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NO. 3848

HOW COMPUTER USE FUNCTIONS AS AN ASPECT OF LITERACY  
DEVELOPMENT: A QUALITATIVE DESCRIPTION  
OF A SECOND-GRADE CLASSROOM

DISSERTATION

Presented to the Graduate Council of the  
University of North Texas in Partial  
Fulfillment of the Requirements

For the Degree of

DOCTOR OF PHILOSOPHY

By

Joyce L. Kostelnik, B.S., M.Ed.

Denton, Texas

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Kostelnik, Joyce L., How Computer Use Functions as an Aspect of Literacy Development: A Qualitative Description of a Second-Grade Classroom. Doctor of Philosophy (Reading), December, 1993, 204 pp., bibliography, 109 titles.

In this study, the researcher investigated how computer use functions as an aspect of literacy development within a second-grade classroom. The researcher sought to gather data to help define the role that computer use plays in the literacy development of elementary school students by concentrating on how computers are actually used in the classroom being studied, and by looking for relationships revealed by students' and teacher's beliefs about computer use in the classroom.

Data collection for this study involved the use of grounded theory methodology and the techniques of participant observation, interviews, and document analysis to develop theory about the relationship between computer use and overall literacy development.

Participants in the study were 18 second-grade students enrolled in a second-grade classroom in an elementary school in a suburban district in north central Texas. These students and their teacher were selected for this study

because their classroom had been identified by the school district as one in which computers were used daily.

The results of the study showed that a wide variety of literacy behaviors could be identified occurring in the school setting. Findings arose which indicated that the students' beliefs about literacy and computer use had direct consequences on their literacy development. Additional findings suggested that the teacher's beliefs about literacy and about computer use directly impacted students' literacy development through computer use. Students were found to use different terminology from the teacher when referring to the use of computers. Students referred to computer use as "playing," while the teacher called it "working."

The primary findings of this research suggested that computers were found to function as a language tool when they were used in connection with reading and writing activities. The results of this study further indicated that computer use in the classroom functioned as an element of the overall literacy development of the students, regardless of the overt curricular purposes for the computer use, as long as students interacted with text in some manner, either by reading or writing.

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## ACKNOWLEDGEMENTS

This study could not have been done without the cooperation and unfailing goodwill of the second-grade teacher, Miss D'Anne Downe, who became Mrs. Jordan during this study to the great delight of her students. Her willingness to open her classroom to a stranger and share her private thoughts will always be deeply appreciated. Those who contributed the most--the second-grade students--cannot be acknowledged directly in order to maintain confidentiality. However, their openness and acceptance of this researcher, their smiles and hugs, and their total honesty and candor will always be cherished. I trust this study does justice to the enthusiasm and zest which permeates their young lives. I wish them each a long and fulfilling life.

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## CHAPTER 1

### INTRODUCTION

We live in an Age of Information. The amount of knowledge available to mankind continues to increase with dizzying speed. With the advent and proliferation of computers, society has acquired a tremendous tool to store, sort, and retrieve this information; otherwise all of humanity might have long since been buried in paper. Since the appearance of the earliest, prototype computers in 1946 (Bitter, 1989), the use and impact of computers in our daily lives has grown exponentially. This impact has been seen in the educational forum as well as the business world.

Just as the business world has embraced the computer as a valued and necessary tool in today's marketplace, educators are using computers and related technology in schools. This use has grown, predicated on the assumption that it will make a positive impact on the educational process. However, it continues to be difficult to measure, or even anticipate, all the ways in which computers are causing change in the educational realm. As Bullough and Beatty (1991) point out, "Whether or not computers will have any significant long-term impact on teaching and learning is a subject for speculation among practitioners and laymen

alike" (p. 1). They base this contention on the fact that the length of time that computers have been used in schools is so short. With some notable exceptions of earlier uses, most educational use of computers can only be traced as far back as the late 1970s (Bullough & Beatty, 1991).

When the changes in computer technology reached the point of developing microcomputers which could be produced at a relatively low cost, computers began to proliferate in schools as they had previously grown in importance in business. Early educational computer users saw Computer-Aided Instruction (CAI) as a wise use of computers in educational settings. Advocates proclaimed the virtues of having a "teacher" that would not get irritated at repetition, would not forget steps, but could effortlessly maintain a numerical record of problems or questions encountered (Lockard, Abrams, & Many, 1987).

Often the software that was produced for these early uses of computers in schools was step-by-step, sequential presentations of drill and practice. Primarily this type of software has been used in laboratory settings where there was a focus on the traditional approach to learning. The traditional approach to learning has an emphasis on product rather than on process. This product approach concentrates on subskills, whether the subject matter is mathematics, science facts, or language arts components such as spelling,

punctuation, or basic language skills (Lockard, et al., 1987).

The whole language movement contributed substantially to changing the way that teachers were looking at their profession. This philosophy holds that the development of reading and writing is a part of a continuum of language learning, not the result of learning a sequential set of subskills (Goodman, 1986). As the philosophical focus of educators began to change, there was also a change in the way teachers looked at the materials they were being given to use in their instruction.

Teachers began to demonstrate a growing reluctance to use computers. Some remembered the lack of success with the so-called teaching machines from the sixties. Others recognized that the computer programs worked and looked very much like the workbooks they were trying to get away from (Whitaker, Schwartz, & Vockell, 1989). "These educators [wanted] students to be involved with authentic reading, writing, listening, and speaking activities . . ." (Burns, Roe, & Ross, 1992). In order to be included in holistic classrooms, computer activities needed to reflect this child-centered philosophy and mirror the emphasis on guiding the processes of listening, speaking, as well as reading and writing, within the context of authentic literacy activities.

Even teachers who structure their classrooms by integrating subject matter throughout the curriculum, and who work at providing a variety of real-life reading and writing activities for their students, may be unaware of the amount of reading that their students are doing as they face text on a computer screen. Reading and writing activities--those computer programs which are purported to help teach reading and writing skills--abound, but students are actually interacting with print every time they work with a computer, regardless of the computer program or the subject focus. The reading and writing that students do with computers in order to create stories or write letters with word processing programs is only part of the reading, and therefore literacy, that is occurring in the context of computer use.

#### Beginnings

This study was devised as a logical next step in a long-term interest of mine concerning computer use in school. During the 1980s, as a classroom teacher, I began to incorporate computer activities in my class for high school remedial readers. The interest that the computers provoked in previously reluctant learners helped to galvanize my growing interest as I learned to use a computer in various new ways in my personal life.

As I became a more proficient computer user myself, I became more of an advocate for using computer activities for their educational value within the regular classroom. I felt a reluctance to join the growing movement promoting computer laboratories because I felt that this separation from front-line teachers (particularly those like myself who had been disinclined to use a computer themselves) would further delay the integration of the technology in the regular curriculum.

I began to see that the way the computer was being used in my classroom was having a far-reaching effect on my students. As a result of a disinterested administration and a non-existent budget, I brought an old, slow, personal computer of my own from home to use in my classroom. I used several software programs that required reading on the computer screen to encourage my remedial readers to do more kinds of interaction with print. I had one early, and by today's standards very primitive, interactive adventure game. This type of game displays simple graphics and allows the player to enter simple statements such as "Pick up rock" or "Open door" to advance the protagonist (the player) through the stages of a fantasy story being told. I was amazed to see students who were virtual non-readers work diligently helping one another read the screen so they could solve a puzzle and advance in the game. A tremendous amount of reading was occurring, and it seemed to be because of the

computer. The literacy development of those students was getting an unexpected boost.

I have been interested primarily in two areas, literacy development and educational technology, throughout my graduate studies. I did two pilot studies looking at computer use in elementary school classrooms. My primary concern at that time was to find out (a) if children at the third grade level could learn to use a database, and (b) if they would use a simple database to maintain information about books they read if such a program were made available to them. With those ideas in mind, I helped design a simple database program for assembling book review information. This program was presented to a class of third grade students. They were given minimal instruction on the use of the computer and the database. My attention was centered on whether any students would be interested in learning to use the technology, what they would write when they entered book reviews in the database, and which students would actually use the database to any degree. The original questions of "Could they use a database?" and "Would they use this particular database?" were answered in a strong affirmative. Having these queries answered raised several others.

During each of the two studies, I donated a copy of "Where In The World Is Carmen Sandiego?," a popular piece of computer software, as a gift for the classroom. I began to notice how the use of this software was having an impact on

the other reading and writing that students were doing. It appeared that the incidental use of computer software which required interaction with print on the screen was having an effect on the reading and writing development in the classroom. This coincided with my earlier experience with my remedial students. I decided to pursue a dissertation which would look at this more closely.

#### Purpose of the Study

This study describes the nature of computer use in the everyday curriculum of an elementary school classroom in order to characterize how using a computer affects the reading and writing of the students and how the students' computer use functions as an element of their literacy development. There was no attempt to demonstrate evidence of change in the literacy development of the students over time; rather, a narrative description of "what is," was developed by focusing on a specific classroom in which computer use played a part in the ongoing educational fabric.

#### Statement of the Problem

The problem investigated was, "How does computer use function as an aspect of literacy development in the elementary classroom?" How does one teacher use the computer in the day-to-day curriculum? How is that computer

use connected to the reading and writing development of the students?

#### Research Questions

The following general question provided structure to the beginning stages of this qualitative research study: When considering an elementary classroom in which computer use is being incorporated across the daily curriculum, how does that computer use function as an aspect of the students' literacy development?

The following questions were developed to help gather information in order to respond appropriately to the main question and to help define the role that computer use plays in the literacy development of elementary school students:

1. In what ways are computers used in the elementary classroom under study, and how is this computer use related to literacy development?
2. What relationships between computer use and literacy development are revealed by students' views of the computer use in the classroom?
3. What relationships between computer use and literacy development are revealed by the teacher's view of the computer use in the classroom?

Implicit in these questions are a number of assumptions. The term literacy development is limited by referring primarily to the initial acquisition and the



subsequent maturation of reading and writing proficiency. A "literacy event" is identified as each distinct occasion in which a student has the opportunity to interact with print in some way. Every time a student uses a computer screen, there is print on the screen which must be read. For the computer to be involved in a literacy event, it must actually be used. Therefore, it was assumed that the teacher and students in fact used the computers in the classroom periodically throughout the school day, and that this use required some interaction with print on the computer screen.

#### Significance of the Study

Computers are becoming as ubiquitous in schools as chalk and chalkboards of the past. In spite of the noticeable increase in the presence of computers in classrooms and laboratory settings, most studies of computers continue to focus on how computers are used to present curricular material and to what degree this presentation is successful. A number of studies have looked at the impact of computers on literacy by looking at how computers are being used as word processors (Collier, 1983; Harris, 1985; Withey, 1983), while other studies have attempted to identify the "best" way to use CAI (Ellis & Sabornie, 1986; Fitzgerald, Fick, & Milich, 1986; Grabe,

1984; Jacobs, 1985; Johnson & Johnson, 1985; Long, 1985; Mevarech, Stern, & Levita, 1987; Pogrow, 1987).

Research on computer use in elementary schools which looked at elements of language arts development often concentrated on presenting segmented information in a regimented manner (Atkinson & Hansen, 1966; Balajthy, 1987a; Carver & Hoffman, 1981) and on using the computer to manage this information. Later researchers began to question the advisability of continuing this "traditional" drill approach (Balajthy, 1988; Clark, 1983; Colorado, 1988) or criticized the use of computers (Heppner, Anderson, Farstrup, & Weiderman, 1985; Kemp, 1987; Leonardi & McDonald, 1986). Other researchers attempted to identify uses for the computer in language arts in ways that coincided with the changing views of teaching and learning (Blanchard & Mason, 1985; Blanchard & Rottenberg, 1990; Dudley-Marling, 1985).

There is a paucity of research looking for an overall effect of adding computer activities to the curriculum. Further, there is a shortage of research looking at how the process of using a computer might effect the reading and writing development of elementary school students. The vast majority of research done in this area concentrates on how a computer can be used to teach students to read or write.

This study gives an in-depth view of the workings of a specific classroom and describes how using the computer affects the learning in that classroom. It adds to the body

of knowledge concerning reading and writing and how these language functions may be enhanced or affected by the presence and use of computers in the classroom.

This study provides subsequent researchers with an understanding of how computer use in a particular elementary classroom has affected the developing literacy of students in that classroom. It provides a basis for additional studies which might look at ways to encourage teachers who have been reluctant to incorporate computer use in their daily curriculum. The study provides a narrative description of one particular classroom, and focuses on computer use by students in that classroom.

#### Definition of Terms

The following terms are defined for the study:

1. Qualitative Research. A descriptive type of research which typically uses the natural setting as a source of information and the researcher as the key instrument of research, using words to describe rather than numbers to measure. Data is displayed primarily in narrative text (Bogdan & Biklen, 1982; Glesne & Peshkin, 1992).

2. Key Informants. Those individuals who are insiders in the setting being studied and who can provide the researcher with greater insight about the experiences taking place (Dobbert, 1982).

3. Triangulation of Data. The effort to collect and compare data by using multiple sources and modes of evidence in a study (Miles & Huberman, 1984).

4. Participant Observer. A researcher who (a) enters and occupies a place in the community being studied, (b) develops rapport with the individuals being observed, and (c) systematically gathers information about the situation being investigated (Spradley, 1980).

5. Grounded Theory. Evolves as raw data is gathered and analyzed. This requires an ongoing process of analyzing as new data is added and as patterns emerge. The researcher's questions become refined and new questions may be generated during the research rather than starting with explicitly-stated questions which a researcher attempts to prove or disprove (Glaser & Strauss, 1967).

6. Literacy. The ability to "communicate through reading and writing. It requires the acquisition of reading and writing skills and the ability to apply those skills in interactions with others in a variety of contexts" (Searfoss & Readence, 1989, p. 6). It is the "process of making meaning and negotiating it with others" (Brown, 1991).

7. Literacy Development. The process children go through as they acquire language in all its forms; listening, speaking, reading, and writing. It is the process by which they continually monitor and enhance their understanding and ability to manipulate language (Fields,

Spangler, & Lee 1991). For the purpose of this study, the term literacy development is limited by referring primarily to the initial acquisition and the subsequent maturation of reading and writing proficiency.

8. Literacy Event. A literacy event is identified as each distinct occasion in which a student has the opportunity to interact with print in some way.

9. Coding. The systematic assignment of descriptive labels to segments of the field note narrative text. This is a progressive and repetitive process. Codes begin as broad descriptive categories and are revised as themes and patterns begin to emerge from the data. Assigning codes to segments of text helps to reduce the data into more manageable chunks, to direct the researcher in subsequent observations, and to guide the process of analyzing the data (Miles & Huberman, 1984).

#### Limitations

The researcher was a participant observer in one classroom; therefore, the study provides a description of computer use and its relationship to literacy development in only that classroom. There was no intent to offer this classroom as a representative sample of all second-grade classrooms; the intent of the study was to present information about a classroom in which the teacher professed to be a proponent of computer use in the classroom and who

claimed to have a classroom in which computer use was frequent and customary.

Participant observation brings its own hazards to the research process. Due to the nature of this participation, the researcher may have inadvertently affected the behavior which was being observed. A participant observer may overlook or misinterpret data. In order to use oneself as a research instrument, the researcher must be aware of the dual perspective of being both an insider and an outsider (Spradley, 1980). It is incumbent upon the researcher to make every effort to reduce any possible effect.

By the nature of participant observation, a stranger is introduced into the dynamics of a classroom. This presence was intended to cause no change or disruption in the normal flow of the classroom. A researcher who is a participant observer attempts to fade into the woodwork by being purposefully unobtrusive (Bogdan & Biklen, 1982). Because the observer was the primary instrument of research, there was the ever-present possibility of bias. The researcher scrupulously attempted to minimize this effect. "The reflective part of field notes is one way of attempting to acknowledge and control observer's effect" (Bogdan & Biklen, 1982, pp. 88-89).

A qualitative study of this nature does not lend itself to generalizations to other settings. It presents findings rather than judgments.

### Assumptions

It was assumed that teacher(s) and students felt comfortable enough with the researcher to give honest answers when being interviewed. It was additionally assumed that no unusual external conditions existed which adversely affected the results of this study.

### Procedures for Collection of Data

#### The Participants

The participants in this study were the teacher and the 18 students in one second-grade classroom in a suburban school district which allowed and encouraged computer use in the classroom. The students in the classroom under study are referred to as participants or informants, with those students who supplied the most critical information being referred to as key informants. Students are identified by pseudonyms only.

#### Research Design

The research project was developed as a naturalistic study following the qualitative paradigm. Grounded theory methodology was used to help develop theory about how computer use functioned as an element of literacy development in an elementary classroom. The qualitative approach to research is often associated with multitudinous, perplexing, and overlapping terms, such as naturalistic, subjective, postpositivistic, ethnographic, hermeneutics,

qualitative, or phenomenological (Lincoln & Guba, 1985). Part of this confusion lies in the circumstance of this research paradigm having developed in several different disciplines, anthropology and sociology being two of the most significant. Even among the different specialties, some of the words take on different meanings.

In order to simplify, and for the purpose of reporting information from this study, the terms "qualitative," "naturalistic," and "grounded theory" are used interchangeably to mean research in which a participant observer enters a site to be studied and the field notes produced by this participant observer serve as the primary source of information, and codes to identify patterns and themes are developed concurrently with data collection. This research project had one second-grade classroom as the primary context and the 18 second-grade students and their homeroom teacher as the primary participants.

#### Data Collection

Data collection for this study involved the use of grounded theory methodology. The techniques of participant observation, interviews, and document analysis were used to develop theory about how computer use in an elementary classroom functions as an aspect of the overall literacy development of students in one second-grade classroom.

The primary source of information was the observation notes, generally referred to as field notes, taken by the



researcher while present during normal classroom activities. These observational notes were supplemented by reflective notes including personal, emotional, or evaluative notations and additional information about events added to more fully explain what occurred. These reflective notes were made by the researcher after each day's observation and became part of the written field note record.

In addition, student writing samples were collected by the researcher in order to gather information about the types of things that students typically created on the computer. Other documents, such as copies of classroom assignments prepared on computer by the teacher, drawings made by students to accompany their writing, and notices sent by the school administration to parents were also collected and analyzed.

### Data Analysis

The data in this study were analyzed in an ongoing fashion according to the tenets of grounded theory. Codes or labels were developed and were assigned to segments of the narrative text of the ever-growing collection of field notes. These codes were used to reduce the data into more manageable thematic chunks. Other codes emerged from the data as new patterns and themes became apparent. This follows the inductive development of codes or topics as explained by Glaser (1978). This helps the analyst of such data to remain context-sensitive (Miles & Huberman, 1984).

The first general topics identified were related directly to the research questions developed prior to the commencement of the study. These coding topics were general in nature and served as a framework from which further analysis proceeded. The first coding labels were COMUSE (for any use of computers by either students or teacher), STUVIEW (for statements or actions which reflected a student view about computers or computer use), and TCHVIEW (for statements or actions which reflected the teacher's view about computers or computer use).

During the early stages of data collection, these general codes helped keep the researcher focused on what type of information to include as observational notes and served as a first-level data reduction mechanism. Further themes, topics, and motifs were generated from within the data each time the raw data was reread and recoded (Glaser, 1978). A summary sheet was prepared at the end of each week of observation to establish the elements being observed, to identify early patterns and motifs as they began to emerge, and to help focus subsequent observations. This series of weekly summary sheets was also reviewed each time the field notes were reviewed by the researcher. This summary sheet method was used to help reduce the data into more manageable form and incorporated the following questions adapted from Miles and Huberman (1984, p. 50):

1. What people, events, or situations were involved in this week's observations?
2. What were the main themes or issues this week?
3. What new predictions about the field situation were suggested by this week's observations?
4. What should the focus be for the next week's observations?

Reading and rereading the previous field notes during each weekend prior to the next week of observation helped the researcher develop new categories or coding labels for the behaviors being observed, as well as develop possible interpretation and explanations. The data were continually under scrutiny.

Transcriptions of observations and interviews were made after each observation. The field notes were then read and summarized and the summaries scrutinized for patterns of behavior or topics of discussion. As categories and patterns were found, they were compared with data from the various sources. Miles and Huberman (1984) refer to this procedure of constantly comparing information from different data sources as indefinite triangulation.

To achieve consistency of analysis, field notes were coded immediately after the observation event and again at a later time. This code-recode procedure helped establish internal reliability. Several sections of the field notes were coded by individuals working separately from the

researcher in an effort to verify the clarity of the coding labels. These different methods of double coding were used to provide internal consistency (Miles & Huberman, 1984).

#### Summary

This chapter has described the origins of this research project and the developments that led to its inception. A qualitative research approach using grounded theory was selected as the most appropriate methodology, because answering the primary question of how computer use functions as an aspect of literacy development directed attention to generating new insights pertaining to classrooms where computers were used. The chapter also introduced the participants and site and described the procedures for the collection and subsequent analysis of data.

## CHAPTER 2

### REVIEW OF RELATED LITERATURE

This review summarizes the research on computer use in educational settings, the teaching of reading and writing using computers, and the theories concerning the relationship between reading and writing. This chapter is divided into three sections: (a) history of computer use in education, (b) computer use for reading and writing, and (c) the reading/writing connection.

#### History of Computer Use in Education

##### Development of Computer Hardware

In the overall scheme of human endeavor, the advent of the computer is a very recent phenomenon. The reason that many adults today can easily remember a time when computers were not a part of their everyday world is that computers only came into existence during the waning days of World War II. The first machine recognized as a computer in the modern sense was the ENIAC (Electronic Numerical Integrator and Computer). It was developed at the University of Pennsylvania as a military device to calculate weapons firings (Bitter, 1989). The early mainframe computers operated with electrical switches and connections. They were enormous in size, consisting of massive collections of

vacuum tubes and wires. As Bitter (1989) noted, "These tubes created tremendous heat and the system required large amounts of electricity. However, the machine did work fast, performing up to 5,000 additions in one second" (p. 31).

Technological advances allowed the movement from the early main frame computers to microcomputers to proceed at a rapid pace. These advances are often identified as the four generations of technology. The first generation of computers used vacuum tubes, the second generation operated with transistors, the third generation was redesigned to use integrated circuits, and the fourth generation was based on microelectronics, or having multiple integrated circuits on a single computer chip (Lockard, Abrams, & Many, 1987). The term "fifth generation" is sometimes used to refer to the proliferation of microcomputers, in addition to the continuing pursuit of the development of thinking machines, or artificial intelligence (Bitter, 1989).

The microcomputer, also known as the personal computer or PC, began to be produced in smaller, more compact sizes. Costs started to go down rapidly. The tiny silicon computer chips began to be produced en masse as an entire industry emerged to supply the growing demand for the product. Availability and lower cost brought this technology within the reach of school districts and individual purchasers.

Hardware changes have been incredibly fast. Even the strongest advocates for microcomputers fell far short when

predicting the increases that would be forthcoming in computing power available. In 1985, Savitsky speculated that all the early machines with 4K to 20K memory would probably be replaced with machines having a much larger capacity, and he ventured a prediction for a memory standard in the heady area of 512K (p. 45). In fact, now the standard configurations are far larger.

#### Early Educational Uses of Computers

The earliest educational uses for computers started before the development of mass-produced microcomputers. In 1959, a computer system called PLATO was developed for educational purposes at the University of Illinois under the direction of Donald L. Bitzer. PLATO was the first use of what would become known as CAI, Computer-Assisted Instruction. This system, based on the mainframe computer, set the stage for further educational developments. Despite its initial complexity and extreme cost, PLATO proved to be very useful (Marsh, 1983).

