researcher, 15(2), 4-14.

Slavin, R. E. (1984). Research methods in education: A practical guide. Englewood Cliffs, NJ: Prentice-Hall.

Smith, N. L. (Ed.). (1988). Dimensions of moral and ethical problems of evaluation: Paper and Report Series No. 92 (Research on Evaluation Program). Portland, OR: Northwest Regional Educational Laboratory.

Stake, R. E. (1978). The case-study method in social inquiry. Educational Researcher, 7, 5-8.

Stake, R. E. (1988). Case study methods in educational research: Seeking sweet water. In R. M. Jaeger (Ed.), Complementary methods for research in education. Washington, DC: AERA.

Strauss, A. L. (1987). Qualitative analysis for social scientists. Cambridge, UK: Cambridge University Press.

Strauss, A. L., & Corbin, J. (1991). Basics of qualitative research: Grounded theory procedures and techniques. London: Sage.

Tesch, R. (1989). Introductory guide to Textbase Alpha. Desert Hot Springs, CA: Qualitative Research Management.

Torgerson, S. (1983-84). Classroom management for Logo. Computing Teacher, 11, 12-14.

U.S. Congress Office of Technology Assessment. (1988). Power on! New tools for teaching and learning (OTA Publication No. 052-003-01125-5). Washington, DC: U.S. Government Printing Office.

Webb, E. J., Campbell, D. T., Schwartz, R., & Sechrest, L. (1966). Unobtrusive measures: Nonreactive research in the social sciences. Chicago: Rand McNally.

Winkler, J. D., Shavelson, R. J., Stasz, C., & Robyn, A. E. (1985). Pedagogically sound use of microcomputers in classroom instruction. Journal of Educational Computing Research, 1, 285-293.

Wiske, M. S., & Zodhiates, P. (1988). How technology affects teaching. Cambridge, MA: Harvard Graduate School of Education, Educational Technology Center. (ERIC Document Reproduction Service No. ED 296 706)

Woodward, J., Carnine, D., Gersten, R., Gleason, M., Johnson, G., & Collins, M. (1986). Applying instructional design principles to CAI for mildly handicapped students: Four recently conducted studies. Journal of Special Education Technology, 8(1), 13-26.

Yin, R. K. (1989). Case study research: Design and methods (2nd ed.). Newbury Park, CA: Sage.