Even though significant achievements were attributed to the use of PLATO, many criticisms were leveled against it. Primarily, critics charged that the software was developed without a clear theoretical framework about the nature of learning. The presentation of material was based on an instructional model known as programmed instruction which is no longer a primary teaching methodology. Also, there were complaints that the PLATO software varied in quality from

one module to another (Balajthy, 1987a). Despite its detractors, the PLATO system continued to be developed and is still used in various forms today.

Following the acceptance of PLATO, other educational applications for computers began to be generated; these included the CAI Laboratory of Harold Mitzel at Pennsylvania State University, Alfred Bork's CAI software for physics at the University of California at Irvine (Bitter, 1989), and the programming language Logo developed by Seymour Papert of the Massachusetts Institute of Technology (Papert, 1980).

Papert asserted that using the Logo programming language helped children to develop thinking skills and generate problem-solving abilities that were applicable in other areas. Using the computer to direct the movements of an on-screen turtle in sequential steps afforded students the opportunity to analyze problems into their component parts. Advocates of Logo described this as a child experiencing "machine thinking." They maintained that a child who learned to operate Logo would be using the same mental processes as a computer programmer writing subroutines in a computer program or a mathematician focusing on the step-by-step resolution of a mathematical problem. Developing these metacognitive skills was the underlying purpose for the use of Logo (Balajthy, 1987b). Even Papert's detractors begrudgingly admired his contribution to educational theory. As Maddux (1987) noted:



What we lack are computer educators who have the vision and the ability to integrate existing disciplines. Papert made a step in that direction with Logo. He combined Piagetian developmental psychology with programming, and had a profoundly positive effect on both disciplines. (p. 55)

Papert (1980) described the process of using Logo as entering a world where specific ideas or intellectual structures could be explored empirically. Within this geometric microworld, children could investigate various possibilities and create their own knowledge related to geometric concepts.

#### Development of Microcomputer Systems

Most educational uses of computers throughout the 1970s and early 1980s were still primarily centered in laboratory settings for multi-terminal systems. This typically involved large, elaborate configurations with broad range courseware packages and sequential modules to move through course material in a prescribed manner. These modules typically contained question-and-answer routines (Burnett & Miller, 1982).

Educational uses followed the changing hardware and moved from mainframes to free-standing microcomputer systems. Educators were no longer limited by the extreme expense of operating a full mainframe computer in order to use CAI applications. Due to the costly investment of computer facilities and tedious software development, most of the early educational efforts were limited to

well-supported universities or large corporations (Bitter, 1989). The move to microcomputers gave school officials much more flexibility. They could design computer laboratories with a large group of less expensive microcomputers and still put one or two self-contained computer units in individual classrooms.

#### Subject Matter Software Development

Software began to be developed for specific applications rather than for a large all-encompassing system operating as the primary information delivery system of subject matter. Software programs were developed for teaching specific subject material with the free-standing microcomputer units. Uses of CAI for teaching mathematics, science, and social studies began to proliferate (Bullough & Beatty, 1991). Researchers began to find evidence that problem solving was enhanced by using computers (Norton & Resta, 1986; Steinberg, Baskin, & Hofer, 1986).

A program devised to enhance computer use was the HOTS (Higher Order Thinking Skills) Project. This instructional program was produced to integrate computer use into more areas of the curriculum by helping students develop thinking skills (Pogrow, 1987). HOTS was developed to accompany the use of more than 40 familiar computer software packages such as "Oregon Trail" and "Gertrude's Puzzles." It was not software to be used on computer, but it was a set of teaching procedures. In the HOTS program there was no

attempt to teach specific skills or to focus on specific subject material. Instead, it delineated organized questioning strategies related to high-interest software so that teachers could "link concepts across computer programs," and "develop prediction and language utilization skills" (p. 12).

A serious concern of educators became the suitability of the software which was available for use, and whether the use of Computer-Assisted Instruction could produce all the advances that advocates had predicted. Additionally, educators were striving to use computers as an implement for increasing student learning in a meaningful way and were seeking ways to evaluate and to use software successfully in different settings and for different purposes (Jacobs, 1985).

Another approach to using computers for educational purposes was through the use of AI, or Artificial Intelligence. AI was developed with the idea that the user should be the teacher and the computer should be the learner. This moved further from the rote memorization model represented by most CAI software. AI and the related Instructional Expert Systems were created to furnish computer-based instruction that was sensitive to the user's strengths and weaknesses. However, a considerable roadblock to AI systems becoming serious players in the educational

computing world has been the expense of AI research itself (Morris, 1983).

### Computer Use for Reading and Writing

#### Stanford Project

One of the earliest efforts to use computers to teach beginning reading was developed by Atkinson and Hansen for Stanford University. Developed during the 1960s, this computer-based reading program was known as the Stanford Project (Atkinson & Hansen, 1966). The Stanford Project was a systematic approach for delivering sequential lessons to teach beginning reading. The program was used to train students in letter discrimination, vocabulary, sentence syntax, and similar subskills of the reading act (Bullough & Beatty, 1991; Grabe, 1984). According to Burnett and Miller (1982), the program was limited because it was "based on an inadequate description of the reading process" (p. 213) and focused on subskills presented in isolation.

Assorted CAI programs for reading instruction came into use during the 1970s. Most of them consisted of drill-and-practice items for the reinforcement of material taught in conventional ways. A few of the more complex CAI programs were tutorials which were used to present new material (Blanchard, 1980). In the 1970s, a module for beginning reading was developed for the PLATO system.

### Limitations of Software

Efforts to use computers to teach reading continued to be limited by a view of reading as a collection of discrete skills that can be isolated and taught. Most software, even in the newer ILS, Integrated Learning Systems, echoed this narrow view of reading and actually was little more than polished forms of drill-and-practice (Bullough & Beatty, 1991). In 1984, Rubin and Bruce reported in a review of educational software (1984) that of 317 computer programs intended for reading or writing, 60% were drill-and-practice activities.

### Computers Used as Word Processors

The use of computers for instruction in the language arts developed slowly, due in part to the early experience with drill-and-practice software. As computers became more affordable and software more accessible, educators began to see the possibilities of using word processing to help teach writing (Bullough & Beatty, 1991). Teachers who were building their instruction in the language arts around the connection between reading and writing began to see the computer as a useful tool for teaching students about the writing process without the labor associated with making revisions (Whitaker, Schwartz, & Vockell, 1989).

Numerous studies have been done looking at computers as word processors (Collier, 1983; Harris, 1985; Withey, 1983). Many contributors to this body of research have focused on

the question of whether students revise more or less when they use computer word processing than when they use pencil and paper (Hawisher & Selfe, 1991). Some reports said students did revise more when they used computer word processing (Bean, 1983; Daiute, 1983; Sudol, 1985). Other studies said they did not (Daiute, 1986; Hawisher, 1987).

Some researchers have seen limitations in the current uses of computers to teach writing skills. Kemp (1987) pointed out that most writing instruction on computers remained limited to "grammar drill, text analysis, and word processing" (p. 32). Kemp lamented the limited flexibility in software for writing and believed that without fundamental changes "CAI in writing instruction will be restricted to supporting the packaging of essays instead of contributing to their creativity and originality" (p. 38).

#### "Writing to Read" System

By the early 1980's, John Henry Martin's "Writing to Read" system began to gain wide acceptance. He had developed this program in collaboration with International Business Machines Corporation (IBM). The program was based on the underlying assumption that students would become more effective communicators if their early experiences in literacy focused on writing rather than reading (Martin, 1984). This assumption is clearly in line with those who support a view of writing as process (Calkins, 1986; Graves, 1983).

An early evaluation of the Writing to Read Program by the Educational Testing Service was contracted by IBM. Murphy and Appel's (1984) report found that most kindergartners using the Writing to Read Program appeared to have higher reading achievement scores, but that few first graders showed an increase. Other studies reported positive results with the program and consistently mentioned a high level of student, teacher, and parent approval of the program (Childers, 1990; Decker, 1991; Hoffman, 1990; Howard & DiSalvo, 1989; Kirkland, 1984; Levinson & Lalor, 1989; Whitmer & Miller, 1987).

Some critics have insisted that the program's heavy-handed emphasis on phonics belies the stated purpose of promoting a student's writing efforts. Detractors have also pointed out that students using the Writing to Read program were reading and writing more than students not using the program. They argued that the increase in reading and writing activity alone could account for the advances in reading achievement scores (Ohanian, 1984).

The Writing to Read program is based on a modified alphabet which must be abandoned when students move into more conventional reading and writing. Because this program was developed for IBM computers only, implementing its use puts great stress on the resources of school districts which have already invested in another brand of computer such as Apple (Whitaker, Schwartz, & Vockell, 1989).

### Advantages of Computers for Reading and Writing

Malone (1981) looked at the different attributes of computer games, such as the use of color, sound production, and rewards to identify how these elements functioned to draw students' attention and keep them interested in playing the games. Similar subjective motivational elements associated with computers have been acknowledged for educational computer use. Particularly in light of the theoretical stance that the act of reading itself develops better reading (Smith, 1978), reluctant students who may be motivated by the game-like accouterments of computer programs may improve in reading because they actually read more from a computer screen than from static, printed text (Grabe, 1984). Grabe also noted that computer-controlled reading games seem to "appeal to students of all ability levels. The games seem to encourage recreational reading among lower ability students in a way that traditional reading materials do not" (p. 41).

There are apparent advantages to using CAI for specific purposes. The oft-maligned drill-and-practice activities are useful to reach a level of automaticity of functioning as described by LaBerge and Samuels (1974). Subskills can certainly be practiced by using the process of repetitive operation of simple steps, organized sequentially and guided by frequent computer feedback. Balajthy (1987b) pointed out that the CAI approach to teaching content area facts and



concepts was very successful when the instruction was intended for low-level literal information. The PLATO system's success in this literal type of training probably accounts for its continued use in certain businesses and colleges (1987b).

In some comparative studies, CAI programs have produced encouraging results, such as students mastering more material in a shorter time frame than students receiving traditional human-directed instruction. A high level of motivation was mentioned in many of the studies, as well (Kulik, Kulik, & Cohen, 1980). Ray and Feldman (1989) noted that college students working in a writing lab under study demonstrated a significant level of personal involvement and pride in the writing they did on computer.

Computerized speech capabilities and the advances in voice recognition are augmenting the possible uses of computers for physically-handicapped students as well as for young children who have not reached a conventional reading level. The evolving capabilities of computers which allow interaction with individuals with mental and physical challenges are becoming areas of interest on many educational fronts (Balajthy, 1987b). Microcomputer applications have been found to be effective as motivators, reinforcers, tutors, and sources of effective skill practice for children with many types of learning disabilities (Collis, 1988; Ellis & Sabornie, 1986; Mason, 1981).

Some recent developments in software have been compatible with the whole language philosophy. Casey (1990) described a computer program, "Monsters and Make-Believe Plus," which assists students in becoming skilled language users and which has been used successfully in holistic classrooms. Programs such as "Story Tree," which encourage students to develop creative stories, have been used with great success (Newman, 1988).

The Language Experience Approach (LEA) can easily accommodate computer use. In this approach to teaching beginning readers, the teacher guides students in dictating stories which the teacher then writes. The students and teacher join in reading the stories together. By using word processors, teachers can easily save the stories on computer where the students can then read or revise at a later time (Feeley, Strickland, & Wepner, 1987). This use of computers for word processing fits handily with the ideas of writing-as-process championed by Calkins (1986) and Graves (1983).

#### Disadvantages of Computers for Reading and Writing

Many criticisms have been leveled at the various endeavors to use computers to teach the language arts. In spite of high expectations for the Stanford project, the success reported seems pale when compared to the overall cost. A major venture like the Stanford project had a very high cost of implementation. It required considerable

outside funding for its one million dollar price tag (Marsh, 1983).

Some problems with hardware and software were evidenced with the PLATO system and with the Stanford project. Yeager pointed out that the reading material for PLATO had been developed by people without a background in reading theory (1977). Slow-moving presentation of material and problems with the audio segment of PLATO were frequently criticized. This was also found to be a problem in the Stanford project (Swinton, Amarel, & Morgan, 1978).

Some observers have denounced the fact that educators were limiting authentic reading activities by concentrating on subskill drills in an effort to take advantage of the computers. Legitimate, purposeful writing activities were, likewise, being replaced with computerized grammar drills (Balajthy, 1987b). According to theories advocated by Frank Smith (1978) and others (Goodman, 1986), the act of reading cannot legitimately be reduced to a list of subskills. According to this viewpoint, reading is a unitary process with all elements overlapping and interrelated. Reading ability is learned and expanded by the effort to read, not developed by practicing subskills of the reading process. Therefore, CAI programs that focused only on subsets of reading were limiting reading development rather than expanding it (Balajthy, 1987b).

In the research that reported CAI success, the comparison was frequently between a traditional teaching approach for teaching subskills and the computerized approach for teaching these subskills. There was usually no acknowledgment of the limitations of traditional teaching as compared to holistic approaches to the teaching/learning process. Also, many of the studies which reported CAI success were presenting math and science facts rather than skills related to language use or reading (Kulik, Kulik, & Cohen, 1980).

One significant factor mentioned in many of the studies surveyed by Kulik et al. (1980) was very low student-teacher ratio with close monitoring and supervision. In 1983, Roblyer and King found that a low student-teacher ratio and having teachers provide close guidance and monitoring of students as they worked with CAI were more important factors in the success being reported for CAI than the computer technology itself (cited in Balajthy, 1987b).

Willinsky and Green (1990) reported that students who used desktop publishing in a research project about remedial language arts were found to write a great deal more, but test results showed a disappointing lack of progress in writing ability. Researchers also complained that even though students were able to use commercial word processing to further some of their abilities in writing, most reading

software was not compatible with the cognitive view of comprehension (Young & Irwin, 1988).

#### The Reading/Writing Connection

Definitions of literacy, particularly the specific element of literacy known as reading, have changed periodically throughout history. Smith (1978) and other psycholinguists have advocated theories which represent reading as a unitary process with all elements overlapping and interrelated. In their view, reading is learned and expanded by reading, not by practicing subskills. Other researchers have theorized about reading comprehension as communication. The professional literature burgeons with studies on educational applications to foster comprehension and communication (Anderson, Hiebert, Scott, & Wilkinson, 1985; Cooper, 1986; Mason & Au, 1986; Raphael, 1986; Reinking & Pickle, 1990).

A separate area of research has grown about the relationship and interconnectedness of reading and writing (Cochrane, Cochrane, Scalena, & Buchanan, 1984; Goodman, 1986; Hansen, Newkirk, & Graves, 1985; Jensen, 1984). By looking at language acquisition and language development as natural processes which can be encouraged through enlightened instruction, educators have begun to move beyond the fragmentation of the language arts in school settings.

### Traditional Views of Reading

In the traditional view of reading, educators looked at the reading act as a "bottom-up" process. It was believed that students must first have a clear grasp of letters and the sounds they represent before they could begin to approach the reading task. Following the mastery of sound-symbol relationships, students could then assemble the letters or sound representations into words, sentences, and finally connected text. Reading ability was believed to come before writing ability, and therefore reading and writing should be taught separately and in that order. Supporters of this traditional view of reading held that reading was primarily a decoding activity and placed great emphasis on phonics teaching (Adams, 1989). Isolated skills were the focus of traditional language arts classes with lessons divided into spelling, grammar, punctuation, or vocabulary drills (Searfoss & Readence, 1989).

### Emergent Literacy

Certain researchers developed a view of reading and writing that has become known as emergent literacy. Teale and Sulzby (1986) led much of the research by proposing that the early reading and writing of young children are not pre-anything, but instead are evidences of the integrated nature of the language development process. In this view of literacy, the prior knowledge about language that children bring to the classroom is valued and used to help them

develop reading and writing abilities (Mason & Allen, 1986; Strickland & Morrow, 1989).

Reading and writing are seen as part of a continuum of language development that begins in infancy and proceeds through several recognizable stages until a child reaches a level of competency in reading and writing that is acknowledged as conventional literacy proficiency. Advocates of the emergent literacy perspective look at literacy as "top-down" processing in which learning to read and write evolves concurrently, as naturally as listening and speaking. They believe instruction should guide students from whole to part by integrating the language processes of speaking, listening, writing, and reading and by putting emphasis on meaning and purpose rather than on decoding and function. Supporters of emergent literacy maintain that writing ability develops before and then concurrently with reading. Therefore, encouraging the writing process first is the appropriate way to develop the reading process (Burns, Roe, & Ross, 1992; Fields, Spangler, & Lee, 1991; McGee & Richgels, 1990; Ollila & Mayfield, 1992; Searfoss & Readence, 1989).

#### Reading and Writing Relationship

The theory of the reading-writing relationship was developed by Tierney and Pearson (1983). They proposed that both processes used planning, drafting, aligning, revising, and monitoring in order to construct meanings.

Moxley (1984) contributed to the explanation of the connectedness between reading and writing by observing that both processes are compositional in nature since they both require the user to respond in ways that develop coherency. Shanahan and Lomax (1986) studied three different models of the reading-writing relationship, and they showed that the models differed primarily in the magnitude of importance placed on different components. In each of the models the reading side of the equation consisted of word analysis, vocabulary, and sentence comprehension, and the writing side of the equation consisted of spelling, vocabulary, sentence structure, and story organization. The developers of each of the models agreed that success in reading and writing involved overlapping mental processes.

#### Whole Language

Whole language is not a teaching methodology. It is an educational philosophy that recognizes that reading and writing are processes of a language usage continuum rather than collections of discrete subskills. Whole language acknowledges the social aspect of language development and incorporates all language facets with subject matter learning. Teachers who use the Whole language approach build on the interconnectedness of all the language functions (listening, speaking, reading, and writing) in order to guide students' learning in a social, language-rich environment (Chew, 1987). The effectiveness of the Whole



language philosophy with its child-centered instruction has consistently been shown to be more productive than the traditional subskills approach as a way of promoting literacy and as a way of organizing classroom activities (Freeman & Freeman, 1987; Robinson & Jacobson, 1989; Stice & Bertrand, 1990).

#### Ways to Encourage Literacy

The understanding that reading does not occur unless comprehension occurs has helped educators formulate teaching methodology to guide the process of literacy building. To encourage literacy, teachers should cultivate a literate environment with a profusion of contextual material for children so they can learn about language in a natural and spontaneous way.

#### Summary

The history of computer use in education has constituted a continuing interplay of technological potentials and educational urgencies, and these two factors have often been at odds with one another. The overall trend in computer use for reading or writing has been to try to teach reading skills or to teach writing skills. Researchers who have concentrated on skills have looked at a valid area of concern, but in doing so they have overlooked another area of greater magnitude. Current views of literacy development center on the fact that children develop their abilities

with language, namely speaking, listening, reading, and writing, in an overlapping process. Children build language proficiency through ongoing and ever-growing interactions with language (Ollila & Mayfield, 1992).

The process of using the computer has become a contributor to this universe of language development because a computer user interacts with language by reading text on the computer screen or writing new text by typing on the computer keyboard. This study attempted to look at this process and identify ways in which computer use in a school classroom functioned as an aspect of the overall literacy development of children.

## CHAPTER 3

### METHODOLOGY

Research design must match the type of questions being asked. For this study, much of the information being sought was not grounded in previous theory on literacy development. Qualitative methodology was used to help generate viable theory and to add to the body of knowledge concerning literacy. This chapter provides information about how the research design helped facilitate the process of answering the research questions and helps to establish the context within which the research took place.

#### Appropriateness of Qualitative Inquiry

Quantitative measures are needed when ideas or approaches are being compared or measured. Quantitative measures often involve controlling variables and focusing on numerical measurements. These strategies are inappropriate when the fundamental questions revolve around what the nature of a situation is according to the participants in that situation. Qualitative measures are most appropriate when striving for the type of information being sought in this study. The qualitative approach to research calls for a certain type of planning as research questions are devised. In qualitative research, broad questions are used

to provide early guidelines (Bogdan & Biklen, 1982; Kamil, Langer, & Shanahan, 1985). As data is then collected and analyzed, the questions tend to become more focused.

To best determine how computer use facilitated literacy development, the researcher chose to become a participant in the setting to learn about the overall literacy development of the individuals in the classroom being studied through observation. This direct observation of events occurring in "real time" in the environment being scrutinized was necessary to gain an accurate understanding about the meanings of these events.

#### Research Approach

A qualitative, naturalistic approach was used for this study. Grounded theory methodology was used to investigate possible concepts about how computer use impacts literacy development. In this approach the "major data-gathering technique is participant observation and the focus of the study is on a particular organization or some aspect of the organization" (Bogdan & Biklen, 1982, p. 59). The intent of this type of research is to create a narrative picture of a slice of life within a particular culture, in this case a particular elementary classroom in which computers are used throughout the school day as an integral part of the curriculum.

This type of research calls for a qualitative approach due to the nature of the questions being asked. When part of the information being sought is the perception of participants in a specific setting, the most appropriate way to discover those perceptions is to ask the participants. This can be accomplished in part by direct, organized interviews. Marshall and Rossman (1989) describe mainstream qualitative research as

that [which] entails immersion in the everyday life of the setting chosen for study, that values participants' perspectives on their worlds and seeks to discover those perspectives, that views inquiry as an interactive process between the researcher and the participants, and that is primarily descriptive and relies on people's words as the primary data. (p. 11)

#### Site and Participants

This research project focused on one particular classroom of second-grade students in a suburban school district which allowed and encouraged computer use in the classroom. This school district had provided individual classroom teachers with computers as well as created numerous computer laboratories for all of the elementary schools in the district.

The school district chosen for the study was a suburban school district located between the metropolitan cities of Dallas and Fort Worth, Texas. The selected elementary school was one of 18 elementary schools. The majority of the students lived in the middle-class neighborhood

surrounding the school. The ethnic make-up of the school was mostly White, with small minority populations of Black, Hispanic, and Asian students, reflecting the ethnic character of the community.

#### Negotiating Entry

Searching for a suitable site and negotiating for permission to conduct the study began in December, 1992. Several school districts in the general area had been proposed as potential choices. The researcher approached principals and teachers at elementary schools in several different school districts asking about the use of computers in their classrooms. The school eventually selected was mentioned several times.

Letters were written to the superintendent of the school district asking permission to present the study design to the school district elementary coordinator (see Appendix A). Meetings were held between the researcher and several school district officials. The assistant superintendent contacted the principal of the target school, and a teacher who was known to use computers in her classroom was suggested as a possible participant. The researcher was granted permission to approach the school principal to describe the study. The principal relayed the information to the classroom teacher, and the teacher agreed to talk with the researcher about the research. Not until all of

these steps were accomplished was the researcher allowed to contact the teacher directly.

The researcher visited the school and the teacher in her classroom to verify through direct observation that the site was suitable and arranged a time schedule with the teacher for the researcher to begin observations in the classroom during the early part of March. The teacher distributed the parent consent letters and collected them for the researcher prior to the beginning of the observations (see Appendix B).

#### Description of School

To contextualize a qualitative study, full descriptions are needed to help the reader consider how the study's findings can reasonably be related to other sites. This study took place in a school located in a well-developed suburban area between two large metropolitan cities. The elementary school was a four-year-old structure situated in a comfortable middle to upper middle class neighborhood. It was the most recent addition to the 18 elementary schools in the district. It had an enrollment of 790 students, making it one of the three largest elementary schools in the district.

The school had a principal, vice-principal, and 55 full-time faculty, including a counselor, a speech therapist, a gifted education teacher, a librarian, an art teacher, a music teacher, and four resource or special

education teachers. There were also several half-time faculty including a physical education teacher, an ESL (English as a Second Language) teacher, and three occupational physical therapists who came for one hour per day.

The building had 33 individual classrooms, 5 resource rooms, a computer lab, a science lab, an art room, a physical activity room, and a music room. The classrooms for each grade level were generally grouped together in one hallway. The school had a cafetorium with a stage for plays or large gatherings. There was a portable building for additional classroom space that had been needed in the past but which was not being used during the school year when this study took place (see Appendix C).

Outside the school there was neatly trimmed grass, some flowers, and a wide, one-way circular drive to facilitate the many parents who drove their children to and from school (Field Notes, 3-3-93). Inside the school the hallways were always decorated, mostly with child-made materials. When this study began, each of the different hallways was decorated with materials from a different ecological environment, produced by students in each of the different grade levels. The second-grade hallway was decorated as a rain forest when the researcher first began to visit the school.



### Classroom Setting

Most of the observations occurred in the homeroom of the targeted second-grade class. Observations were also made while students were working in the computer lab and when they went to the library. The researcher accompanied the group when they went outside for break. Other classrooms such as art, music, and physical education were visited in order to see the students in other contexts.

The classroom was one of six similar classrooms on one hallway. All of the classrooms on this hall were second grade rooms except the room directly across the hall, which was used for mentally- and physically-challenged students.

### Physical Description of Classroom

Because the framework in which naturalistic research takes place serves such a vital role in the presentation of the research findings, the following classroom description is presented to provide the context. This written representation of the physical setting helps to delineate the environment in which the study took place and to provide a reference point for activities described in this setting.

The classroom was rectangular shape with an adjoining private restroom. It had a window to the outside near the southwest corner and a window to the school hallway at the northeast corner. The door from the hallway was located near the southeast corner of the room. The backside of a metal bookcase was visible just inside the classroom door.

Magnetic name tags used for the lunch count were arranged on the metal bookcase. The students moved their name tags as they entered the room at the beginning of the day. The bookcase and a worktable with a world globe on it were placed end-to-end and created an entryway into the room.

Along the south wall just inside the classroom door were several built-in lockable wooden cabinets. The doors were polished wood about six feet tall. Mounted on the cabinet doors were various posters giving directions for fire drill, tornado drill, and a weekly lunch menu. On the third cabinet was a poster titled Helping Harry which had labels for messenger, line leader, door helper, books, and other similar items. The teacher rotated the student names attached to the helper labels once a week.

Next along the south wall was a sink and countertop with kitchen-style upper and lower cabinets. A single student desk was positioned just past the sink counter area touching the side of a black, four-drawer file cabinet. This desk was used for some writing activities. Sitting on this desk was a collection of crayons and writing materials and a container of candy used as rewards. The black file cabinet had magnetic letters and numbers mounted on both sides and on the front of the drawers. Students sometimes moved these around to make patterns or words during their free time. The arrangements would change every few days.

Farther along the south wall was another built-in cabinet. This cabinet was much smaller and thinner with about a three-inch ledge for a top. It appeared to open from the top down like a murphy bed. On the ledge were small decorative items. Above this cabinet on the wall was a large calendar which was changed monthly and a large poster titled "In Our Classroom" containing lists of rules, rewards, and consequences for behavior. Also on this wall was a map of the United States and a map of Texas.

Next along the south wall was the door to the adjoining restroom. Above this door was a large cartoon of a children's literary character: Clifford, The Big Red Dog. At the corner of the room against the floor-to-ceiling window to outside was a single student desk. This desk had several reference books on it.

From the corner along the west wall, there was a short angled wall with a low two-shelf book cabinet with a set of encyclopedias placed against it. Mounted on the wall above the encyclopedias were decorative posters, titled "Save the Earth" and "Be a Friend to Earth," and a large poster titled "Words of the Month." Words related to ecology and the environment were listed and remained without change during the months of observation.

Next, mounted on the west wall was a chalkboard about 10 feet long with a bulletin board at each end. On the left bulletin board were some photos of students at much younger

ages under a title of "Marvelous Me." On the right bulletin board were small fish shapes with students names, under a title of Brag Board. Some of these names were students who were no longer enrolled in the class.

Mounted above the chalkboard was a pull-down screen. Directly above the screen were strips of letters showing manuscript and cursive lettering. Above these items was a small hand lettered poster about how to disagree politely. Nearby were other small hand-lettered posters describing three types of writing: narrative, how-to, and descriptive. On the floor in front of the chalkboard were several different colored plastic file trays where students turned in written assignments.

Along the north wall, in the corner past the chalkboard, was a stack of four large white plastic crates with various books and teaching material inside. Above this on the wall was an area of the white wall outlined in bulletin board border to make an area look like a large bulletin board. This was labeled "Word Wall." Inside the border were individual words printed on separate strips of colored paper. This display did not change during the observation period.

Continuing from the corner along the north wall was the teacher's desk with the left end pushed against the wall where the teacher would be facing the main part of the room while sitting at the desk. Next was a large half-round

table with four computer stations. Inside the open area created by the computer table was a single student desk with a printer on it. On the wall above the printer was a small poster titled "A Sea of Birthdays" with children's names listed. The rest of the north wall was used for display of student-made material and was changed several times during the observation period.

Beyond the computer area along the north wall were two small student desks placed side-by-side against the wall and touching the back of a metal bookcase. These two desks were labeled the "Author Station." Above the "Author Station" were hand-lettered signs giving directions for steps to follow in writing, editing, and publishing.

Next was the black metal bookcase with one end placed against the wall and facing the reading corner. Placed at the end of the bookcase toward the center of the room was an easel with several Big Books. In the reading corner there was a low-slung webbed fabric sand chair and a large stuffed animal, Sylvester the Cat. On the wall was a poster with cards to check out books. There was a large fabric-covered pillow on the floor in the reading corner.

After the reading corner was the angled part of the wall with a floor to ceiling window to the hallway. Blocking the lower part of this window was a small white plastic bookshelf with stuffed animals, toys and buckets of crayons. Near this bookshelf was a five-foot model of a

tropical tree, with paper palm fronds at the top and paper decorations spiraling around it. On the walls around the window were several posters encouraging reading. Also by the window was a poster with library sleeves that held the students cards where they collected "punches" (from a hole puncher) for good behavior. Ten punches could be traded for treats such as extra time on the computer, free reading time, or a piece of candy.

Along the east wall were student lockers in two rows one above the other. Some of the lockers had student names on them and others were blank. At the end of the lockers was a rolling cart with an overhead projector. On the lower shelf of the cart was a large tape player with a listening post for four headphones.

In front of the student lockers were two tables placed together to create a large worktable area. Placed on the floor around the edges of this worktable were a number of small plastic baskets filled with children's books.

The children's desks were assembled in two arrangements of 10 desks in the shape of a "T" placed parallel to each other. There were eight desks placed face-to-face and side-by-side, with two additional desks placed side-by-side at the end of the row. Each desk had a hand-lettered name tag with pencil holder on the top. There were several open spaces in the room where teacher and students would gather for whole group activities (see Appendix D).

### Description of Teacher

The teacher in the classroom under observation was one of six second-grade teachers, each teaching a class of 17 to 20 students. She appeared to be one of the youngest teachers of the second-grade team. She got married one week before the end of school.

The teacher had taught second grade for four years and had been teaching in the same room in this school since the school opened. Prior to that, she taught for five years in junior high. She had completed a Master's degree in reading a year prior to the research project.

In an interview the teacher described herself as an "integrated teacher." She explained that she didn't see herself as a whole language teacher since she believed that whole language teachers integrated language activities throughout the entire curriculum. She said she felt she was trained at a time when people were just "getting into whole language." She said that she used traditional methods like skill lessons and worksheets part of the time, but that she used integrated language most of the time. "I just don't put every subject in there" (interview, 3-9-93).

During an informal interview with two of the girls, the researcher mentioned their teacher. One of the girls exclaimed, "Oh, she's so NICE!" The other girl enthusiastically agreed. "She's not mean, like Mrs. \_\_\_\_\_!", and she mentioned the name of another second grade teacher

(interview, 4-6-93). The students seemed to be genuinely fond of the teacher and occasionally students were observed giving the teacher hugs (field notes, 4-8-93).

The teacher was not overly demonstrative, but generally maintained a calm demeanor, even when the class became somewhat unruly. She was supportive of student responses and encouraged multiple answers (field notes, 3-22-93). The overall tone of her classroom was of teacher control being of primary importance, with student interactive, cooperative activities occurring under benign, but firm teacher management.

#### Description of Students

Information concerning the socioeconomic status of students attending this elementary school and details about the general milieu of the community in which the school was situated were shared with the researcher through various informal conversations with school staff, teachers, and parents. Most of the students attending this school lived in single-family homes, most of which were less than 10 years old. A smaller number of students and their families lived in generally well-kept apartment complexes. The 18 students in this study appeared to come to school each day clean and neat. Several students participated in organized activities outside of school, such as scouts or baseball. None of the 18 students in this study was a member of an ethnic minority.



The class was composed of 8 girls and 10 boys. Two students, one boy and one girl, had been identified as having Attention Deficit Disorder, and both had medication administered while at school. One student had been in a Chapter 1, remedial first grade. Two students had demonstrated emotional difficulties at different times during the school year. Seven of the students had been identified by the school district as being of above-average ability and were designated as gifted students, although these individuals were never identified as such in any way to the researcher.

Several students experienced changes in their family make-up during the course of the school year. One student experienced the remarriage of his natural parents. Another student acquired a new step-father when the mother married. The whole class was affected when one student's father died of a heart attack. This death had far-reaching repercussions because the father had been a little league baseball coach for a number of the second grade boys.

The students generally were present all day, every day with very few absences for illnesses or other reasons. They appeared to come to school well-fed and cared for. It did not appear that there were any other significant factors in their lives which would tend to interfere with their potential to learn while at school.

### Data Collection

Data was collected about the selected classroom and its students and teacher. The study attempted to produce a narrative description of the inner workings of the classroom--in particular the use of computers as related to language arts, reading, and writing activities. Data collection and data analysis were each divided into four phases (see Appendix E). These divisions identify the focus and techniques used during each segment of data collection and data analysis.

All of the data collection for this study was focused through grounded theory methodology. Data sources included participant observation, interviews, and document analysis. This approach was used because of its potential for generating theory about how computer use in an elementary classroom functions as an aspect of overall literacy development.

Data collection took place over a 3-month period, March 3, 1993 to May 28, 1993. Data summarization and reduction began in April and continued as coding guided more in-depth data analysis. Data analysis proceeded concurrently with data collection throughout the later stages of the research project. Final data analysis was completed after exit from the field.

### Field Notes

The primary data source was the field notes written by the researcher during the time that the classroom was being observed. These field notes were transcribed and analyzed for topics and common trends following each observation. The pages of typewritten or handwritten notes were organized by computer word processing. The written work was arranged so that all lines of text were numbered sequentially and each page was marked with the date on which the observation was made.

Two types of field notes, reflective notes and descriptive notes (Bogdan & Biklen, 1982), were used in order to create a clear, accurate, and detailed description of what people were saying and doing. The descriptive notes were written about what was seen and heard in the classroom as these events were occurring. These were recorded in "real time" in order to preserve as much of the phenomena being studied as possible in a written form. The researcher used a laptop computer as a notepad and typed directly into a word processor. These raw notes were later organized and arranged into a summarized, dated and line-numbered narrative.

Reflective notes were written as soon after leaving the site as possible. The researcher carried a minicassette tape recorder and verbally documented personal feelings and reflections about the observations immediately following the

observations. These tapes were transcribed and added to the printed observation notes in time sequence order. These notes contained the observer's opinions and comments about what was being observed.

The reflective notes also included questions and comments that the researcher had about what had been observed during that day's visit to the classroom. These were made by recording comments on the minicassette recorder immediately after leaving the classroom. All tape recordings were transcribed, coded, and added to the collective written data. These reflective notes helped to guide the researcher in selecting events or students to watch more closely in subsequent observations.

Occasionally, additions were made to the observation field note record to elaborate on incidents which had been occurring too rapidly for full description at the time of the event. Some incidents were documented "after the fact" in reflective notes, because it was not possible or prudent to write at the time of the event.

Other reflective notes were added as the researcher reread the previous day's observation notes. In this way the researcher could more fully describe events and document other insights as they occurred. Sometimes just the process of rereading would create a new understanding of an event.

### Interviews

The other key source of information was both structured and unstructured interviews with the participants in the study. The interviews were analyzed for common terms and patterns and then reviewed along with all other written field notes. Information from these interviews led to key informants who were willing and able to articulate their feelings about literacy and about computer use. These individuals were questioned more thoroughly during subsequent conversations.

The interviews were audio-taped. The minicassette recorder was also available during all observations. Several times the researcher was able to record students' conversations while at the computers in the classroom. These tapes were also transcribed and coded for patterns of behavior, and the transcription was added to the written field record. Transcripts were analyzed along with field note data to facilitate triangulation of data which in turn helped contribute to reliability. This step of triangulation, involving the collection of information about a specified topic from more than one source in order to establish a level of reliability (Miles & Huberman, 1984), is a vital element of data analysis which begins during data collection.

### Artifacts

Various artifacts were collected and analyzed to gain an additional data source for evidence of computer impact on literacy. These included samples of the students' creative writing done on the computer, creative writing done manually, computer printouts from various computer programs used for classroom instruction, documentation for computer games accessible to the students during free time, and student grades in various disciplines throughout the current school year. Notes were made about the teacher's lesson plans, and memos from the principal's office to parents were also reviewed as artifacts. (A complete list of data sources is listed in Appendix F.)

### Time Frame

Data collection for a qualitative study is sometimes spread over an extended period of time. The data collection for this study extended over several months during the spring semester of 1993. Interviews and meetings with school administrative personnel began in January. Actual classroom observations and student interviews began early in March. The researcher was present for the full school day for at least two days per week. On the full day observation days, the researcher arrived before school began, accompanied the class throughout the day as they moved through various activities, and remained until school was dismissed for the day. At least two other days of the week

the researcher observed for a period of one to three hours. No observations were scheduled on the days the students were taking standardized achievement tests or on days when the students were having special school-wide activities. Observations commenced during the early part of March and continued until the close of the school year at the end of May.

## Data Analysis

### Coding Process

Data analysis for qualitative research involves a search for general statements which can show relationships among categories of data. The data from this research project was examined on a continuing basis. Qualitative research depends on the repeated return to the data to identify patterns which can be further refined as the analysis proceeds. This establishes that all assertions are grounded in the data as required for "grounded theory" (Glaser & Strauss, 1967).

Preliminary codes were developed from the research questions in order to assign thematic labels to various segments of the narrative text. These labels were created in order to help provide a focus for the material being accumulated in the observational field notes. These coding labels also helped the researcher maintain a clear view of the information being sought while observing the dynamics of

the classroom in action. Early codes were also used to reduce the data into more manageable thematic chunks.

This first level of coding came directly from the research questions: COMUSE (for any use of computers by either students or teacher), STUVIEW (for statements or actions which reflected a student view about computers or computer use), and TCHVIEW (for statements or actions which reflected the teacher's view about computers or computer use). Each day of field notes was read three times, and different colored highlighters were used to mark any sections of text that seemed to fit in one of these three categories.

For the researcher to evaluate the data, the field notes, observations, and interview transcriptions had to be in a form which could be analyzed. Guba and Lincoln (1978) mentioned looking for recurring regularities. This means finding patterns which can then be sorted into categories.

The classification system that was developed helped to prioritize the importance of different elements in the data by identifying patterns. According to Miles and Huberman (1984),

First-level coding is a device for summarizing segments of data. Pattern coding is a way of grouping those summaries into a smaller number of overarching themes or constructs. It is, for qualitative researchers, an analogue to the cluster-analytic and factor-analytic devices used in statistical analysis. (p. 68)



Each time the field notes were read, some categories grew and others began to atrophy. Labels were frequently revised to more closely resemble the categories identified.

Weekly summary sheets were made. These summary sheets were reviewed each time the field notes were reviewed by the researcher. As a previous week's field notes and interview transcriptions were read, the highlighted areas were scrutinized for emerging categories. The unmarked sections were also reviewed to see what patterns could be identified there.

Reading and rereading the previous field notes during the weekend prior to the next week of observation served as a technique to keep the researcher alert to behavioral themes as they emerged and assisted in the development of possible interpretations and explanations. Data analysis occurred simultaneously with data collection.

Coding became more refined as the researcher read and reread the written text and summary sheets. New and revised category titles were assigned to sections of the text as similarities began to be apparent. New codes continued to emerge from the data as new patterns and themes began to manifest themselves. This inductive development of codes kept the researcher firmly grounded in the data (Glaser, 1978). As patterns and categories were identified and labeled, they were compared to data from the various

sources, a process identified by Miles and Huberman as indefinite triangulation (1984).

To provide consistency of analysis double coding was used. Several sections of the field notes were coded both immediately after the observation event and again at a later time. This code-recode procedure was employed for internal reliability. Several sections of the field notes were coded by another individual working separately from the researcher to verify the clarity of the coding labels. These methods of double coding were used to provide internal consistency (Miles & Huberman, 1984).

After exiting the field, final data analysis began with the examination of the categories which remained after several iterations of the coding process. The qualitative researcher's thorough familiarity with and total immersion in the narrative allowed the researcher to move into evaluation, the next step in the analysis process. Concerning the process of moving from analysis to interpretation, Patton (1990) suggests the following:

Interpretation, by definition, involves going beyond the descriptive data. Interpretation means attaching significance to what was found, offering explanations, drawing conclusions, extrapolating lessons, making inferences, building linkages, attaching meanings, imposing order, and dealing with rival explanations, disconfirming cases, and data irregularities as part of testing the viability of an interpretation. All of this is expected - and appropriate - as long as the researcher owns the interpretation and makes clear the difference between description and interpretation.  
(p. 423)

The final stage of data analysis was composed of the researcher's efforts to draw conclusions about the behaviors and comments which appeared most frequently in the data. After selecting the elements of the data which appeared to be most significant, the researcher formulated possible explanations for the patterns and themes which had been identified.

#### Summary

This chapter described the methodology of qualitative research as applied to the search for how computer use functions as an aspect of literacy development. This particular research consisted of a naturalistic study using qualitative research procedures, with the researcher as the primary instrument of the research. The research attempted to provide "thick description" (Geertz, 1973) by using structured and unstructured interviews, artifact review, and coding of observational and reflective field notes. Data collection and data analysis were consistent with grounded theory methodology, and indefinite triangulation helped address the issues of validity and reliability. A narrative story describing the situation being observed, namely how the computer was used in the target classroom and how that use affects literacy development, was produced by means of grounded theory methodology.

## CHAPTER 4

### THE NARRATIVE OF FINDINGS

This study was primarily an investigation of the computer use in one elementary classroom and how that computer use functioned as an aspect of the literacy development of the students in that classroom. One part of the study focused on how the computers were used in the classroom and how the students and the teacher viewed this computer use. Another part of the study focused on the general literacy development of the students. The last focus of the study was the identification of relationships between computer use and literacy development.

The first section of this chapter describes the general setting in which the study occurred. The information presented in this section comes from informal conversations with the central teacher in the study, other second-grade teachers at the school, and school administrative staff.

The second section relates the general operation of the classroom under study. Data presented in this section come from field notes, interviews, informal conversations, and classroom documents.

In the third section, findings are presented about the students in the study. This section includes specific

information about the students' literacy behaviors, their beliefs about literacy, their use of computers in the classroom and computer lab, and their beliefs about computers. Data for these findings come from field notes and interviews.

The teacher's role is described in the fourth section. This section discusses the teacher's beliefs about literacy, her use of computers, and her beliefs about computers. This information was developed from analyzed data from field notes and interviews.

The final section addresses the overarching research question of how the computer use in this classroom serves as an element of the overall literacy development of the students. These findings issue from analysis of the field notes, the interviews, and the classroom documents.

#### Overview of the Setting

The primary setting was the classroom of one second-grade teacher. She was one of six second-grade teachers at the selected elementary school in a suburban school district in a metropolitan area of north central Texas. Eighteen students were assigned to this class. The teacher volunteered the information to the researcher that seven of the students had been identified by the school district as being gifted students. These students were never identified individually to the researcher, and they were never

separated from the total group for any supplemental activities intended to enrich their learning experience.

The school had four to six teachers assigned to each grade from kindergarten through sixth grade. In addition, a special needs class with seven physically- and mentally-challenged children was directly across from the classroom being studied. On some occasions, the second-grade teachers combined their classes for an activity, usually involving no more than two classes at a time. The six second-grade classes and their teachers had lunch and lunchtime break, a period of outside play, at the same time every day.

The teacher had arranged with a fifth-grade teacher who taught language arts to bring two of her fifth-grade language arts classes to visit with the second graders as "reading buddies." These visits occurred weekly for 20 minutes in the morning for one group of fifth graders and in the afternoon for the other group of fifth graders.

The school had frequent parent involvement. Parents were often seen working as volunteers in the library and helping to update hallway and bulletin board displays throughout the school building. One parent came to the classroom for an hour on Wednesday morning to assist students with the computers. This same parent also worked as an assistant in the library.

Parents were not permitted unrestricted access to the classrooms, however. When parents came to pick up a child

early from school, they went to the office and the child was summoned by intercom. Exterior doors remained locked throughout the school day. These doors could be used as exits but not as entrances. Access to the school was through the main entry by the office. Visitors, including parents, were requested to stop and sign in at the office each time they entered the school building.

#### Description of Class

The classroom had individual student desks for the students which were moved into different configurations at various times during the study. Even though the students' desks were situated in two or three clusters, the students were discouraged from interaction with one another unless directed to work with a partner or with a group assigned by the teacher.

Students began the school day each day with announcements on the loud speaker from the office. At the end of the announcements, all students throughout the school would stand and say the Pledge of Allegiance and the pledge to the Texas flag. The standard schedule was as follows (Interview with teacher, 3-4-93):

8:30	-	11:15	Language Arts
10:00	-	10:30	Break (not included every day)
11:15	-	12:30	Lunch/Break
12:30	-	1:00	Social Studies/Science

1:00 - 2:05 Math  
2:05 - 2:50 P.E./Music/Art  
2:50 - 3:15 Health - Get ready for home

Every day students had a silent reading period which the teacher referred to as DEAR time (Drop Everything And Read) from 11:00 to 11:15. During the 2:05 to 2:50 time period, students went to either P.E., Music, or Art for one week at a time on alternating weeks. On Wednesday students went to the Library to check out books from 8:50 to 9:05 and immediately went to the Computer Lab from 9:05 to 9:40. The students did not have an outside break on Wednesday mornings.

Periodically, the teacher would announce a "Center Day" in which student pairs worked through a series of academic games or activities. The teacher would write a list of 10 different activities, such as math pattern blocks or educational games, on the chalkboard. Computer time was usually included twice. Students would be assigned to start at different places on the list. They would work on each activity for a prescribed amount of time and then move to the next activity.

The students got very excited when a Center Day was announced (Field notes, 5-18-93). These class activity days were not assigned according to a predetermined schedule; however, the teacher said she had a center day about once every six weeks (Interview with teacher, 5-6-93).



The teacher frequently used a shorter version of Center Day in which she set aside an hour of time for students to work in three different centers, one of which would be the computers. This activity period usually occurred only during the morning, but occasionally it was continued into the afternoon.

#### Description of Computer Lab

Students went to the Computer Lab for a 35-minute session once a week. The room was set up with four parallel rows of computers in individual carrels. The two center rows of computers were situated back-to-back. At one end of the room was a small work table where the classroom teacher sat while the students were working in the Lab and a semi-circular table for the Computer Coordinator. The Computer Coordinator had a monitoring station to oversee the laboratory network. From this location she could verify which lesson an individual student was currently running.

Students sat down at their assigned locations and put headphones on. As soon as the student signed in, the computer program automatically began. It didn't matter what name a student typed in because the computer laboratory system was programmed to present a lesson according to which student was assigned to that specific position. Brian was observed signing in as "Nolan Ryan" on two different occasions. Darla signed in as "Elaine." Other students

were seen signing in with altered versions of their given names on different days (Field notes, 3-24-93 and 3-31-93).

#### Description of Students

There were 18 second-grade students in the study. Of this number, 8 were girls and 10 were boys. No changes to the total occurred during the time of the study. All of the students were present for the majority of the observation periods.

The students appeared to be well-adjusted and comfortable in the school setting. Seven of the students had been identified by the school district as being of above average ability and were designated as gifted students, although these individuals were never identified as such to the researcher. Through observations and interviews, the researcher came to regard certain individuals in the classroom as probable members of the seven gifted students. Several others of the students were clearly not in the top seven.

#### Literacy Behaviors

In order to position computer use as an element of the literacy development of these second-grade students, it was important to have a clear understanding of the students' general literacy behaviors. The researcher made specific note of times during which students were interacting with print, either in reading or writing activities.

These specific activities, or behaviors, were then compared to similar events which occurred in connection with computer use.

Silent reading time. One type of literacy event that occurred every day was silent reading time. This was referred to as DEAR (Drop Everything And Read) time. For the 15 minutes just prior to their lunch time, students would stop all other activities and do uninterrupted silent reading. Sometimes students read books they had previously checked out of the library. Other times they selected a book from one of the baskets on the floor by the worktable. During DEAR time, students would be scattered throughout the room. Some students would be stretched out on the floor with their books, sitting in the corners, and even sitting under the worktable. A favorite spot was the sand chair in the reading corner.

During the DEAR time, the teacher also read. She read without cessation through the entire silent reading time. Some students did not read, but they seemed to recognize that the teacher would not interrupt her reading to say anything about it as long as they remained still and quiet. Either the teacher was not aware of students who did not read, or she chose not to acknowledge it. On a few occasions, however, she interrupted the silence to tell students, who were sharing a book and whispering about it, to look at their own books. During DEAR time, students

occasionally moved quietly from place to place to select different books.

On one occasion Beth had chosen two different books, both of which had been brought by the researcher to share with the class. She had moved a chair near the easel and was reading one of the books. The other book was on the floor beside her feet. She put her foot on this book when another student walked near and looked at it (Field notes, 3-29-93). Movement through the room was usually limited and very quiet. Sometimes there was brief whispering between students sitting near one another.

One day, Paul, Scott, and Mark were sitting on the floor near each other by the globe table. Each boy had a book open in his lap, but they were all looking at the book in Mark's lap. They were very still and very quiet, but they were softly whispering about the book. When the teacher noticed, she told them to move away from each other (Field notes, 3-29-93).

Alice was the only student who was frequently observed not reading during DEAR time. As noted on 4-15-93:

11:05 AM: Alice is the only one of the students who isn't reading something. Everyone else is either looking at a book or actively reading something. She finally has taken a book and opened it in her lap, but she is actually fiddling with a piece of paper.

Then she starts to thumb randomly through the book (Field notes, 4-15-93).

Students were allowed to read magazines or other material if they wished, instead of books. Sometimes students would look at posters created by other students, or read stories displayed in the room, such as the tall tales, in place of choosing a book to read.

The DEAR time was a time when everyone was expected to stop and read. However, students were often told to get something to read if they finished a worksheet or assignment before the rest of the class. On several occasions, the researcher observed pairs of students attempting to look at books together after they had finished an assignment. There seemed to be a great deal of interest in looking at a large atlas which was usually displayed on the easel near the reading corner. On one such occasion, Julie and Paul were talking quietly about the atlas as they looked at it together on the floor. The teacher was heard to chastise them by saying, "You should be reading by yourself if you're finished" (Field notes, 4-5-93). On other days, Scott and Carl looked at the atlas together (Field notes, 3-22-93), and Mark and Brian looked at the atlas together, but the teacher did not ask these particular students to separate (Field notes, 4-19-93).

Reading in the library. The teacher escorted the students to the library to check out books on Wednesday from

8:50 to 9:05 a.m. Students usually selected a book, checked it out, and started reading within the first five minutes. The library had several tables where four or five students could sit together. There were two large stuffed bears and several floor chairs in a central area of the library where students liked to sit and read. The students sometimes sat on the bears as they read. Students were expected to find a place to sit and read silently, but certain ones frequently whispered among themselves if the teacher did not remind them to be quiet. One day, Molly and Paul had a quiet but spirited argument about who got to a bear first, but they worked it out without incident or intervention from the teacher (3-24-93). It was more common to see students sharing the bears to lean on or sit on as they were reading.

Story time. When the students returned to the classroom from lunch and outside break, they had story time. Students would gather on the floor in the center of the room and listen as the teacher read a portion of a book aloud. A volunteer would be selected to be the teacher's assistant. This student would give the teacher a shoulder rub while she read to the class. Some of the girls added to the shoulder rub by "doing" the teacher's long, blond hair, by twisting or braiding sections of her hair. The teacher was very tolerant of this while she read.

Grooming activities seemed to be a part of every story time. Students gave each other shoulder rubs and fiddled

with each others' hair while they listened to the story. They typically stayed very quiet and attentive to the story even though they did not look at the teacher very much while she was reading.

Book time with researcher. The researcher brought four or five books to share with the students every couple of weeks. The students were often seen reading the books that the researcher brought during DEAR time. They enjoyed looking at the informational books, but were especially appreciative when one of the humorous books was read aloud.

Once the researcher read a book in which the main character went from problem to problem and eventually was led back to something akin to the original predicament. Students were attentive and laughed at the jokes and the rhyme in the story. Paul said, "Oh, it's a circle story," indicating his understanding that the story wound its way back to the beginning.

Reading during show and tell. After the 10 to 15 minutes that the teacher read aloud for story time, the students had show and tell. Any student who wished to share could stand up and talk about something they brought to show the class. Sometimes students shared books during show and tell. On 4-14-93, Brian brought his scout book and read a little bit from it. He described the American Sign Language alphabet. The story that the teacher had been reading during story time was about Helen Keller. For several days

the students experimented with signing some words with the hand alphabet.

On other occasions Beth, Alan, Scott, and Paul read from books they brought for show and tell. It was particularly interesting to see Paul read from a book about how to disagree without making people mad. Everyone in the class seemed to really be very attentive as he read, and they were nodding vigorously and saying, "Yeah, that's right, that's right!" (Field notes, 5-13-93). It was a book about how not to be a troublemaker being read by the one student in the class most often identified as a troublemaker by the other students and by the teacher.

Reading aloud during science or social studies.

Sometimes during the science or social studies time in the afternoon, the teacher directed the students to turn to a specific page in a textbook and students would be assigned to read aloud. Usually, students were directed to read a paragraph or a page. Periodically, the teacher would stop and ask questions.

Oral reading seemed to be a simple activity and did not appear to be a problem for many of the students. Jason read smoothly and without error. Alan read very confidently and with great expression. He stumbled a little but showed no frustration and continued to read in a very adult-like manner. Scott was also an accurate oral reader, although



his reading was a bit rushed. He used expression, but was not as dramatic as Alan.

Other students did not seem as confident. Jana's reading was much more word-by-word and more hesitant. One day after the teacher had called on Julie to read, Julie mispronounced "bran" for "brain." Julie began to shake her head, looked down and said very softly, "I don't want to read." The teacher repeated softly, "You don't want to read? OK," and then she quickly called on another student. Lisa, whom many of the students identified as one of the best readers, had occasional difficulty with oral reading. She seemed to read more in phrases than in a conversational manner.

Language arts assignments. The language arts assignments used in the classroom covered a wide variety of activities. These assignments included group writing, individual writing, experience with poetry, introductions to research, and opportunities to develop literacy and language mastery in all the language facets (listening, speaking, reading, and writing). The language arts textbooks were infrequently used for these language arts activities. Most of the language arts assignments were part of short units which covered several days. The class had completed a unit on Texas prior to the beginning of the research study. The teacher described how the students had each written a letter to a different Texas city. The information received was

used to make a report about the city (Interview with teacher, 3-9-93).

The teacher often read a book to set up an activity or series of activities. She read several versions of the Paul Bunyan legends to the students to prepare them to write their own tall tales. After the students wrote a draft of their tall tale, they were supposed to find another student in the room to read it to as an editing partner. The researcher sat in on several "editing conferences." Students were seldom able to give specific editing help to one another. One such conference between Darla and Alice lasted 90 seconds. According to the field notes for that event:

Darla is walking around the room looking for something. Then she walks to the author desk and asks, "Molly, will you conference with me?" Molly nods. Darla begins to softly read aloud from her paper. Molly says, "You need some periods in here" (Field notes, 3-11-93).

Students were involved in some activities where they could interact with each other and in other activities which the teacher expected them to accomplish individually. Sometimes students did partner reading, where pairs of students would sit in different areas around the room and alternately read to each other. Other times students filled out traditional-style worksheets on reading and writing

subskills. For a unit on Charlotte's Web, the students did several such worksheets per day. Students were well-trained in completing worksheets and then putting them in the assigned plastic colored trays. They moved briskly back and forth from their desks as they turned in worksheets.

The teacher used another book to tie in a writing assignment for the unit on Charlotte's Web. After reading the book Can I Keep Him? to the class, the teacher solicited answers about how the two books were related. Several students were able to answer that Fern, in Charlotte's Web, asks her dad, "Can I keep him?" about the pig. Others mentioned that lots of animals are in both stories. After accepting several similar statements, the teacher explained the writing assignment, which was to write a letter to parents asking permission to have an exotic pet. She then read two examples of suitable letters written by other second grade students. Students worked individually on creating a letter that followed the specified format.

One of the language arts activities was a group assignment to find pairs of synonyms. Each student had a thesaurus to use. Each group was supposed to find 18 pairs of synonyms. One student in the group was responsible for writing the pairs of words they selected. Each member in the group took turns looking for words in the thesaurus. The students in the group the researcher was watching did not look for words until it was their turn. After the list

of synonyms was written, the students used markers to write the words on the two halves of plastic Easter eggs. These plastic eggs were used later in the week for an Easter egg hunt the second graders held for their fifth-grade reading buddies. Some of the synonyms they selected were very difficult. The teacher reviewed the synonyms from each group before allowing the students to write the words on the plastic eggs. Sometimes she told students to remove difficult or confusing words, but she allowed most of their choices to be used.

Writing in base groups. Each week the teacher assigned the students to new base groups of four or five students. These five groups were expected to work together on one or more assignments. Sometimes they would produce a group written product. Other times, they filled out charts or made lists. The overall purpose of the group exercise, however, was for the students to practice a social behavior or a thinking activity. Before starting the activity, the teacher would talk to the students about a specific type of desirable behavior that they would be judged on during that day's group activity, such as being polite, encouraging others, or taking turns.

While the students were working in the groups, the teacher stood silently near each group making marks in a small notebook. Later in the day she would tell each group how many points the group had earned. These "points" were

the same as the "punches" the students got on their behavior cards to be used for special privileges or candy rewards.

Journal writing. At least one morning per week the students wrote in a journal. A timer was set for 10 minutes. Students were required to write for this period of time. The teacher usually graded papers while the students were writing. Sometimes she stepped out of the room to talk with other second-grade teachers.

Some students found journal writing to be easy and wrote long, detailed stories. Some other students did not appear to enjoy this writing assignment. During one journal writing time, Darla wrote, "I don't know what to write. I don't know what to write" over and over on her page (Field notes, 4-5-93). Other students traded in punches to have 10 minutes of computer time rather than do journal writing. Sometimes the teacher would put a notice on the board that everyone would be writing in the journals that day, and no punches could be traded.

Sometimes the teacher would select a specific topic for students to write about. Other times they were allowed to write on any subject. When the timer went off, the teacher would ask who would like to read what they've written, or who would like to share. Many hands would be raised. She then called on several students to read aloud from their journals. After a few minutes of oral reading from the

journals, the teacher would take up the journals to be reviewed later.

Journal entries often reflected elements of other activities occurring in the classroom. After the students had been working on tall tales for a while, some of the journal entries sounded like tall tales with exaggerations sprinkled throughout (Field notes, 3-29-93). A typical journal writing time is reflected in the following field note entry:

Teacher stepped out of the room. The timer went off, but the teacher is not in the room to tell the students what to do next. Scott, Carl, and Darla have their hands up, but there is no one to acknowledge them. They quietly put their hands back down. Teacher walks back in and says, "Anyone want to share?" Many more students put their hands up quickly. Teacher calls on Alice who wrote about going to the dentist yesterday. Jason reads, then Lisa. Lisa read that on Saturday she got on the computer and wrote a card for Mark. She went to Mark's birthday party. Abby read, then Scott. Mark read about having a birthday party on Saturday. Jana read and her journal sounds very story-like. Then she goes on to tell more of her story. Teacher asks, "Are you reading what you wrote?" Then she says, "Just read what you wrote." Next Alan reads. His journal sounded very story-like, and seems much longer than

some of the others. Carl read his journal entry which was about going to grandmother's house (Field notes, 4-13-93).

Later the researcher asked Carl about the story, and he said that it was the same story that he wrote in his first-grade journal last year. He just tried to remember it so he could write it down again for this assignment. More than once students revealed to the researcher that they reused stories they had written for other occasions (Field notes, 4-7-93; Field notes, 4-13-93; and Interview, 5-12-93).

Spelling. The students were given a new list of spelling words on each Monday with a spelling test on Thursday. The teacher would write the words on the chalkboard in three columns and ask the students to find the relationship between the words in each column. There usually was a phonetic connection such as words having the suffix "-est," words with the letters "ght," or words spelled with the vowel digraph "ai." After students identified the relationship, the teacher would ask them to guess possible words to be the mystery word she would add for each of the three lists of words. The students would hold up their hands to give possible words. The teacher would write these words on the board. Usually there would be a list of 8 to 10 new words written on the board for each of the three columns. The teacher would tell them yes or no if they had guessed the mystery word and if it was on the

board. The researcher never saw students writing down any of these potential "mystery" words.

Each time a spelling test was given, some of the students wrote their spelling words on the computers. The others wrote their spelling tests on regular notebook paper. The teacher would direct the students to write certain words in manuscript print and other words in cursive. All of the spelling tests were finished in about six or seven minutes, but it took a little longer for the students at the computers to print and turn in their tests. Whenever students missed a spelling test, another student would be assigned to give the test to them later.

Reading buddies. The second-grade students in this study had reading buddies from a fifth-grade language arts class. The fifth-grade students came to the second-grade classroom for 20 minutes each Friday to be helpers for the younger students. The teacher said there were more students in the fifth-grade class than in her second-grade class, so many of the second graders had two buddies. This did not seem to be a problem for anyone. The extra buddies were assigned to another student if there were any students absent.

The teacher also commented that the fifth-grade teacher said the bigger kids really were disappointed if they did not get to come visit the little kids. They looked forward



to this as much as the second graders did (Field notes, 4-2-93). During the time the two groups spent together, the older students listened to the younger students read aloud from their most recent writing project and gave editing assistance. Most of the editing help consisted of pointing out misspelled words, or missed punctuation (Field notes, 4-30-93).

Other evidence of literate behavior. Students demonstrated that they were actively engaged in literacy behaviors in many different ways. Various students expressed interest in the researcher's ability to type by touch. Alan once asked the researcher, "How can you type without looking, while you are looking around the room?" When the researcher explained that this was the result of a great deal of practice, he was satisfied up to a point. He concluded the conversation by accurately stating that there were still at least two things going on at once, thinking and typing (Field notes, 3-11-93).

On one of the last days the researcher was in the classroom, the students interviewed the researcher. In response to a question they asked about college, the researcher explained about the three different levels of degrees that can be earned by going to college. Paul made an accurate connection between this explanation and his own experience with one of the computer games. In the game of Where in the USA is Carmen Sandiego? the player attempts to

solve criminal cases, and whenever a sufficient number of cases have been solved, the player is awarded a promotion and a new title. This had already occurred several times for Paul. "Oh," he said, "it's just like the different degrees (bachelor's degree, master's degree, and doctorate) are like Carmen Sandiego. You've got to work to get to the different levels. Like the promotions, right?" (Field notes, 5-24-93).

The students were sometimes observed reading different posters in the room. One day before they began a writing assignment, Jana and Alice sat at the Author's Desk and read aloud to each other from the poster about the steps of writing. Then they commenced writing (Field notes, 4-6-93).

There was evidence of the full range of literate behavior when the students were observed working out the details to put on a play. The class was divided into two groups. Each group had its own director. The students decided on part assignments, created minimalist costumes, made props, and constructed simple sets using colored construction paper and other material available in the classroom. Performers created simple blocking for the movements called for in the script. Players held their books as they read the parts. The play was presented two times as each group performed for the other. Both groups were enthusiastic players and appreciative audiences (Field notes, 4-3-93).

### Beliefs about Literacy

Students' beliefs about literacy in general, and more specifically, their beliefs about their own literacy abilities, are components of their literacy development. Students in this study uniformly enjoyed being read to. They were read to on a daily basis during story time, and they consistently reacted favorably when additional reading times were inserted in the curriculum. The majority of the students were willing and eager to read orally to the class when the teacher called on them. They enjoyed hearing their own words being read aloud, whether they were personally reading something they had written, or if someone else was reading it.

On one occasion after a group writing assignment, the researcher observed the students in one group having harsh words with each other about what to include in their group story. The following excerpt from the field note account reveals the way one student was affected by hearing his words being read:

Paul was still frowning until she [another student in his group] read a line about the clock and "being ticked off." Then he smiled broadly. Apparently he wrote this line. He continued to smile throughout her reading of the rest of their story (Field notes, 4-26-93).

Students in the second grade were expected to master the use of cursive writing. During the spelling tests, the teacher would announce several of the words to be written in cursive. Julie told the researcher that one of the reasons she preferred to do her spelling test on the computer was that this meant she did not have to write the spelling words in cursive. As she responded during an interview:

RESEARCHER: The fun part is the typing part?

JULIE: Yeah, it means no cursive. We don't have to do it in cursive. (Interview with Julie, 4-6-93).

Another student demonstrated this dislike of using cursive writing during the activity of writing the synonyms on the plastic Easter eggs. Beth told her group, "Just think how hard this would be if you had to write in cursive! And you think this is hard!?" (Field notes, 4-5-93).

The students frequently mentioned having favorite books or favorite authors. Jana told the researcher that she enjoyed reading science and science fiction books, especially Isaac Asimov's space books. Then she mentioned that she and Beth had both read all the Babysitter Club books and were already rereading them because they liked them so much (Field notes, 5-4-93). Brian said, "I kind of like the long books," although he could not think of a title at the moment (Interview with Brian, 3-24-93).

When the researcher showed a copy of the Jane Yolen book Sleeping Ugly, several students excitedly said they

knew that book and really liked it. They were familiar with the author and other books she had written (Field notes, 3-10-93). Alice mentioned that she really liked the story in And To Think That I Saw It On Mulberry Street and could quote it from memory (Interview with Alice, 4-26-93).

Students' choices of best reader. Students were asked to identify the person in their class who they believed to be the best reader. This question was asked during the oral interviews and in the written interviews (see Appendix G). The students mentioned most often as the best readers were Lisa and Scott. Six other students were indicated at least one time. The teacher identified Scott as probably the best reader, although she qualified this statement by adding, "but I've got a lot that are really good readers." She added:

If he reads something one time, he can tell you anything you want to know about it. I mean, he can just read something, and then he remembers it forever. It's in there. And I guess that's why I think of him as being the best reader. Just because when he reads something, boy, he's got it in there." (Interview with teacher, 3-9-93).

What a good reader does. After students were asked who they thought was the best reader, they were asked to describe some things that a good reader does. Scott was often described as reading fast. Several students alluded

to the fact that the students they selected as the best reader had learned to read in kindergarten and kept getting better. Most students mentioned that good readers always like to read. Several students said that good readers would sound out a word they did not know. The most frequently mentioned characteristic of a good reader was that good readers practice by reading a lot. The element of practice was mentioned as important in a majority of the responses. As Molly said, "Reading books is like practicing" (Interview with Molly, 4-21-93).

Some students mentioned vocabulary as being important. Lisa, one of the two students most frequently selected as the best reader, picked Brian as her choice of the best reader because as she observed, "We were partner reading one time, and he was reading, and there was this big word, and I didn't know it, but he knew it." (Interview with Lisa, 4-15-93). Scott, the other frequently selected student, described Carl, his choice, as a student who knew "lots of words and who could read sort of fast" (Interview with Scott, 4-21-93).

Students' choices of best writer. When students were asked during interviews which student was the best writer, the two students most frequently mentioned were Lisa and Jason. Six other students received at least one vote apiece. Jason was often pointed out as a person who wrote the funniest or most imaginative stories. Lisa was

described as being able to write a wide variety of different kinds of things and doing them all well.

What a good writer does. When students were asked to give characteristics of what a good writer does, they often focused on the mechanics of writing. Sometimes they mentioned the need to be careful about capital letters and punctuation. In describing Beth, Jason remarked that "she always goes back and checks and makes sure her letters are correct and she has her capitals and her periods" (Interview with Jason, 4-26-93). Students often mentioned handwriting when asked about writing. They seemed to be more inclined to think of writing as an action of putting words on paper than as a process of composition or reason. Being able to put thoughts into print quickly was also highly valued.

Lisa was one of several students who mentioned that good writers would be able to find interesting things to put in their writing. She said, "If they are writing about a dog, they just wouldn't say a dog barked. They'd say interesting facts about the dog, and what he does" (Interview with Lisa, 4-15-93).

Alan described it this way:

A good writer tries to think up unusual stories. If you really want to tell some people about truth, like animals and stuff, first you should go out and find as much as you can, like first get all the information you can get, if it was non-fiction. And then fiction, a

writer really has to use his mind. He has to think up believable stuff in make-believe stuff. (Interview with Alan, 5-3-93)

The characteristic of being able to write funny stories was the feature mentioned most frequently. Students often mentioned things involved in the mechanics of writing. Sometimes they referred to the need to make the letters neat and straight. Several of them demonstrated a belief that good writing must fit a pre-determined length. Darla said that a good story would be too short if it was just one or two sentences, because a good story needed to be at least two or three pages long (Field notes, 4-19-93).

Characterization of self as a reader. Students were asked if they thought of themselves as being good readers. One student said no, and two others had somewhat negative answers. The rest were positive. Of the students answering positively, several were very emphatic and confident about their reading ability. Their responses to the question were similar:

RESEARCHER: Do you think you are a good reader?

JASON: Um, not to compliment myself, but, yes, I am a pretty good reader (Interview, 4-26-93).

DARLA: Yeah. I learned how to read when I was in kindergarten (Interview, 4-19-93).



MOLLY: Yes, I think I am, because I love reading long books and I don't have much trouble on them, so I think that I'm pretty good (Interview, 4-21-93).

SCOTT: Yeah, I'm a good reader! It's fun! The books at the library are amazing. And seems like I can go, I just dream where I want to go when I'm reading (4-21-93).

Jana answered that she thought she was a good reader, but qualified the statement by specifying that she preferred silent reading over oral reading. She said "reading out loud sort of puts--I start to get tired of reading" (Interview, 5-4-93). The two negative answers came from Paul and Alice. When Paul was asked if he was a good reader, he answered "Uh, I guess so. But, um, I don't like reading that much" (Interview, 5-3-93). Alice was the only student who characterized herself as not being successful as a reader. During an interview with Alice the following exchange occurred:

RESEARCHER: I'm very interested in how you read, how you write, and how you use the computers. So, when I'm having interviews with the kids...

ALICE: I don't read, I do NOT read very well.

RESEARCHER: You don't? Do you think that's a problem for you?

ALICE: Yeah. I used to read really, really well. But, now that I haven't practiced a lot, I'm getting bad at it.

RESEARCHER: Why do you suppose it's gotten to be bad? Is it just the practice, or are there other things?

ALICE: It's just the practice. I never have time to do it, because, well, um, most of the time I'm at my mom's in Oklahoma, or spending time with my mom.

RESEARCHER: So you stay with your dad and your grandmother sometimes and you stay with your mom sometimes?

ALICE: (nods).

RESEARCHER: Who do you think here is a good reader?

ALICE: Well, Lisa. She sits at this table here.

RESEARCHER: What about her makes her a good reader?

ALICE: I'm not really sure.

RESEARCHER: What would you guess? If somebody said, how do you know somebody's a good reader, what are some things that you might say?

ALICE: Well, um. I'd say she practices.

RESEARCHER: Okay. What else?

ALICE: And, maybe her parents aren't divorced either.

RESEARCHER: How would that make a difference?

ALICE: Well, my parents are divorced, and I hardly have any time to read. And because my mom doesn't have any books over there.

RESEARCHER: Uh-huh.

ALICE: I want to read, but I never have time to. And I never have any books to read (Interview, 4-26-93).

The teacher corroborated Alice's observations that her reading ability was deteriorating. During a casual conversation with the researcher after school one day, the teacher remarked that Alice seemed to have actually gotten worse in reading. The teacher said Alice was now acting as if she could not read, when in fact, she had been reading fairly well before, at the beginning of the school year (Field notes, 5-12-93).

Characterization of self as a writer. When students were asked if they thought of themselves as good writers, typically they commented first about handwriting rather than about composition. Most of the students were more hesitant about identifying themselves as good writers than they had been about identifying themselves as good readers. Even Lisa, who was mentioned most often by other students, was reluctant to call herself a good writer. When asked if she thought she was a good writer, Lisa answered, "I guess so" (Interview with Lisa, 4-15-93). In that same interview Lisa identified writing stories as her "favorite subject."

Alice, the student who had described herself as not being a very good reader, also revealed difficulties with writing. She was aware that writing involved thinking when she said, "Well, you have to think about it. You have to

use your head." However, in response to a question about what a good writer does, Alice said, "Well, uh, they practice writing their alphabet. And make sure it's nice, printed." Alice was observed to avoid writing assignments by sharpening her pencil, looking for paper or supplies, or staying in the restroom (Field notes).

Other evidence of beliefs about literacy. Students demonstrated other beliefs about literacy. They were able to formulate preferences about reading material and express these preferences. In response to a request by the researcher, Eric read a book the researcher brought to share with the class and gave his opinion about whether it was suitable for other second graders. He said, "I think it's a good book for second graders, because it's really exciting. And the pictures really help explain the story" (Field notes, 3-22-93). Students were very excited when the teacher mentioned that one activity would involve using a map and doing a word search. These were reading and writing activities they found very pleasurable. They also mentioned that writing a story that turned out well was fun (Field notes, 3-11-93).

#### Use of Computers

Students used computers at different times and for different purposes, but always under the direct control of the teacher. The researcher was able to observe students using computer programs that the students were very familiar

with and which they had been using for the entire school year. Several new computer programs were added during the research project, giving the researcher the opportunity to see how the teacher introduced new software and to watch the students as they familiarized themselves with new programs. Students sometimes mentioned that they were more interested in the computer programs that were the newest ones (Field notes, 4-21-93).

Some of the students revealed that they had access to computers outside of school. Beth, Paul, Scott, and Jason said their families had a computer at home and that they sometimes used them. Carl reported that he had Super Nintendo, and Toby had an Atari game. These were items that they equated with computers (Interview with Carl and Toby, 4-15-93). None of the students could identify the exact brand of computer that they had at home, even the students whose fathers worked in computer sales or service (Field notes).

Of the students who reported having a computer at home, only Beth mentioned writing stories on the home computer. She said that she usually did not save or print them (Interview with Beth, 4-6-93). Jason said he read stories on his computer in a special section of Prodigy, a widely-used bulletin board system. He also described several computer games (Interview with Jason, 4-26-93).

Sometimes students would use the computers to avoid doing something else that they did not want to do. Unless the teacher indicated that everyone must write in their journal, two or three students would usually trade in punches to have computer time instead of doing journal writing.

Access to computers. Student access to the four computers in the classroom was strictly regulated by the teacher. She had devised a rotating plan where the students were divided into five groups corresponding to each day of the week. This was the result of some problems at the beginning of the year.

TEACHER: At first, at the first of the year, what I would do was if they finished work, and they wanted to get a center, this [using the computers] was one of the centers that they could get. And I started seeing where several of the ones who really enjoyed being on the computer would race through their work SO fast, trying to get on the computer. Then what I did was assign them days. This was probably around November. I mean their work would be horrible, but they'd get on the computer, so they didn't care. And then I started assigning them days. And like today's Thursday. Even if they're finished with their work, the computer is not an option because it's not their day. So they need to find another center. And, like I said, then there

are days when I assign everyone some computer time. Everyone will get 20 minutes on it or whatever (Interview with teacher, 5-6-93).

There were different times when students were given access to the computers. Students were allowed to do their weekly spelling tests on the computers with their "day" group. This meant that they would be doing the spelling test on the computer once every five weeks.

The teacher also had two different kinds of "Center Day." Periodically, she would assign students to rotate through three centers, meaning academic games or activities. One of these centers would be a computer game or activity picked by the teacher. Students would have 20 minutes on each center and then they would move to the next, for a total of one hour of center activities. The other type of "Center Day" was a day when students would rotate through 10 different academic centers; thus they would essentially be doing centers all day long. Computers would be listed twice on this day. Students also had the option of trading in 10 punches for 15 minutes of computer time, but this was strictly at the discretion of the teacher.

Conflicts over access to computers. There were frequent indicators that students did not want to stop once they were involved with the computers. Students sometimes played computer games before the beginning of school, and they would delay turning off the computers until the teacher

insisted that they move on to the morning activities. Students who traded in 10 punches for 15 minutes of computer time sometimes stretched this by saying they were about to finish a game, even if they had just started a new game (Field notes, 5-12-93). Even if the timer went off, or the teacher indicated the students on the computers should move on, they often asked "Do we have to stop now?" (Field notes, 3-11-93).

Favorite computer activities. Students indicated that they particularly enjoyed using certain computer programs. Sometimes they described certain elements of a computer game or program as being the reason they liked the game. The programs most often mentioned were Kidpix, Kidworks, Where in the USA is Carmen Sandiego?, Oregon Trail, and Math Magic. The last three were the most recently added programs.

Most of the students spent their computer time working in pairs rather than singly. They shared the advances that they jointly made on the games. Frequently they would sign in with a shared name. When Toby and Carl were beginning a case on Where in the World is Carmen Sandiego?, they signed in as "doctor" (Field notes, 4-15-93). A conversation between Beth and Molly revealed how they chose a joint name:

BETH: Hey, I never have done this. What do you want to be? [They are starting Oregon Trail, and they are being asked to enter the player's name.]



MOLLY: What's your favorite pretend name?

BETH: Stacy.

MOLLY: The Babysitter's Club Stacy?

BETH: Yeah.

MOLLY: Okay, let's use that. I like that, too (Field notes, 5-18-93).

Math Magic was an educational program that alternated between a few minutes of an arcade-type game and a few minutes of answering simple math problems. The arcade game, which was similar to Breakout or Pong, had a ball which the player tried to hit by moving a paddle so that the ball would strike and knock out blocks from a wall. Students could vary the difficulty of the game by selecting a faster or slower speed or by selecting a larger or smaller paddle. They could also modify the difficulty of the math problems being given.

The teacher experimented with the program so she could demonstrate it to the students. On April 2nd, she had all the students gather by one of the computers so she could show it to them. When the teacher started playing the game, the students watched with anticipation. Several students began discussing what the apples and decorations were for that were displayed along the sides of the screen. They asked the teacher to click on them to see if anything happened. After the teacher had played for a few minutes, Carl's eyes lit up as he said, "Oh, I know! Those things

are there for every time you get a problem right!" (Field notes, 4-2-93).

The boys usually wanted to change the game to make the action part harder. The girls often wanted to change the game to make it slower and easier, or just leave the game at whatever level it was when they began to play it. When Darla and Julie were starting Math Magic on May 18th, Darla went to the challenge screen to change the game to the highest number of balls, the slowest speed, and the widest paddle. She also changed the math section to the simplest math questions (Field notes, 5-18-93).

Another of the software programs that the students especially enjoyed was Oregon Trail. This program provided a simulation of the hardships experienced by the pioneers who moved west by wagon train. It required the player to make choices at the beginning and periodically along the way. These choices directly impacted the success of the wagon train and its people. One minor element in the program was an arcade shooting gallery segment in which the player could add to the wagon train's food supply by hunting. Some of the students found the hunting action so compelling that they neglected other things in favor of hunting, especially when the game was still new to them.

After students had been able to experiment with Oregon Trail for one or two days, the researcher watched Scott working on it. He was very reluctant to read or try to

understand the text that was presented on the screen. He was much more intent on switching back to the hunting screen so he could shoot. When he was asked if he liked that part more, or if he really needed to hunt to do better in the game, he insisted that he only did the hunting because it was important for the game. However, his actions indicated that he was much more intent on making things move around the screen than he was about figuring out the best way to play the game (Field notes, 4-5-93).

Two days later, Scott was again observed working on Oregon Trail. In this incident, Scott's wagon train was in trouble because he was rushing to try to get past the problems. Instead of solving anything, he was getting further in trouble. Everyone in his wagon was about to die of starvation, and his one strategy, hunting, was not working because it was snowing and there was no game to hunt. Molly, who was working at another computer, was doing rather well. She was using the information on the screen to help her decide what to do (Field notes, 4-7-93). Later that same day, Molly and Abby were working together. They were not particularly adventurous, but they were moving adeptly through the program. They watched for words printed in darker print, or anything that something started flashing on the screen. They were aware that was one way to watch out for something bad happening. If the screen displayed information about somebody being hurt or sick, they would

choose to stop and rest. Molly said they should rest two days, because that was what she did the last time, and it seemed to help (Field notes, 4-7-93).

Carl was also at a computer doing Oregon Trail at the same time. He tried to hunt several times when there was little or no game. He did not respond to the information on the screen about there not being much game available, and he nearly depleted his supply of bullets trying to hit a fast moving rabbit. After traveling for a while, he returned to the hunting screen and killed several deer and buffalo. He continued shooting until there were no more animals on the screen. He had much more than he could carry since the game limits a hunter to only 200 pounds of meat. Carl did not seem to notice that this was a problem, or that he had killed too many animals (Field notes, 4-7-93). Later on, the teacher talked to the students about the effects of being wasteful and would admonish them if they went to the hunting screen more than necessary or killed more than the character could carry.

The computer program Where in the USA is Carmen Sandiego? was the most popular program with the students. There are many different versions of the Carmen Sandiego game produced. The classroom had another of the Carmen games, Where in Time is Carmen Sandiego?, but this game did not interest the students the way the USA version did. The basis of all the Carmen games is acting as a detective who

must use clues to get an arrest warrant and follow a criminal through several locations in order to capture the criminal and solve the case.

Most of the students preferred working in pairs on the Carmen game. Beth and Darla exhibited typical responses to the game as they gained experience with it. They read together from the screen and took turns clicking the mouse on items they selected. When they decided that they better work on getting the arrest warrant, they skipped around through the name list, called the "police dossier," trying to find a criminal who fit the two clues they had. Then they guessed. Unfortunately, their guess was incorrect, and they lost the case. They were aware that they needed an arrest warrant, but they had not figured out how to get one. They were also aware that the police dossier was a place to get information about the characters, but they had not yet learned how to use this information (Field notes, 4-14-93).

Later observations of students working on Carmen revealed different kinds of problem-solving. The next day, Paul and Alice were working together, but they had not yet developed any strategy about what to do, and they appeared to be making random guesses. At the same time, Darla was working on another computer on Carmen. She was reading the clues and using them to make decisions about what to do next (Field notes, 4-15-93).

Jason, Mark, and Scott seemed to be the most persistent about guessing. Scott would only read one of the three possible clues before he was ready to make a guess for the next city to visit. Scott did not seem to have trouble remembering where he had been, since he often backtracked and tried another of the possible choices. Jason often guessed, but seemed to be using some background knowledge about geography to select the next city, and he was frequently successful (Field notes, 4-20-93).

Students were observed using the clues more and guessing less as they spent more time working on the game. However, they usually read hurriedly through the clues, especially if they could not make sense of them quickly. They focused on the clues about favorite foods or favorite sports of the crooks. The location clues they most often used were the ones that had to do with places on the map, not names of museums, rivers, or state park names.

All the students seemed to like the cartoons and music that played at the end of each case. As the music started playing the "success" theme to indicate that he had caught the crook, Brian exclaimed, "I love this part!" (Field notes, 5-13-93). Paul and Mark, who were not close friends, worked together on a case in Carmen. They got so excited about winning the case that they started singing the music together out loud. They were reading aloud from the screen as the game announced that they had earned a promotion.

They were showing so much enthusiasm that the teacher began to laugh with them (Field notes, 5-13-93).

Another activity that the students enjoyed on the computers was using one of the drawing programs. The students had been using Kidpix and Kidworks nearly all year. These programs were used for writing text and for drawing. Kidpix had an art segment that they especially liked. Story Illustrator was another drawing program that they sometimes used. Students did not print any of the pictures they made with the painting programs. This may have been due, in part, to having a printer which did not print in color.

Even during the creative phase of experimentation with one of the painting programs, students seemed willing and able to do partner work. Jana and Darla worked for 20 minutes during a center day on the paint program in Kidpix. They were making different designs and changing back and forth as they experimented with different colors and shapes. They seemed to have a built-in sense of order about when to change. It looked like they were taking turns based on some shared internal clock. Jana or Darla would make changes to the screen, and about every two minutes they would switch places. There were no complaints or arguments about who was going to move the mouse or make the decisions. They both talked about what to do and made suggestions to each other, and they moved the mouse smoothly from one to the other (Field notes, 5-4-93).

Spelling tests on computer. Each week, students were given spelling words on Monday and were tested on Thursday. One group of students was allowed to take their spelling tests on the computers. The teacher had assigned all students to one of five different groups according to the days of the week. The students who used the computers for the spelling tests were rotated every five weeks according to which day they were assigned to. The students would set up the computers for the spelling tests, type in their names, put a heading about spelling, and number from one to twenty on the screen. The actual test usually was finished in about six or seven minutes, but it took a little longer for the students at the computers to finish and print their tests.

Students liked doing the spelling tests on the computers, even though most of them were ambivalent about the issue of having difficulty with the typing. Julie told the researcher that even though she had problems with typing she preferred doing her spelling test on the computer because that meant she did not have to write any of the words in cursive. During the same conversation, Beth said that she had some problems with typing, but it was still easier than writing, because she did not like it when her hand got tired or got sweaty holding a pencil (Interview with Julie and Beth, 4-6-93).



Writing stories on computer. Many of the students mentioned to the researcher that they had stories saved on the computers, but they said they usually did not get to go back and finish them. The teacher determined if and when students were allowed to print things they wrote on the computer. These were normally the items the teacher specifically assigned, not the spontaneous writing that the students did during their computer time.

At various times throughout the school year, the teacher asked the students to write group stories, personal stories, poems, or letters on the computers. These assignments would be printed and added to the students' portfolio collections, posted in the classroom, or sent home to be shared with parents (Field notes, 3-29-93).

Behaviors at computers in classroom. Students often demonstrated a calm and confident manner when dealing with new material on the computers in their classroom. The researcher was watching Lisa as she experimented with Where in Time is Carmen Sandiego? for the first time. Lisa appeared to be clicking on different places on the screen more at random than in response to the instructions printed on the screen. At one point she said, "I really don't read all of this." It appeared that she was not aware of any rules for the game, and she did not seem to have a particular strategy in mind for choosing her moves. She happened upon the section where all the names of people who

had played previously were located. She clicked on the name Carl. An instruction came on the screen asking, "Are you sure you want to erase Carl?" She read the sentence aloud, looked all over the screen until she found the place to click for "no," and clicked it. She did not seem at all bothered by this, and continued to explore the game as before (Field notes, 3-22-93).

On another occasion there was a problem with two of the computers. They were "freezing" in the middle of an activity. After trying a few different things to fix the computers, the teacher resorted to turning them off and then back on again to start everything over. Later that hour, the computer Toby was using froze again. He looked around, saw that the teacher was busy, and quickly turned the computer off and back on again. He restarted everything and quietly went back to his game (Field notes, 4-7-93).

One day the researcher watched as Brian typed a story on the computer. He seemed to type more slowly than some of the other students, but he continued steadily tapping with his right index finger until he was satisfied with his story. He pressed a key for the program to switch to a sound generator, and the computer began to read his story aloud. Mark, who was working at the adjacent computer, leaned sideways to see Brian's computer screen. They both watched the screen and laughed at the computer voice. Brian made the computer read the story again. He softly laughed,

quietly clapped his hands, and smiled broadly as it finished. After the teacher reviewed the story on the screen, she gave him permission to print this story (Field notes, 3-24-93).

Many of the students manifested behaviors that reflected a high level of competition in connection with their activities on the computers. Sometimes, if students were aware that someone else was working on the same program, they would look back and forth to see how many items the other student had done. On one occasion, Toby and Scott each completed more than 30 responses on a math program in about five or six minutes in an attempt to outdo the other (Field notes, 3-29-93). There seemed to be a definite gender difference, in that the boys were apparently much more intent on the competition and speed factors than the girls were (Field notes, 4-15-93).

Students worked easily with partners on the computer activities. Usually they were allowed to select their own partners. The partner assignments were sometimes made by the teacher, but this did not seem to effect how the students worked on the computers. When students were working independently, they still often leaned over to look at someone else's computer screen or to give each other encouragement or share information.

One day Julie walked up to Paul and Alan, who were working together on a computer. She tapped Alan on the

shoulder and said, "It's my day, not yours." Paul and Alan both began to complain, saying, "We just got on." Paul continued the resistance until the teacher intervened. Alan got up reluctantly, and Paul and Julie started working as partners as if nothing had happened (Field notes, 4-30-93).

Fifteen of the eighteen students had completed the keyboarding instruction in the computer lab, and the last three students were nearly finished with keyboarding, but most of the them did not attempt to type according to standard fingering when they wrote stories on the computers in the classroom. Typically, the students resorted to a one- or two-finger typing method whenever they were typing text (Field notes, 5-18-93).

Some of the behaviors observed as students worked on the computer games revealed a high level of thought processing and decision making. As Molly and Beth began a new session with Oregon Trail, they used some of the suggestions from the Help screen to choose items to outfit their wagon. Both of them laughed frequently as they chose and typed in items. Then, as they began the game, they talked about the safest way to cross the first river. They discussed whether they needed to trade or keep their cash after they had a setback. Then they deliberated over whether they had enough food or if they needed to hunt to replenish their supply. They shared information and made informed decisions (Field notes, 5-18-93).

Behaviors at computers in computer lab. The students went to the computer lab once a week on Wednesday for a 40-minute session. They entered the computer lab, immediately went to their assigned computer terminal, put on the headphones, and signed in. Brian signed in as "Nolan Ryan," and Darla signed in as "Elaine" on two different occasions (Field notes, 3-24-93). Once the session started, no one left the seat or had any contact with their classroom teacher or the computer coordinator unless they held up their hand for help.

After about 15 minutes in the computer lab, students began to get fidgety. Julie held the mouse and flipped it back and forth in her hands between the times she needed to use it. Many of the students could be seen swinging their feet back and forth under their chairs as they continued looking at the screen, reading and following directions by pressing keys or using the mouse. Sometimes Alice would trace words with her finger on the screen, as if to keep track of her place. On one occasion Jana was observed as she struggled to stay engaged with her assignment. Jana, one of the students still working on the keyboarding program, sat back and sighed softly as she faced a full screen of text to type. She typed very, very slowly and then stopped to look around and watch what was on Beth's screen. She typed three more letters and stopped again to look at what was on Julie's screen. She completed only two

lines of text in four minutes of time. At one time or another, all of the students were observed looking around the room or talking surreptitiously to one another (Field notes, 3-31-93). Students' attention in the computer lab always seemed to deteriorate before the end of the assigned time.

### Beliefs about Computers

Students revealed their beliefs about computers through many of the things they said or did. They seldom mentioned the activities in the computer lab. They did, however, freely comment about the activities available on the computers in their classroom. These comments are the basis for the following section.

Frequently, students would congratulate themselves or congratulate others when they finished a case on Carmen. Alan and Jason began to bounce up and down in their chairs when the "success" music began to play, and Jason exclaimed, "Yeah! We got him! We got him!" Then Alan asked the boys at the next computer, "Hey guys, what are you? We got a promotion. We're Inspector!" When the computer began playing the success theme music, Brian walked over to watch Alan and Jason's screen and said, "I love this part!" (Field notes, 5-13-93).

Students were often reluctant to leave the computers once they got involved in a game. After the teacher announced that they must shut down the computers to go on to

another activity, Julie asked, "Do we have to stop now?" (Field notes, 3-11-93). Students often delayed getting off the computers when they were supposed to stop or when they were supposed to let another set of students use the computers.

Occasionally students would express dissatisfaction with the fact that the teacher usually told them what program to work on. Eric complained that the worst thing about doing the computers in the classroom was, "Most of the time you have to do a certain kind of game. You don't get to choose unless you trade in 10 punches or something like that" (Interview with Eric, 5-3-93).

Sometimes students reacted differently to a new program. When the teacher was modeling for the students how to play the Math Magic game for the first time, many of the students were anxious to get to try it out. Others were less convinced. Molly said, "This is confusing." Several other students replied in unison, "No, it's not!" The teacher selected Eric to take her place to try the game. All the students were quiet and watched expectantly as he signed in. The teacher pointed out that he could change the speed of the game. Jason said, "I would put it real slow." Paul countered by claiming, "I only want the fastest" (Field notes, 4-2-93).

Some of the fascination that the students exhibited for playing Oregon Trail and Where in the USA is Carmen

Sandiego? was related to their excitement about being able to play games that the teacher had told them were really for older students. During an interview with Alan, he indicated that one of the reasons he liked Carmen USA was, "That's really a fifth grader game" (Interview, 5-3-93). Jana expressed a similar sentiment when she proudly boasted, "[The teacher] said that it was for around fifth grade, but I do it all the time" (Interview with Jana, 5-4-93).

Another reason students liked using the computers was that it felt like they were avoiding work rather than doing work. Alan described this feeling when he said, "Well, the best thing about getting on the computer is that, if the teacher just lets you get on, while everybody else is doing work, you don't have to do the work right then" (Interview with Alan, 5-3-93).

Students often joined in cheering one another when they accomplished something noteworthy in one of the games. Once when Abby was working on Oregon Trail, she reached the last segment, an arcade game at the end where the wagon must be guided as it floats down a fast moving river and is dodging rocks. She was already into this segment when the timer went off for computer time to be over. Abby anxiously asked the teacher if she could finish, since there was no way to stop in the middle of the river. When the teacher agreed, the next group of students, who were supposed to begin their computer activities, circled around her and began cheering



her on, saying, "Yeah!", "Good!", "Watch Out!" and similar things. They clapped for her when she successfully negotiated the river and finished the game.

When Lisa was playing with the Where in Time is Carmen Sandiego? game for the first time, she tended to click more or less at random as she explored the possibilities of the game. Other students also seemed to believe that experimentation was the best way to get acquainted with something new on the computer (Field notes, 3-22-93). The only student who consistently demonstrated a reluctance to experiment was Alice. Her inclination was to step away, sit back from the computer, and ask somebody else what to do. She did not find it as easy as the others to take the risk of experimenting (Field notes, 5-12-93).

Students regarded the times they got to use the computers as being very special. One day when it was time for the spelling test, the teacher told the Friday people to go to the computers. After several complaints that it was not their turn, she recalled them and told the Thursday people to go to the computers. The ones that had to vacate acted very disappointed (Field notes, 4-15-93).

The students were very possessive of the times they were assigned to do computer activities, and the general feeling was that more access to computers would be better. When Mark was asked if he got to use the computers as much as he would like to, he frowned and said sternly, "No, not

really. I'd like to practice more times." Mark was one of the most competitive students about advancing through the ranks on Carmen Sandiego. He said, "I'm the farthest in our class. I'm an Investigator. I've beat three more cases" (Interview with Mark, 4-26-93).

Students often mentioned that learning things was as enjoyable as the game-playing aspects of the computer programs they worked on. When Jason described why he liked doing Oregon Trail he said, "Well, you get to make your own decisions. And it's fun. It's just fun. You get to learn. You get to learn and have fun at the same time" (Interview with Jason, 4-26-93). Molly expressed similar sentiments about the Carmen Sandiego game. She said, "I love the way that teaches you. And also it's lots of fun" (Interview with Molly, 4-21-93). Generally, responses to questions about computers reflected the students feelings about how exciting the computer games were and the enjoyment the students felt when they got to spend time on the computers. Jana expressed this feeling most succinctly when she told the researcher in a conspiratorial whisper, "It's fun!"

Computers in classroom. The researcher asked students to compare how they felt about using the computers in the classroom with using the computers in the computer lab. There was uniform preference for using the computers in the classroom. During an interview with Jana, the researcher asked what she would change about how she got to use the

computers in the classroom. She enthusiastically declared, "I'd pick the whole day, all the hours of school!" And then she laughed uproariously. She added, "Yeah! I really like the computer at homeroom!" (Interview with Jana, 5-4-93). When Mark was asked if he liked using the computers in the classroom more than the computers in the computer lab, he immediately responded, "Oh, yes! It's a lot funner in here!" (Field notes, 3-24-93).

The students felt that they were at the mercy of the teacher about getting any extra time on the computers. This point was poignantly illustrated in an exchange between Alan and some other students. Alan finished his assignment and instead of getting something to read, he walked up behind the students who were working on the computers and began wistfully watching them. Softly, to no one in particular, he said, "I wish I could get on the computer with somebody, but nobody would let me." Paul heard him and said, "You can help us," as his partner nodded in silent agreement. Alan replied sadly, "[The teacher] wouldn't let me."

Many of the students described the ability of the computer to talk made using the computer more interesting. Scott described why he thought some of the "computer talk" was so amusing.

RESEARCHER: Is it better for it to talk to you than to be silent?

SCOTT: I think it's better for it to talk to you. If it's funny. On one, [the teacher] wrote "lollipop" on there, and he said, "loll ee pip!" and on Math Shop, he says, "Whay, thank ya!"

Then he started laughing hysterically (Interview with Scott, 4-21-93). Whenever students listened to computer-generated speech, they seemed to be amused by it.

Computers in computer lab. Students were somewhat ambivalent about whether they liked using the computers in the computer lab or not. The teacher had explained that the students had a series of 15 lessons to help them develop keyboarding skill. After they completed these lessons, they were given some reading activities that were supposed to help with phonics. The students frequently mentioned that this was easier than the keyboarding lessons. As Alan explained, "Now I'm past that part. And you get easy stuff after you're past that part. On the easy stuff you use the microphone. The headphone thing with the microphone, and talk" (Interview with Alan, 5-3-93). The students were split 50-50 about whether they would go to the computer lab for extra time if they had the chance.

Most of the students indicated that they liked the keyboarding lessons somewhat. The keyboarding lessons used some game-like actions, such as working against a timer and seeing a character move forward through some activities. Darla said, "Yeah, it's fun. But it's not THAT fun"

(Interview with Darla, 4-19-93). Lisa said, "I thought it was kind of boring" (Interview with Lisa, 4-15-93).

Students appeared to have conflicting feelings about the headphones. The phonics lessons directed students to say words into the microphone at specified times. The students would then hear their own voices repeated. Sometimes students said that listening to the computer speech on the headphones and talking into the attached microphone was fun. However, there were many protests about wearing the headphones. Jana complained that "my ears get all sweaty. They're uncomfortable" (Interview with Jana, 5-4-93).

Alice had the strongest criticisms about the headphones. She did not like wearing the headphones because they messed up her hair. She especially disliked the computer-generated voice. She said, "I don't know why they have that voice on there. It drives me nuts!" Later she mentioned the voice again. "Well, it's a stupid voice. It just sounds stupid" (Interview with Alice, 4-26-93).

Some of the students talked about how easy the phonics lessons were. Mark described the lessons and using the microphones for the verbalizations which were required as "kind of silly." He described the activities as being too simple, and he felt somewhat insulted that he had to do something that was so unchallenging. He described the

phonics activities as generally being "too babyish" (Interview with Mark, 4-26-93).

Computers at home. Students who had access to a computer at home all indicated that they used the home computer. They described their use as playing games. Although none of them could successfully identify the type or make of computer that they had at home, they were all able to identify specific games or programs that they had on their computers. Scott referred to a business program called Word Perfect Presentation as a game. In describing it, Scott said:

We have lots of neat games on there, like Word Perfect Presentation. We went where they had all this computer stuff, and we got a free game of it. But we didn't have all that picture stuff, so we had to, my dad bought seven disks, and he had to load them up, to get all the pictures. It's neat (Interview with Scott, 4-21-93).

Some of the students had some of the same programs at home that they had at school, like Kidworks or Kidpix. Jana mentioned that she had a maze game on her computer at home that she especially liked (Field notes, 5-4-93). Some of the students described doing games that they had on their home computers that were for building math skills.

Computers versus other desirable activities. Students were asked a series of questions about whether they would choose computer time over other activities they liked. All of the students were asked which they would prefer, doing the things on the computers in the classroom or doing the things in the computer lab. Most answered very strongly in favor of the classroom computers over the computer lab. Most of them also characterized the activities in the computer lab as boring. Scott, Alan, and Darla described in detail how frustrating it was to wait for the computer to do something. They felt that the computers in the computer lab were too slow, and the voice production was distracting rather than helpful. No one described any of the programs on the classroom computers as boring (Field notes).

Two students said they preferred the computer lab. Molly said she liked the computer lab "because it's sort of like the computer's challenging you to get through everything." She was very focused on the idea of learning from the computer and felt that she was learning important things in the computer lab. Molly reported that doing the easier lessons on grammar and phonics was more fun to do than the keyboarding. She said she thought she would enjoy going back to the computer lab for extra time, but they never got to do that (Interview with Molly, 4-21-93). In spite of her extreme dislike of the headphones, Alice said she preferred the computer lab over the computers in the

classroom, but she indicated this was only because of one particular drawing activity that came at the end of certain lessons. She especially enjoyed getting to paint those screen pictures. Otherwise, she preferred the activities on the computers in the classroom (Interview with Alice, 4-26-93).

Another comparison question asked students to choose between working on the classroom computers or doing their favorite center activity. Of all the students who responded to this questions, only Jana did not immediately choose the computer, and it was extremely difficult for her to make a choice. After the researcher continued to urge her to decide and pressed for an answer, she finally said that she would probably choose pattern blocks since she liked them and very seldom got to do anything with them (Interview with Jana, 5-4-93).

Another question was asked about choosing between going outside for break or doing computer activities. The students were evenly split on this question, and some of the ones who chose going outside qualified their answers with additional factors. Mark found it very hard to choose and managed to create an unexpected compromise. He said, "I don't know. They're both fun!" Then he said, "If it wasn't my day on the computer, and no one brings a soccer ball, or no one brings any other ball, I would stay inside." Then he



thought a few seconds more and added, "Or I would bring the computer out!" (Interview with Mark, 4-26-93).

Value of computers. The highest value that the students placed on using the computers revolved around the level of fun or amusement that they perceived. They typically described the things they liked by referring to them as being fun, and computers and the computer programs in their classroom were frequently described as fun. Students liked having colors on the screen and getting to use a mouse instead of only the keyboard. They also alluded to having preferences for programs that played music.

The students frequently mentioned that using the computer was important because they were learning new things, and learning was very important to them. Darla said, "I like Oregon Trail [because] it helps you learn what it was like to live back in the old days" (Interview with Darla, 4-19-93). Jason said, "Computer have programs that help you learn. Like the Oregon Trail helps you learn about history. And Kidworks helps you learn your keys. And Once An Enchantment helps you learn about how to make stories to be a writer" (Interview with Jason, 4-26-93). Mark mentioned, "Well, on Math Magic, and Math Shop, there are math things and you can, it gives you problems and it gives you a chance to do math things, doing math problems and other things, like divided by and multiplications" (Interview with Mark, 4-26-93).

When students complained about the computers, their complaints usually revolved around their difficulty with typing. When Lisa was explaining why she actually preferred doing her spelling test on paper rather than on the computer, she said, "I'm not used to typing on the computer. And the typing part slows me down" (Interview with Lisa, 4-15-93). There was always a sense of urgency to hurry through things on the computers. Every time students worked on computer activities, they were working against a time limit, and they never felt that they had enough time.

#### Description of Teacher

The teacher was one of six second-grade teachers at the elementary school. In a phone interview with the researcher prior to the commencement of observations, she said that she helped to set up the computer lab at this school and that she had four computers in her classroom which she used for student activities (Interview with teacher, 3-2-93).

#### Beliefs about Literacy

The teacher described herself as an "integrated teacher." She did not think that she was a whole language teacher, since she believed that whole language teachers integrated language activities through the entire curriculum and did not use any skill activities. She, however, used skill activities at certain times, because she felt that this was a way that she could verify students' understanding

of important rudiments of language. During an interview she explained this in the following way:

I feel like they've got to have a skill lesson in there, too. They can't just learn it all just from reading a book. And you know, maybe they can eventually, it'll kick in. But I feel like they learn it quicker if I go back and cover it. And it may just be a 5-minute lesson (Interview with teacher, 3-9-93).

She believed in the importance of sustained silent reading. She mandated a 15-minute silent reading period during every class just prior to lunch. She also recognized the value of modeling what she wanted the students to do by always reading without interruption during the students' reading time.

She valued journal writing and had the students maintain a collection of their writings in a portfolio that was periodically reviewed and sent home. Every week students did numerous writing assignments, including stories, letters, and poems.

She directed writing workshop activities every Wednesday for students to write and do editing conferences with each other and with her. She was very exacting in requiring that students work alone unless they were at the editing stage. When she saw two students whispering to one another during writing time, she said, "You are working by

yourself. Unless you are editing, you are not to be talking" (Field notes, 3-11-93).

She encouraged invented spellings and praised all written efforts. During one activity students made a list of synonyms to be written on Easter eggs. She asked that a few of the words be deleted or changed, but she let the students keep the majority of the word choices they had made (Field notes, 4-5-93). There were always examples of children's writing displayed on the walls, which was an acknowledgment of the value of their writing efforts.

She seemed to struggle with combining the traditional elements of her teaching style with her more holistic approach to language development. There were many worksheets used throughout the day. Traditional teaching techniques seemed to be predominant, and she perpetuated a teacher-centered room rather than a child-centered room.

#### Use of Computers

The teacher was still relatively a novice computer user. She had been teaching at the second-grade level for four years; previous to that she taught in junior high for five years. She mentioned that while she was at the junior high she had a computer placed in her room. It was unused because she didn't know anything about it and didn't know what to do with it.

Her experience with computers had really started two years prior to the time this research project was initiated.

She had been working on her master's degree and to complete an internship she had been the vice principal of the summer school. During that summer, the requirements of the position forced her to become more familiar with computers. She said that was how she learned how to do things on the computer, by being forced through necessity to experiment and learn things. She said:

[At first, it was] mostly word processing. Then they had the computer lab open, and we [she and the others who were working that summer] had to bring up the computer lab. And I just got where I wasn't so afraid. I know if I messed something up, it would just not do what I wanted it to. It wasn't going to blow up or anything (Interview, 3-9-93).

The teacher used the computers in her classroom for typing messages to send to parents. She sometimes printed worksheets for students. She also kept some of her grade-book records on the computer. She spent some time familiarizing herself with each new software package that came so that she could demonstrate it to the students and help them get started using it.

There were times that she became frustrated with the computers. On one occasion, when she attempted to print out a copy of her class roll, she became baffled because she kept getting an error message from her disk. After three tries, she turned away from the computer and said, "I'll

have to figure this out later" (Field notes, 3-4-93).

Several times during one particular day, different computers would freeze where they would not accept an entry from the keyboard or the mouse. The teacher was perplexed and resorted to turning the computers off and back on.

Fortunately, this appeared to work (Field notes, 4-7-93).

#### Beliefs about Computers

The teacher was aware that students were most strongly motivated to work on the programs that had been the most recent additions to the computers. When she was asked about Math Shop, a program that had been on the computer since the beginning of the year, she said:

They don't do it any more. They don't do it any more, because they do the Math Wizard or I let them do Oregon Trail for math because it's got all the money. Or they'd rather, now all they do is Carmen Sandiego. And they don't do anything else! (Interview with teacher, 5-6-93).

The teacher was aware that some of the appeal of the Carmen Sandiego game was the fact that it was a contest, against the computer and against each other.

I think part of it is just the competition, because I've heard them saying, "Well, I'm an investigator," or "I'm a senior investigator." And they know when they go back to the computer now that the game's going to pick up wherever they left off. So they're going to

have the chance to advance. And I think that's part of it, the competition of catching the thief, and that's fun (Interview with teacher, 5-6-93).

The teacher recognized that the students were willing to experiment, or "mess around," with the computers in order to figure things out. She remarked:

So much of the time the kids are able to figure out something on the computer that I don't know how to do. Like they'll do something, and I'll see it and say how did you do that? And they'll just say, "I just figured it out" (Interview with teacher, 5-6-93).

She admired this experimentation, but she did not openly encourage it.

The teacher believed that using the computers was a fringe activity. It was not, and need not be, a center item of the curriculum. She described the computer activities as extra items, and she manipulated the time on the computer as rewards to be doled out carefully. She perceived the competition element of the programs to be the ingredient by which students were most highly motivated.

#### Summary

This chapter presented the major findings of the research. Information was presented to describe the school, the central teacher in the study, the students, and the

classroom in which they functioned in order to firmly ground the findings in the qualitative data gathered.

The main focus of this study was to describe how computer use functioned as an aspect of students' literacy development. The findings of this study suggest that students' literacy development can be categorized by looking at different types of literacy behaviors in which the students engaged while at school. The literacy behaviors identified were: silent reading time, reading in the library, story time, book time with the researcher, reading during show and tell, reading aloud during science or social studies, language arts assignments, writing in base groups, journal writing, spelling, reading with buddies, and other evidences of literate behavior. The findings further suggest that students' beliefs about literacy revealed vital information about their literacy development. The literacy beliefs which were identified were: choices of best reader, descriptions of what a good reader does, choices of best writer, descriptions of what a good writer does, characterizations of self as a reader, characterizations of self as a writer, and other evidences of students' beliefs about literacy.

The findings also suggest that a description of students' use of computers reveals a relationship between computer use and literacy development. The computer use was identified in the following categories: access to



computers, conflicts over access to computers, favorite computer activities, spelling tests done on computer, writing stories on computer, specific behaviors seen at the computers in the classroom, specific behaviors seen at the computers in the computer lab, use of computers at home, use of computers compared to other desirable activities, and student perception of value of computers. The findings suggest that computer use appeared to operate as an element of the students' overall literacy development. Students were found to interact with the computers in ways which helped to build their abilities in reading and writing.

The findings further suggest that the teacher's beliefs about literacy, her own history with and use of computers, and her beliefs about computers directly impacted the level at which computer use functioned as a part of the students' literacy development.

## CHAPTER 5

### THE DISCUSSION OF FINDINGS

This study arose from an interest in computers in schools and how this use contributed to the literacy development of students. Literacy development is itself all pervasive in the early years of children as they experiment with the facets of language: listening, speaking, reading, and writing, and the importance of language development continues through their entry into elementary school. The ability to successfully manipulate language and the acquisition of facility with reading and writing are inalterably intertwined with all other learning that occurs during these formative years. This study looked for a new thread in this tapestry of learning--literacy abilities developing in connection with reading and writing on computers.

The teacher in whose second grade classroom this study took place expressed a belief that computer use in school was important to the general learning of students. She had four computers available in her classroom, and she said that these computers were used daily by the second graders in her class. This site appeared to be suitable for a study of the

relationship between computer use and the overall literacy development of students.

#### Overview of the Study

The key participants in this study were the 18 second-grade students and their homeroom teacher. Field observations were documented with field notes, multiple interviews with the teacher, group interviews with two or more students, and interviews with individual students. Various artifacts were collected, including written interviews with the students, printed copies of stories students wrote on computers, and other classroom documents. Analysis of these data provided information about the literacy of the students, their beliefs about literacy, their use of computers, their beliefs about computers, the teacher's beliefs about literacy, the teacher's use of computers, and the teacher's beliefs about computers.

From this data, findings arose which indicate a relationship between the reading and writing that occurs in connection with computer activities and the overall literacy development of students. Other findings emerged which indicate that a wide range of literacy behaviors occur in the school setting. Findings suggest that students' beliefs about literacy and computer use have direct consequences on their literacy development. Further results show that the teacher's beliefs about literacy and beliefs about computer

use directly impact students' literacy development through computer use.

#### Addressing the Research Questions

This study began with some basic questions about the nature of computer use in educational settings. The researcher sought information about how computer use might be functioning as an aspect of the overall literacy development of students who perform reading or writing tasks with computers. The specific question which guided the beginnings of this research was: When considering an elementary classroom in which computer use is being incorporated across the daily curriculum, how does that computer use function as an aspect of the students' literacy development?

The researcher chose to pursue answers to the following supplemental questions in order to gather information related to the primary question:

1. In what ways are computers used in the elementary classroom under study, and how is this computer use related to literacy development?

2. What relationships between computer use and literacy development are revealed by students' views of the computer use in the classroom?

3. What relationships between computer use and literacy development are revealed by the teacher's view of the computer use in the classroom?

Qualitative methodology was used to develop hypotheses about computer use and its role in literacy development. The researcher assumed the role of participant observer in order to gather qualitative data which could shed light on these questions.

Results suggested that the literacy behaviors of the students could be divided into the following categories: (a) silent reading time, (b) reading in the library; (c) listening during story time; (d) book time with the researcher; (e) reading during show and tell; (f) reading aloud during science or social studies; (g) working on various language arts assignments; (h) writing in base groups; (i) journal writing; (j) spelling activities; (k) reading buddies; and (l) other evidence of literate behavior. Students' beliefs about literacy could be revealed in the following categories: (a) students' choices of the best reader; (b) what a good reader does; (c) students' choices of best writer; (d) what a good writer does; (e) characterization of self as a reader; (f) characterization of self as a writer; and (g) other evidence of beliefs about literacy.

The students' uses of computers could be classified in the following ways: (a) gaining access to computers;

(b) conflicts over access to computers; (c) students' favorite computer activities; (d) doing spelling tests on computer; (e) writing stories on computer; (f) student behaviors at the computers in the classroom; and (g) student behaviors at the computers in the computer lab. The beliefs that students felt about computers appeared to fit the following categories: (a) beliefs about computers in the classroom; (b) beliefs about computers in the computer lab; (c) beliefs about computers at home; (d) comparing computer use with other desirable activities; and (e) beliefs about the value of computers.

The results also suggested that the teacher's role in the literacy development of her students could be described in the following categories: (a) teacher's beliefs about literacy; (b) teacher's use of computers; and (c) teacher's beliefs about computers.

Through the data analysis technique of coding and recoding, the researcher was led to credit the categories identified here as being the most significant elements within the broader classifications which emerged during data analysis. The data in the major categories were subsequently reviewed in order to generate theories which could be postulated from careful reflection on the findings in each category.

### Analysis of Student Literacy Behaviors

Students were found to exhibit a number of literacy behaviors during their school day. Each literacy event, identified as a specific interaction with text by either reading or writing, was noted. The findings suggest that the students were able to accomplish activities as directed by their teacher. Students' experiential base of knowledge about literacy was being increased as they successfully completed writing assignments. Their competence as readers was expanding as they encountered diversity in texts, and because they practiced reading daily. The findings further suggest that students interacted with print energetically with or without teacher direction.

Successful readers also tended to be equally successful with writing activities. There was a clear relationship between the ability to read well and the ability to write well. The most creative stories were produced by students who exhibited well-established patterns of reading for personal pleasure and who were self-aware of their own strengths as readers.

Students who were accomplished readers and writers were not necessarily adept at oral reading. Those who were most willing to read orally were sometimes actually less skillful at oral reading than students who did not volunteer habitually. Findings point to a probable relationship between the relative success of students during oral reading

and their own sense of self-confidence and self-worth. Students with a secure feeling of self often demonstrated this security by their willingness to take risks, and they tended to perform before their peers more freely.

Writing and reading abilities were not found to be entirely equivalent. The one student who demonstrated a regression in reading was found to be moderately successful with writing. Other students were found to produce written material of uneven quality. The difference appeared to be related to students' feelings about the writing assignments. This probably indicates that a strong connection between personal interest and specific involvement in the writing task is necessary for students to invest enough time and effort to express themselves adequately.

Findings suggest that students preferred interacting with others as they accomplished writing tasks. Students worked willingly in the base groups to create group stories. Even when conflict arose on substance or form, students found ways to negotiate compromises. They derived a clear measure of personal worth and a feeling of speciality from participating in the creation of a group written product that was well-received by the rest of the class. A sense of ownership was displayed when students discussed the group stories or other group writing activities.

When students talked about their group writing products, their comments were nearly identical to the



remarks they made about stories they produced independently. This finding suggests that the feeling of personal ownership of written work is not limited to those items which are produced independently and in isolation from others.

Students exhibited a need for social interaction during silent reading that was consistently suppressed by classroom policy. Students demonstrated a strong yearning to share their responses to reading material and to talk about their books as they interacted with the print. Groups of two or three students would form spontaneously as students gravitated to different parts of the room during the silent reading time. Even though talking was strictly prohibited during this reading time, some students persisted in surreptitiously whispering as they furtively glanced at each other's books.

Interaction with other students, either in their own class or with reading buddies from the fifth grade, enhanced the students' abilities in reading and writing. The second graders took their fifth-grade reading buddies' editing advice very seriously. Internalization of writing corrections was apparent as certain suggestions appeared in later writing efforts.

#### Analysis of Student Beliefs about Literacy

Students expressed a wide variety of beliefs about literacy. They were able to articulate more effectively about reading than about writing. Students generally were

able to identify the importance of comprehension when they discussed reading. They often misidentified writing as being handwriting rather than a process of composition, although they demonstrated knowledge of the underlying thinking necessary to produce writing. These findings were consistent throughout the students under study.

Students thoroughly enjoyed being read to. The majority of the students also proclaimed that they enjoyed reading silently. This was supported by observations of students actively engaging in silent reading tasks. Each of the students was observed to be fully engaged with print at some point during the research project. With the exception of two students who expressed negative feelings about reading, all of the students were observed reading without interruption during one or more of the assigned silent reading periods. They also revealed very definite preferences for particular items when they selected reading material. Certain students were observed reading the same books or magazines multiple times.

Oral reading was an area of literacy about which the students voiced definite opinions. Some students enjoyed performing by reading orally. This was most powerfully demonstrated when students read from their own compositions. Students frequently described the good readers as those individuals who could read aloud with confidence. Because the teacher requested students to read aloud at some point

nearly every day, it is reasonable that students would acquire a belief that oral reading should be highly valued.

Most students thought of writing in concrete terms such as handwriting, rather than in terms of composition. They frequently mentioned their distress over the need to develop their abilities to use cursive writing. Students had a great deal of difficulty characterizing a good writer because their internal definitions of "writer" were unclear. However, students demonstrated a knowledge and an understanding of the compositional nature of writing when they were guided into a consideration of writing as something other than handwriting. When students discussed writing in this way, they conveyed recognition of the importance of audience and purpose, they were able to discuss the role of author, and they clearly discerned between fiction and non-fiction writing.

#### Analysis of Student Use of Computers

Students were uniformly in favor of doing activities on the computers in their classroom. They looked forward to the times they were allowed to get on the computers with great anticipation. On the occasions when students were given the opportunity to spend an extra 10 minutes with the computers, they were delighted. Students approached the computers eagerly and without hesitation.

Many of the computer software programs which they were allowed to use were rather complicated, but this had no

apparent effect on their willingness to experiment with them. In fact, this seemed to be part of the appeal, since they expressed pleasure with the fact that they were using programs meant for older students. Students explored the computer programs freely and exulted in their triumphs. Many times their successes were wholly accidental, but that did not detract from the students' genuine excitement.

There were certain elements of the activities that took place in the computer lab that were pleasurable, but students appeared to be rapidly losing their enthusiasm for them. Students demonstrated pleasure mixed with relief each time they completed a segment or lesson in the lab. They checked with each other to see which students were on the same lessons, especially to see if they were ahead of someone else. Even the things students indicated that they liked about the computer lab, such as the drawing program that periodically appeared as a reward, did not hold their attention for more than a few minutes.

In the computer lab, students began to get fidgety well before the time limit expired on the networked lessons. They would swing their feet back and forth under their chairs, lean back and look around the room, whisper to a neighbor, fiddle with the mouse or headphones, or prop their heads on their hands. Students sometimes looked up and laughed aloud at the sound of some other student's voice repeating a word into the microphone.

These behaviors seem to indicate that the amount of time scheduled for second graders in the computer lab was inappropriate for their attention spans. It may also indicate that the software was inappropriate for them. Both of these conjectures are plausible, because students were not required to work unceasingly on any other activity for that length of time. Several students indicated that the grammar programs which came after the keyboarding lessons were much too easy for them. This was evident as students were sometimes seen impatiently pressing keys repeatedly trying to get the computer to go faster.

Much of the students' frustration with the computer lab appeared to be related to the double isolation of being placed in separate computer cubicles and being required to wear headphones. Students found the headphones either bothersome or silly. The headphones were used for listening to the computer program speaking instructions and for the students to say words as the computer program directed them. Even students who did not mind the bulkiness of the headgear commented that using the microphones and headphones in this way was foolish for students who already knew how to read. The greatest appeal of going to the computer lab was the fact that every individual student had access to a computer all at the same time.

Three of the students were still working on the keyboarding lessons that the other students had finished,

some as much as several months earlier. The level of frustration that these three students demonstrated was almost palpable. Their time in the computer lab was spent in laboriously tapping out phrases and sentences. There was little or no effort from any of the students to maintain even the facade of using correct fingering. If the classroom teacher or the computer coordinator stood behind them in the computer lab, the students put their hands on the home row. Some students attempted to use some standard fingering, but even those students stopped as soon as the teacher walked away.

The computer programs in the classroom had many facets which appealed to the students. The students were strongly motivated by the game-like elements in the software. They liked the animation and music from several of the programs that they had on the computers in the classroom. Sometimes students sang with the music. Whenever music or sound effects started to play on one of the computers, students in other places in the room would look toward the computers to see what was happening. They were very drawn to the sounds.

Boys and girls demonstrated different degrees of motivation related to the competition inherent in some of the game formats. The boys who had experience with Nintendo or similar arcade style games found greater appeal in the time-related competitive elements of the educational games. Findings suggest that students who described having

experience with arcade-type games, typically having a fast moving pace, an emphasis on physical coordination, and an importance of scoring, tended to operate the educational programs in a more superficial manner. These students showed far less evidence of problem-solving behaviors than the students who were not experienced with arcade games. The arcade game players tended to be reactive, relying predominately on guesswork and luck rather than thoughtful mental processing of information.

Less competitive students, including a few of the boys and the majority of the girls in the class, preferred slower-paced activities which made fewer demands on coordination and more demands on thinking and reasoning. The boys who preferred the competitive games were frequently heard boasting about what levels they had achieved on the Carmen Sandiego game. Girls seldom, if ever, mentioned what level they had reached. Girls also were observed spending several seconds puzzling about one specific clue. Boys tended to rush and preferred to guess rather than spend even a few seconds attempting to muse about a clue. The boys who played Carmen Sandiego in this way actually turned the program into a kind of arcade game by the way they played it.

Because students perceived their contact with the computers as "play," they exhibited a high level of motivation and attention. The elevated intensity of the

interaction during play appeared to result in a higher than expected degree of learning. Their highest praise for the computers or the computer activities was calling it "fun." This type of praise was offered by many students under many different circumstances.

Students also demonstrated a high level of preference for working on computer activities with a partner. They exhibited the need to have social interaction with other students while involved with computer activities. This need for sharing was evident even in the computer lab where isolation was strictly enforced. Students often whispered to each other about what was happening on their screens, and students leaned to look around the carrel walls to look at their neighbors' computers.

Students interacted with print every time they encountered text on a computer screen and every time they entered text with the keyboard. They demonstrated the same type of problem-solving in connection with their activities with computers as they exhibited in their interactions with other types of print. The findings suggest that the literacy behaviors observed in connection with computer use were contributing to overall literacy development.

#### Analysis of Student Beliefs about Computers

Students felt very positively about their experiences with computers and looked forward to their time on the computers with great anticipation. They did not, however,



have a clear mental image of a difference between the hardware and the software. They often referred to a piece of computer software as if it were the same thing as the computer that ran it. This appeared to be a function of their limited knowledge about how computers operate.

These findings suggest that some of the students' interest in using the computers in their classroom was a result of the novelty of having new programs added periodically to the classroom computers. Students seemed to be motivated by the novelty factor in many cases. The teacher sometimes designated specific programs for students to use, but even when the students were allowed the freedom to choose any activity, they invariably selected one of the most recent additions. Students tended to have one particular favorite program at a time, and this favorite was usually displaced when new items were made available.

The students tended to reflect the teacher's attitude about access to computers being a privilege. Doing computer activities was one of the most special activities available to them, and students often ranked computers as their highest preference among their favorite activities. For some students, computer activities even took precedence over their desire to play outside.

Students jealously guarded the times that they were designated to use the computers and vigorously sought additional opportunities to use the computers. They would

sometimes elaborate the truth or outright lie in order to have extra turns or to extend their time on an activity. There was some evidence of a feeling that getting extra time on the computer showed that you were a better student or a smarter person, because only people who consistently finished their work even had a chance.

Students did not spend much time in contemplative thinking while they interacted with text on the computers. This was predominately a function of the limited amount of time that was generally allowed for computer activities. The students always felt rushed, and they hurried through most activities because time was limited. There was no indication that the teacher was aware of this tendency to rush or ever attempted to intervene.

Students seemed to repeat behaviors when they worked on a computer activity successive times. Experiencing a measure of success with one strategy caused students to continue using that technique. If they randomly guessed during their initial experience with a program, they tended to continue guessing unless they learned another approach from a new partner or by watching other students.

Students had mixed feelings about writing stories on the computers. They enjoyed seeing their stories printed, and they were entertained by the program that allowed them to turn some of their words into pictures, creating rebus stories. They also liked the program that allowed them to

hear the computer read what they had written. However, the students were uniformly negative about the amount of time and effort it took for them to type the words of their stories into the computer. Trouble with typing was their continual complaint.

Even though nearly all of the students had completed the series of keyboarding lessons in the computer lab, they typically made no effort to use any standardized fingering. Most students persisted in using a one-finger hunt-and-peck style of typing. Students had been taught about the keyboard and the location of the letters, but they were not formally being taught how to type. There was no apparent effort to guide the students into developing typing skills, or any follow-up instruction to get them to continue using the fingering that the lessons in the computer lab had covered. When students were not working on a keyboarding lesson, fingering did not matter to them. Students considered the one-finger method sufficient, even though they complained about how slow it was. They typed this way because they did not know anything else.

Students highly valued their time on the computers, even the time in the computer lab where the activities were generally less interesting to them. One reason they valued this computer time so much was because every student had a computer to himself or herself. The relative "fun" of the programs that they were required to do in the computer lab

were offset by the fact that they each got to use their own computer for that period of time.

They uniformly acknowledged computers as a source of learning. Many students described computers as being the combination of something fun with something that allowed them to learn new things. The students often expressed feelings about liking to learn new and interesting things. They were intuitively aware that if that learning was taking place in connection with pleasurable activities, they would probably learn even more.

#### Summary of Student Behaviors and Beliefs

Findings suggest that the literacy behaviors observed when students were interacting with computers were parallel to their other literacy behaviors. The reading and writing that students do on computers is commensurate in the impact on their literacy development with the reading and writing that they do in more conventional ways. The results of this study point to students' having a high degree of preference for working socially when they read and write in conventional ways and a similar preference for working socially when they interact with computers.

The behavior of the students was consistent in their enjoyment of hearing someone read to them. They displayed definite preferences about the types of things they elected to read, the types of things they enjoyed writing about, and the types of computer activities they found attractive.

### Analysis of Teacher Beliefs about Literacy

The teacher demonstrated some ambiguity in her theoretical approach to teaching. She attempted to guide the students with language arts activities which were in line with current theories of whole language by encouraging reading and writing with a wide variety of experiences. She acknowledged the need of students to work in groups and designated certain times for students to work with partners. She had identified center activities which were effective in reinforcing factual material that had been presented in various subject matter areas.

The rest of the teacher's approach to teaching seemed to reflect a traditional teacher-centered approach to classroom management and teaching. She believed that any social interaction during reading time was inappropriate. She used commercially-prepared worksheets for a large portion of classwork that was done by the students.

The findings suggest that this teacher is in transition as an educator. She appears to be moving away from some of the familiar traditional techniques which she probably used in previous years in favor of more holistic integrated activities. She appeared to be aware of her position between theoretical stances, because she referred to herself as an "integrated teacher," but "not a whole language teacher."

### Analysis of Teacher Use of Computers

The findings suggest that the teacher was aware of her position as a novice computer user. She was no longer a rank beginner, but she was aware that many times the students knew things about using computers that she did not know. She had acquired enough expertise with operating computer software that she was able to load programs on the four computers in the classroom without difficulty. She would experiment with new software in order to demonstrate it to the students.

The teacher was aware that her approach to computers had changed from "hands-off" to "hands-on." She was now willing to experiment with the computer where she had been afraid to try things only two years earlier. The findings indicate that the teacher had probably ceased to be insecure about computers and, in fact, was now one of the leading proponents in her school district for incorporating computer activities into the classroom.

### Analysis of Teacher Beliefs about Computers

Findings suggested that the teacher regarded computer use as a fringe item. She consistently referred to computer time as being extra activities that were not part of the regular curriculum. She was aware that some of the students experienced a high level of motivation because of the competitive elements in some of the games. She neither encouraged nor discouraged the competition, but accepted it

as a given. Extra opportunities to work on the computers were given as rewards.

Because the teacher had ceased to be hesitant about experimenting with the computers, she was more willing to allow students to be adventurous with them. She seemed to be intuitively aware that the students were drawn to the novelty of the most recently acquired computer programs, but she did not make any effort to guide them to continue using the older programs.

#### Consequences of Teacher Beliefs about Computers

The teacher seemed unaware of the extent to which students were engaged in literacy events when they were interacting with computer activities. She was aware of the language and vocabulary that students were gaining from Carmen Sandiego and Oregon Trail, but she did not acknowledge this in any way, nor did she attempt to tie this consequential learning to any other academic activity. Students might have been encouraged to expand the lexicon of words they used in writing if the teacher had devised writing activities that included the new words that students were encountering on the computer.

The teacher did not appear to recognize that there was a vast difference between her perception of computer use and the students' perception of computer use. She seemed to equate the computer activities with other supplemental work that students did in center activities. The teacher's

attitude indicated that she understood that the activities were obviously fun for the students, but that she felt they were incidental work that could be added or subtracted without consequence.

The students saw computer activities as avoiding work. They felt that using the computers was more like play than work. Because the teacher was unaware of the extent to which the computers and the computer games were impacting the students' literacy, she was unable to capitalize on this incidental learning by connecting it to other classroom activities.

#### Unexpected Findings

Unexpected findings came from a review of the specific words students used to refer to computer use. The students' choices of words were consistently different from the words the teacher used. The students invariably referred to their use of computers as "play" or "playing." There were 24 instances when the word "play" occurred in a student quotation in reference to computers. Some examples of these statements were:

"You don't get to play with the mouse hardly."

" And you get to do this other kind of stuff and play around with the computer."

"I like playing on the computer and stuff."



"If they didn't have a soccer ball, I'd rather come back and play the computer."

"She just played around with the keys and then she was on the next level."

They also used the words "beat," "fooling around," or "messaging around." They sometimes used the word "work," but far less frequently than "play." In addition, students referred to any and all computer programs as "games." This included Microsoft Works, Kidpix, Kidworks II, the programs in the computer lab, as well as the programs which could genuinely be considered games.

The teacher typically used different words to refer to the students' use of the computer. She predominately used the word "work" in connection with students using computers. She never referred to students' computer use as "play." On one occasion the teacher described a student as "messaging around" as a criticism.

This review of word choices may reveal a fundamental difference in the way children and adults view learning. The children's language seems to reflect the thoughts of early childhood specialists who point out that the learning of children is predominately couched in the elements of play, and that play is the best construct for ensuring that desired learning takes place.

The element of play that was evidenced in the students' relationship with the computers is also congruent with the

theories of Vygotsky (1978) who described learning as taking place within social contexts. The students found it very difficult to be isolated from one another as they interacted with the computers. This was evident even in the computer lab where isolation was strictly imposed.

### Significance and Implications

Among the different ways a computer can be viewed, there are two metaphors which seem to apply to the ways computers are used in schools: a computer is either a delivery system for information or it is a language tool. By looking at the computer as a language tool, the researcher found evidence that suggests that computers occupy a pivotal role in the language development of young children who interact with computers.

The primary findings of this research suggest that computers are found to function as a language tool when they are used in connection with reading and writing activities of children. The results of this study suggest that computer use in the classroom functions as an element of the overall literacy development of the students, regardless of the overt curricular purposes for the computer use, as long as students interact with text in some manner, either by reading or writing.

Students must have some degree of control over the computer for it to operate as a language tool. This is

analogous to students needing some degree of control over the reading and writing that they do in order for them to internalize its importance.

Children develop language skills by building on previous knowledge and acquiring more mature abilities with language. As students develop their abilities in reading and writing, they ultimately reach a level of proficiency recognized as conventional literacy. Students at the second-grade level are still in the process of developing their abilities with language and are attempting to move toward a more adult level of competence in reading and writing. Students in the classroom under study were seen to use computer activities as a normal part of their everyday activities and this computer use operated as one of the aspects of their overall literacy building.

In order for students to successfully interact with book text, they must have acquired a certain level of proficiency. Interacting with text of similar complexity within a computer program necessitated the same level of language proficiency.

These findings suggest that educators are neglecting a meaningful area of students' literacy development. Computers are contributing to the growth and development of students' uses of language in ways that are scarcely being acknowledged.

### Implications for Educators

These findings point to the need for educators who incorporate computer activities in the curriculum to become more aware of the effect these activities have on literacy. Any computer activity which requires a student to interact with print, either by reading from the screen or by entering text with the keyboard, is operating as an element in that student's ongoing literacy development. Students frequently acquire new vocabulary and hone their problem-solving skills by operating computer programs or games. They are building their literacy skills with computer activities in many of the same ways that they are building literacy elsewhere. Computer use appears to have an impact on students' overall literacy that has seldom been noticed. This contribution needs to be acknowledged and augmented by educators who are cognizant of this fact.

One way that a teacher could make use of the literacy effects of the reading and writing that takes place in connection with computer use is to use the vocabulary that emerges from a computer program. For instance, as students in this study were becoming acquainted with the Carmen Sandiego program, they learned several new words to identify hair colors, including "raven," "auburn," and "flaxen." A vocabulary lesson could have been devised to share with all the students ways of describing hair colors. It could then be expanded into a lesson on the variety of words that exist

to describe color or an etymology lesson on the source of those words.

The Carmen Sandiego games describe geographical locations. Using an unlabeled United States map, students could develop their own informational maps and add factual information as they learned things in the game. Students might write out lists of clues with the answers to share with each other. A teacher could assign students to make lists of certain categories of geographic or historic facts as they uncover them in the game to build students' understanding of geography.

The computer programs should be used as springboards for writing projects. The students enjoy working with a partner; thus, they might be assigned to write partner stories based on what happened in one of their cases. This might also be an opportunity to use new vocabulary words or new information about geography.

Teachers need to be aware that competition and speed requirements in games affect students differently. Having sensitivity to how students react to the arcade elements of educational games would allow teachers to pick software that is most suitable for their classes and to monitor the programs' use. Teachers should also take note of the students who do not respond to the competitive elements of some computer programs and be careful not to disenfranchise these students by having only highly competitive educational

games. They should also be alert to the possibility that a gender difference may be part of the disparity with boys gravitating toward the competitive games much more than girls.

Computer activities should be selected with specific learning in mind. However, teachers need to be aware that the highest level of student involvement occurs when students are having fun with the computer. Therefore, software that is being evaluated needs to be reviewed for its child-appeal as well as for the facts that are conveyed to students.

Teachers need to know that the reading and writing students do with computers are as important to overall literacy development as conventional reading and writing. Therefore, when students are required to do independent or silent reading, it should also be acceptable for students to choose, as reading material, a computer program that has a high degree of interaction with text.

The findings from this study also point to a need for teachers to incorporate more partner reading and to allow a degree of verbal sharing during silent reading. This could even be incorporated into the type of DEAR time described in this study, by the teacher modeling for students how to share information with a reading partner so that it does not disturb other students who are reading privately.

This study also points out a need for teachers and administrators to be guided into more effectively utilizing the computer resources which are available to them. The teacher in this study is to be highly commended for her efforts to include computer activities in her classroom and for the advances she has personally made in using computers. However, when computers are used infrequently and remain fringe items or rewards, educators are not getting full use of a relatively scarce resource.

There also appears to be a need for a more structured approach to the selection of software. Educational goals could best be reached by selecting software items on the basis of suitability to the target users and relationship to the subject matter that the software is expected to support. Teachers need to be guided in how to evaluate software for their students' needs so they can make informed choices.

This study also revealed the importance of instructional planning for computer uses in the classroom. Teachers would benefit from training for integrating computer activities into the curriculum. The lack of instructional planning leaves a classroom teacher without a clear view of how computers and other technology can be used in the educational setting. Teachers need to be made aware of the social aspects of computer use, the impact of computer use on students' literacy development, and the need

to plan for the instructional impact of computers in the classroom.

#### Suggestions for Further Research

There is much research left undone. This study has suggested a different way of looking at computer use in educational settings. Much is already known about the successes and failures of the computer as a delivery system of information. There have also been many efforts to study computers used to teach reading and writing, but little research has been done on how computer use, apart from the factual material being presented, functions as an element of students' literacy development. Such research seems to be called for, especially because this could provide educators with information on how to maximize the effects of computer use.

This study did not attempt to delve into the specifics of what kind of text is the most helpful for students who are still in the early stages of learning to read. The findings from this study did, however, point toward certain kinds of games or activities which students seemed to be most likely to find interesting. A comparison of the types of text available in the most popular educational games might prove very beneficial.

Further research is needed to substantiate or refute the findings that emerged from this study. A body of



literature needs to be developed in order to aid educators as they continue adding computer activities throughout the curriculum. A longitudinal study of the students in this study, or of students in a similar situation, could uncover more data about the effect of student beliefs and teacher beliefs about computers. Another aspect of this study which could be investigated is the role of social interaction during computer activities. The role of the teacher could be more fully explored. Another element of this study which warrants further study is the different ways boys and girls seemed to relate to the elements of competition in the computer games. A follow-up study on the literacy behaviors identified in this second-grade classroom could verify or rebut the categories that were identified in this study.

#### Conclusion

This research arose from an interest in looking at educational computer use in a unaccustomed light. It required looking at the computer, not as a delivery system of information, but as a language tool. This research pushed into a thinly-explored region concerning the use of computers in educational settings and its impact on literacy. By looking at the use of computers, not the things computers can teach, and by looking for the interaction between students and the language (reading and writing) that arises from executing a computer program, this

study attempted to lay a groundwork for future, more extensive studies of the role of computer use in literacy development.

APPENDIX A  
LETTERS TO SCHOOL SUPERINTENDENT

January 29, 1993

Dr. Ronald Caloss  
Hurst-Euless-Bedford ISD  
1849 Central Drive  
Bedford, TX 76022

Dear Dr. Caloss:

Mrs. Joyce Kostelnik, one of my doctoral students in Reading Education at the University of North Texas, has recently contacted Jack Thayer and Carolyn Colvin about the possibility of doing her dissertation study in an elementary classroom in the H-E-B school district. Meadow Creek Elementary or Midway Park Elementary appear to be suitable sites. This research project would involve observation in one classroom. Mrs. Kostelnik would be present for two days per week through the end of the school year, with the days and times to be set to coincide with the needs of the teacher. These observations would be scheduled for the least possible disruption of the class.

The dissertation will be a qualitative study of the effect of computer use on the literacy development of children in a 2nd or 3rd grade class. It will not require any adaptation or change in the classroom. Confidentiality of the participants will be maintained when the results are reported. One of the elements that makes the proposed research unique is the combination of Mrs. Kostelnik's interest in computer use with her advanced training in reading education. Computers are being used in every area of schools, and it is pertinent that a study such as this focus on how that computer use is impacting literacy development within the overall curriculum of the class. Mrs. Kostelnik's interaction with students will be as a classroom observer and interviewer. We hope that having her work with one of your teachers during this time period will be acceptable to you and your school district. Any questions may be directed to me at the University of North Texas. I look forward to sharing our findings with you.

Very truly yours,

M. Jean Greenlaw Ph.D.  
Regents Professor

CC: Jack Thayer  
Carol Colvin  
Donna Rawlings

January 29, 1993

Dr. Ronald Caloss  
Hurst-Eules-Bedford ISD  
1849 Central Drive  
Bedford, TX 76022

Dear Dr. Caloss:

I am working on a doctorate in reading education at the University of North Texas. Since I am a resident of Eules, I would like to do a research project for my dissertation in one of the H-E-B elementary schools. This study will be a qualitative, ethnographic investigation of computer use and its effect on literacy development. I want to observe a teacher in 2nd or 3rd grade who is integrating computer use throughout the curriculum. This would involve observing and interviewing the teacher and students.

If you can help me identify a specific school location and a particular teacher who would be interested in being a part of this research, I would be most grateful. Thank you for your time and effort in this matter.

Very truly yours,

Joyce L. Kostelnik  
611 Cypress Circle  
Eules, TX 76039

(817) 540-2510

APPENDIX B  
PARENTAL PERMISSION LETTER

Dear Parents,

My name is Joyce Kostelnik. I am conducting a study in association with the University of North Texas that will look at computer use in the elementary school and how this is related to reading and writing. Two days per week during the remainder of this school year, I will be observing in your child's classroom. I will be talking with students and teachers, watching when children use computers, and keeping written notes of observations and conversations. Some audiotapes will be recorded. I will also look at samples of student work and make copies of some classroom papers. Part of my study will be looking at what students write when they use a computer.

ALL INFORMATION GATHERED WILL BE KEPT STRICTLY CONFIDENTIAL. YOUR CHILD'S NAME WILL NOT BE ASSOCIATED WITH ANY INFORMATION COLLECTED. THE STUDY WILL NOT CHANGE THE NORMAL OPERATION OF YOUR CHILD'S CLASSROOM AND WILL NOT AFFECT YOUR CHILD'S GRADES IN ANY WAY WHATEVER.

This study may help teachers and other educators understand more about the learning process and how computers can best be used in classrooms. If you agree to allow your child to be included in this study, please sign and return this form to your child's teacher. Your cooperation will be very much appreciated.

Sincerely,

Joyce L. Kostelnik

\*\*\*\*\*

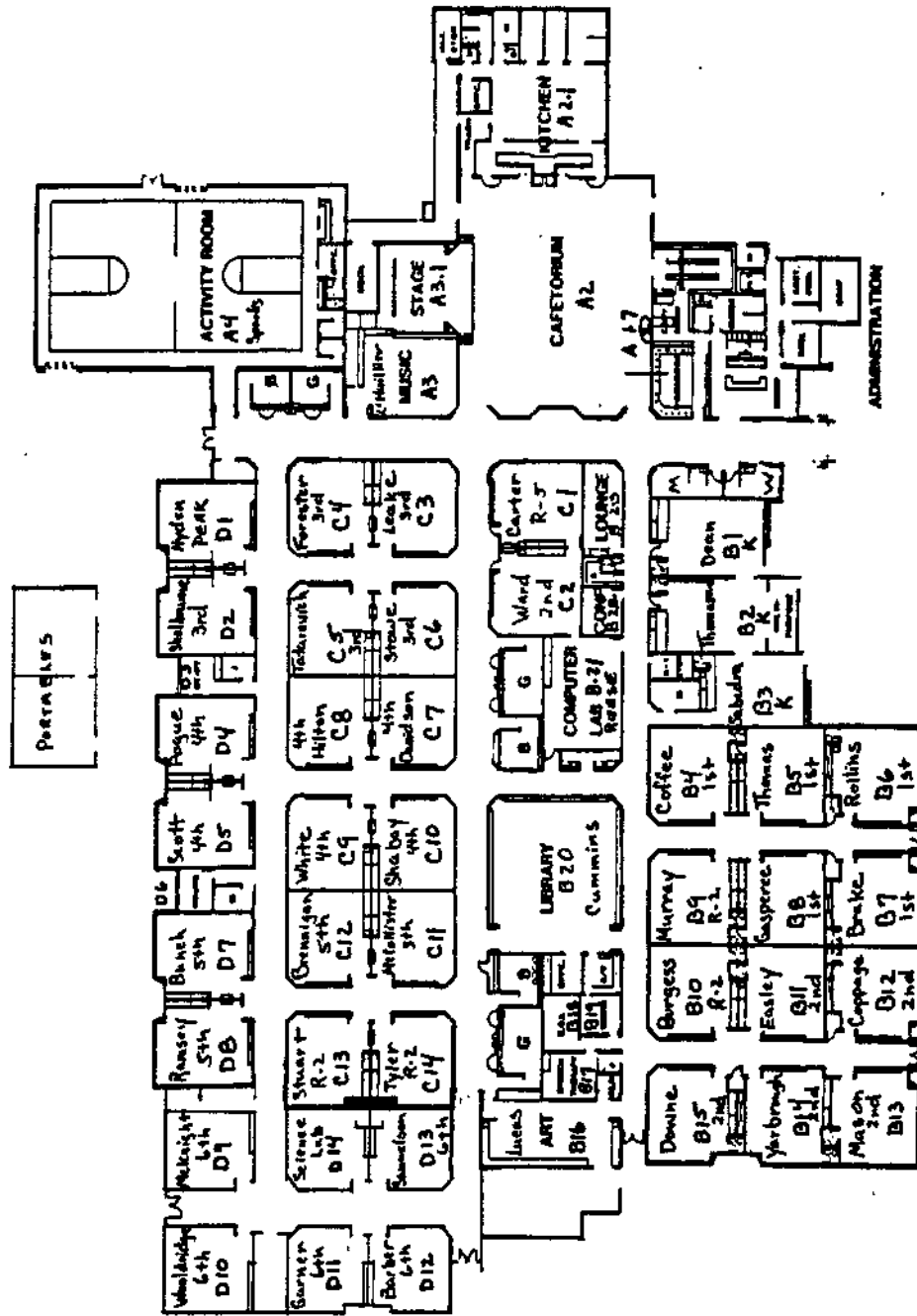
I give my consent for my child to be included in this study. I have read the description of the study and understand it. I understand that NAMES WILL NOT BE ASSOCIATED WITH THE RESULTS, THAT ALL INFORMATION WILL BE CONFIDENTIAL, AND THAT THIS WILL NOT AFFECT MY CHILD'S GRADES. I understand that I am free to withdraw my consent for my child's participation in this study at any time.

Date \_\_\_\_\_ Child's Name \_\_\_\_\_

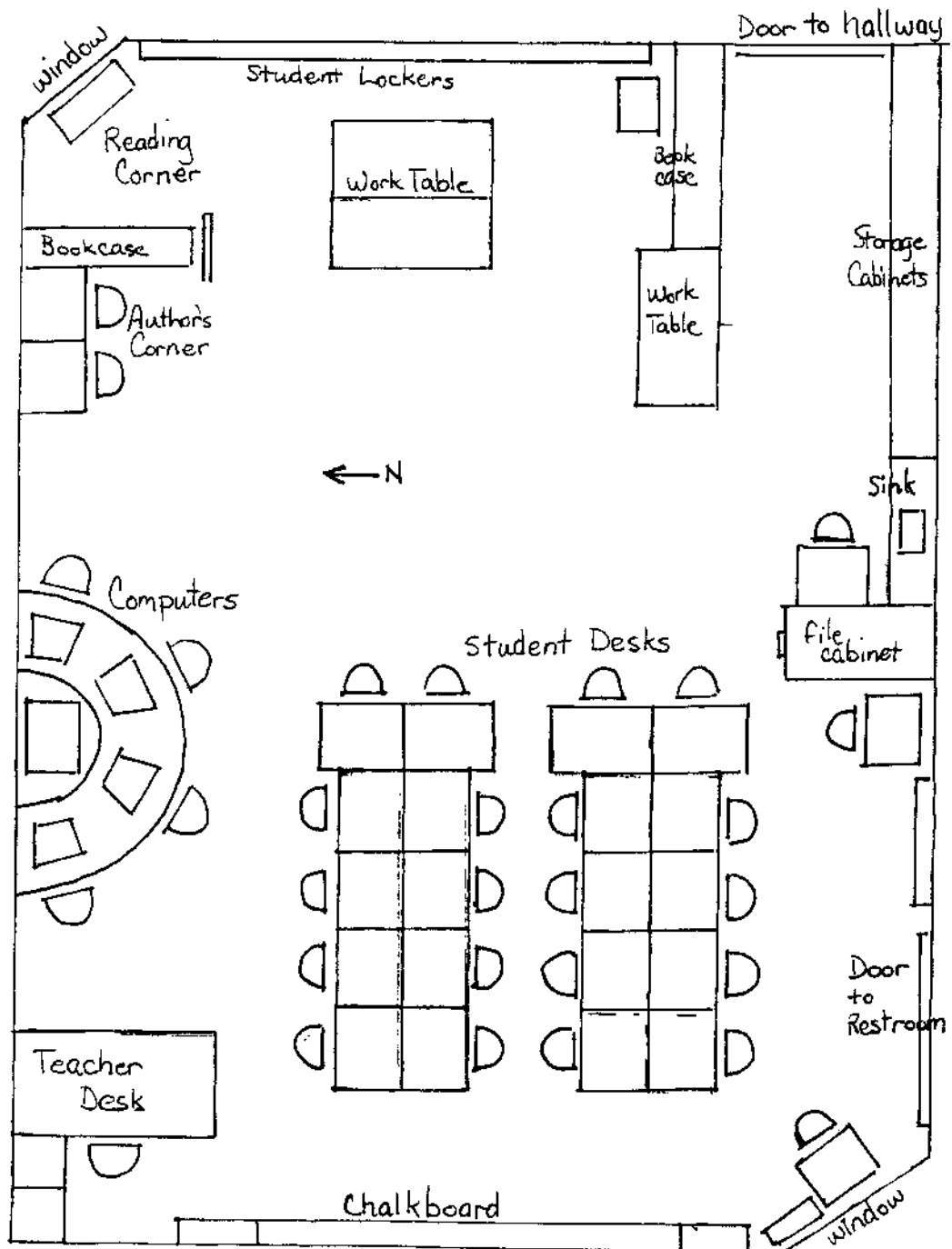
Parent or Guardian's Signature \_\_\_\_\_

APPENDIX C  
DESIGN OF SCHOOL





APPENDIX D  
CLASSROOM MAP



APPENDIX E  
DATA COLLECTION AND DATA ANALYSIS PROCEDURES

## DATA COLLECTION PROCEDURES

PHASE ONE January - February, 1993

FOCUS	TECHNIQUE
Establishing entry	<ul style="list-style-type: none"> <li>- Informal interviews with various principals of potential sites</li> <li>- Contact superintendent of target school district</li> <li>- Write letter to superintendent</li> <li>- Narrow choices of schools and teachers</li> </ul>
Finalize research site	<ul style="list-style-type: none"> <li>- Visit target school</li> <li>- Informal interview with principal</li> <li>- Informal interview with teacher</li> <li>- Visit target classroom</li> </ul>

PHASE TWO March, 1993

Establish contact	- Participant observation
Identify context	- Informal teacher interviews
Map physical data	- Informal student interviews
Become familiar with social setting	- Field notes in setting
	- Reflective notes
	- Collect classroom documents

PHASE THREE April, 1993

Identify patterns of behavior	- Participant observation
Identify key informants	- Informal teacher interviews
Develop hypotheses	- Informal student interviews
Identify patterns of computer use	- Field notes in setting
Identify patterns of reading and writing in research site	- Reflective notes
	- Collect classroom documents
	- Administer informal written attitude surveys
	- audiotapes

PHASE FOUR May, 1993

Search for major themes	- Participant observation
Refine hypotheses	- Informal interviews
Field Exit	- Field notes in setting
	- Reflective notes
	- Audiotapes
	- Final collection of documents
	- Final interviews

## DATA ANALYSIS PROCEDURES

PHASE ONE March, 1993

FOCUS	TECHNIQUE
Recognize patterns of behaviors in classroom	- Transcribe audiotapes
Search for patterns of computer use	- Code field notes and reflective notes
Search for patterns of reading and writing, literacy events	- Indefinite triangulation

PHASE TWO April, 1993

Refine patterns of classroom dynamics	- Code field notes and reflective notes
Refine patterns of computer use	- Code transcribed audiotapes
Refine patterns of reading and writing, literacy events	- Code attitude surveys
Check for credibility of patterns	- Indefinite triangulation
Narrow focus for final data collection	

PHASE THREE May, 1993

Refine patterns of computer use	- Code field notes and reflective notes
Refine patterns of reading and writing, literacy events	- Prepare data display for computer use/literacy relationships
Check for credibility of patterns	- Do constant-comparative re-coding for reliability
	- Code informal written attitude surveys

PHASE FOUR June, 1993

Identify major themes related to computer use	- Review all codes
Select appropriate evidence for each of the major themes	- Produce data display charts
Create the narrative	- Write narrative description of interviews and observations

APPENDIX F  
LIST OF DATA SOURCES

The following list summarizes the data that were collected and analyzed:

166 pages of typewritten field notes

11 hours of audiotaped informant oral interviews

197 pages of transcribed informant oral interviews

49 pages of computer printouts of student writing  
and other classroom documents

57 pages of written informant interviews



APPENDIX G  
STUDENT INTERVIEW FORMS - WRITTEN

Name \_\_\_\_\_

COMPUTER INTERVIEW

1. Do you like using computers? Why or why not?  
\_\_\_\_\_
2. Are you good with computers? Why or why not?  
\_\_\_\_\_
3. Do you prefer to work on the computers in your homeroom or in the computer lab? Why?  
\_\_\_\_\_
4. If you could play on the computer or play outside, which would you choose? Why?  
\_\_\_\_\_
5. What is the best thing about going to the computer lab?  
\_\_\_\_\_
6. What is the worst thing about going to the computer lab?  
\_\_\_\_\_
7. Do you have a computer at home? If so, do you use it? What do you use it for? Who uses it the most?  
\_\_\_\_\_
8. Do you think computers help you learn?  
If YES, how do computers help you learn?  
\_\_\_\_\_  
If NO, what are better ways to learn?  
\_\_\_\_\_
9. If you could make the computer do something that it doesn't do now, what would it be?  
\_\_\_\_\_

Name \_\_\_\_\_

READER INTERVIEW

1. Who is the best reader that you know?

\_\_\_\_\_

2. What makes that person a good reader?

\_\_\_\_\_

3. What do you think that person does when he (or she) comes to something he doesn't know when he is reading?

\_\_\_\_\_

4. If you knew someone was having trouble reading, what could you do to help them?

\_\_\_\_\_

5. What would a teacher do to help that person?

\_\_\_\_\_

6. Do you think that you are a good reader?

\_\_\_\_\_

7. When you are reading and you come to something you don't know, what do you do?

\_\_\_\_\_

8. Do you ever do anything else? What?

\_\_\_\_\_

9. What would make you a better reader?

\_\_\_\_\_

Name \_\_\_\_\_

WRITER INTERVIEW

1. Why do people write?

\_\_\_\_\_

2. How do people learn to write?

\_\_\_\_\_

3. Are you a writer?

\_\_\_\_\_

4. What kinds of writing do you do in school?

\_\_\_\_\_

5. What kinds of writing do you do when you are not at school?

\_\_\_\_\_

6. In general, how do you feel about what you write?

\_\_\_\_\_

7. What do you think a person needs to do in order to be a good writer?

\_\_\_\_\_

8. How does your teacher decide which pieces of writing are the good ones?

\_\_\_\_\_

APPENDIX H  
SAMPLE OF FIELD NOTES

March 29, 1993 - MONDAY

8:15 am As I came in Alex came to me to show me his new flattop hair cut. He was very proud of it and I told him how cool he looked.

On the board is written:  
 March 29, 1993  
 Write in your journal -  
 be prepared to share!  
Turn in homework!  
 No trading punches this morning -  
 everyone will write in their journal!

I asked what that meant about "trading punches". T. told me that when the students had 10 punches, they could trade them in for things, and she pointed out a small pink sheet of paper on the chalkboard with a magnetic clip.

Students are writing in their journals. One student set the timer for 10 minutes. T. erased the board, leaving only the date. She prints the following things on the board:

1. needs to be sharp
2. folds
3. has numbers
4. you use only once
5. you can see through
6. is straight
7. you squeeze
8. holds water
9. has a handle
10. makes a noise
11. has a knob
12. is white

She also writes in brackets "cannot use food, clothes, or toys as your answer."

Molly looks at me and smiles. Several of the students are watching what the teacher is writing. T. turns to shush them and says, "No, talking please." I didn't hear any voices but there is a little bit of undercurrent of movement. The timer is set for 10 minutes. When the timer goes off T. says, "Who would like to read what they've written." Many hands are up. Carl reads a long but very rambling piece about something in my shoe, and a hole in my shoe.

Many of the readings from students are very silly and students giggle appreciatively. T. sits with very little expression change. She finally begins to smile but appears to be repressing it. T. continues to call on different students to read their journal. Some of the journal entries sound a lot like tall tales with exaggerations, especially Kelli's story about TNT. Molly was called on to read the last one. Her story also was an exaggeration about money growing on trees in the land of trees. T. asks Abby and Julie to pick up journals.

T. says I'm going to put you in new base groups in a minute. Then she asks who brought homework. T. says they will miss all of break for today, and that she will check to see who turned in the homework and if they didn't turn it in, but didn't hold up their hand now, they would miss break for two days.

Then T. says, the new base group would be working on "encouraging". She puts a t-chart on the board with "looks like" and "sounds like." Students seem to have a lot of trouble thinking of good examples for this chart. When T. says how about nodding, Alex begins to nod furiously and for an extended amount of time. When T. says how about thumbs up, Alex does this in an exaggerated way and says "awesome."

At 8:55 they get in groups. The groups are sitting still and whispering very quietly with one another. I go and sit with the group by the door, Julie Scott Molly and Brian They put some items that didn't really fit the categories, but they seem to be more concerned with putting things that nobody else might think of than whether they were choosing accurate items. Item 12 is white. Scott said "Michael Jackson." They all say yeah, and he writes that. That is the last item for their list, and they start talking about Michael Jackson and pantomiming his songs.

9:10 Scott and Brian go to the teacher who is sitting near the window group and ask what do we do when we are finished. T. tells them to go back over their list and be sure that they have good answers and that there will be only about 5 more minutes. She hasn't announced to the entire group what the time frame is. Scott and Brian go to the easel and get a big book of an atlas. Brian sits at the work table with a book on the rain forest. Molly looks over his shoulder. Julie sits on the floor with Scott looking through the atlas. They are the only group that has stopped working in the assigned group setting. T. goes back to the group by the lockers to oversee. Molly gets another book and is sitting at the back part of the big work table.

Two other groups finish. T. says there will be only 3 more minutes, and they should go back over their lists to see if they have unique answers, and that none are food, clothes or toys. She says to get books to read when they are sure they are finished.

9:17 Julie and Scott are still quietly sharing the big atlas and quietly pointing to different things on the two page spread with the United States on it. Other students are moving around the room.

Carl has returned to his desk with a science book. He is the only student sitting at a desk. All others except Brian and Molly are sitting on the floor. Kelli gets up from her group, stretches and yawns. Then she gets a big book and stretches out on the floor in front of me with it. She actually crawls on her knees across the book as she looks from one page to another.

9:20 T calls students to sit in a single big circle. She tells them to sit with their base group. She calls on Eric to speak for his group. He says tomahawk, and the next group said arrowhead. It appears that they are drawing on their background knowledge from the unit they did on Indians recently.

Jason's group said grenade for something you use only once. The class laughs and someone says, "Of course, Jason would think of that!"

The group with the highest number of points was told to either get a point or get one item out of the goody jar. They get candy.

Scott is sitting backward in his chair with his leg hanging over the back of his chair and swinging that leg in a circle. No one is watching him. He is not moving otherwise or saying anything. Scott turns to put both legs over the back of his chair and then turns back frontward. Alex starts to stand up and T. quickly says to him "Sit down." He sits. Then when she hands papers to the paper passer, he stands briefly, as soon as her back is turned, long enough to move his legs so he is sitting on one foot.

10:00 So far today, no student has turned on a computer.

There are thirteen tall tales mounted on the wall where the chocolate stuff used to be. Two of them have already fallen from the wall and are draped across computers. Three others are still stretched out on the big work table. At 10:02 T. has students line up for break.



10:05 to 10:40 students are gone outside for morning break.

10:40 students return from break. All go quickly to their desks and commence working on the worksheets. There is some movement around the room but generally the level of activity and sound is considerable lower than before break. Alex asks if he can color his picture. T. asks, "Are you done?" He nods. T. says then you are finished, and you have time so you should color the pictures.

10:52 Jason has gone to the big worktable and is sitting looking through a book quietly. T. directs Abby to get a pencil out of the lost and found - a zip lock bag on the desk by the sink - when Abby says she can't find her pencil.

10:55 Julie asks T. what do I do now and T. says go ahead and start DEAR time. T. then looks at the clock and says, "Lets get ready for DEAR time. I'll give you a little more time after story time. Jason is still sitting at the same place with the same book. Students are moving all around him and he doesn't acknowledge anyone. Kelli sits in the chair next to Jason and starts looking at a book. Julie goes back to the big book atlas and takes it to the center of the room, and stretches out prone on the floor propped up with a pillow to look at the book. Jana is sharing the pillow with her and looking at a book.

Alex, Scott, and Mark are looking at the same thing. They are almost under the globe table. They look to each other and almost soundlessly whisper among themselves. They each have a book, but they are looking at the book Mark has. T. notices and tells them to move away from each other.  
11:03.

11:12 AM Beth is sitting in a chair by the easel reading my book of Gregory the Terrible Eater. She has Ollie Forgot on the floor beside her feet and put her foot on it when another student walked near and looked at it. He then went to one of the book baskets on the floor and got another book. Julie has been looking at Where the Sidewalk Ends. She is moving her mouth as she looks up from the page like she is trying to recite one of the poems from memory. I can hear several voices whispering, but I can't see who's talking. It looks like Scott and Mark have started looking at the same book again. They are two of the whispering voices but there are more.

10:15 lunch and afternoon break

1:10 Alex has finished his assignment and is given permission to go to computer 2. Scott and Mark get 3 and 4. Jason goes to computer 1.

1:25 I was sitting between Scott and Mark asking them questions as I was watching them. They were both working on Math Shop Jr. Within about 4 minutes both boys had done over 20 items which involved adding several numbers to reach a target number. Mark had made his computer change to the sound of monkey. Scott said, "How did you make it do that?" Mark leaned over and said, "Use the control panel." Scott still didn't know how, and Mark pointed to a block and said, "Pull that down until you see the thing that says 'sound.'" Scott was able to duplicate Mark's sound change within 15 seconds.

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## BIOGRAPHICAL SKETCH

Joyce Laverne Kostelnik was born in Fort Worth, Texas on January 8, 1946. She attended public schools in Fort Worth, graduating from Carter-Riverside High School in 1964. She entered the University of North Texas in Denton, Texas, and graduated in 1970 with a Bachelor of Science in Education majoring in Secondary Education, with teaching fields in English and Music. She began teaching in 1973 in Newark, Texas teaching 6th through 8th grade English, Reading, and Music. She worked for the City of Fort Worth and for the University of Texas Health Science Center in Dallas, Texas from 1974 through 1977. From 1977 to 1983, she taught 8th Grade English, Compensatory Reading, English as a Second Language, General Music, and Choir in Saginaw, Texas. After working for American Airlines from 1983 to 1985, she returned to the education field and taught Title I Reading and Correlated Language Arts in the high school level in Boyd, Texas. Concurrently, she returned to the University of North Texas earning a Masters of Education in Reading Education with Certification as a Reading Specialist in 1988. She entered the University of North Texas doctoral program in Reading Education in 1989. She received a one-year appointment as a full-time faculty member for the University of North Texas in 1990, and was a full-time faculty member for Southeastern Oklahoma State University in Durant, Oklahoma in 1991. She has been a Graduate Assistant at the University of North Texas since September of 1992. She is a member of Kappa Delta Pi and Phi Delta Kappa. She and her husband, Elmer J. (Nick) Kostelnik have a blended family of five children and step-children; John, Laura, Jeff, Matt, and Julie, and three grandchildren; Christy, Lindsay, and Erin.