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MICROCOMPUTER WORD PROCESSING AND GRAPHICS IN ELECTRONIC COMMUNICATION EXPERIENCES OF THIRD GRADE STUDENTS

The Ohio State University

Ph.D. 1986

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MICROCOMPUTER WORD PROCESSING AND GRAPHICS
IN ELECTRONIC COMMUNICATION EXPERIENCES
OF THIRD GRADE STUDENTS

DISSERTATION

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

By

Gretta Hofmann Kumpf, B.S., M.S.

The Ohio State University
1986

Dissertation Committee:

Marlin Languis
C. Ray Williams
Roger Cunningham

Approved By
Advisor
Education
To My Husband, Joe
My Sons, Art and Adam
My Parents
ACKNOWLEDGMENTS

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VITA

September 20, 1951 . . . Born - Brazil, Indiana

1972 . . . . . . . . . . . . B.S., Indiana State University, Terre Haute, Indiana

1973 . . . . . . . . . . . . M.S., Indiana State University, Terre Haute, Indiana

1974 . . . . . . . . . . . . Instructor, Department of Home Economics, Indiana State University, Terre Haute, Indiana

1982-1986 . . . . . . Graduate Teaching Associate, Instructor in Reading, Language Arts, WACA Project (Writing Across the Content Areas with Computers), University Internship Program, The Ohio State University, Columbus, Ohio

PUBLICATIONS


"The Recurring Question --- Where is the Time and Place for the Microcomputer in the K-8 Curriculum?" ERIC, 1986 (in press).
FIELDS OF STUDY

Major Fields: Child Development and Learning, Language Arts, Reading and Writing

Child Development and Learning:  Dr. Marlin Languis
Dr. C. Ray Williams

Studies in Language Arts, Reading, and Writing:

Dr. Martha King
Dr. Victor Rentel

Integration of the Curriculum:

Dr. Roger Cunningham

Microcomputer Application in Education:

Dr. David Heigle

Ethnographic Research:

Dr. Judith Green

Early Literacy:

Dr. Marie Clay
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CHAPTER I

THE NATURE OF THE PROBLEM

Background of the Problem

Computer development began in the late 1930's and was used primarily for scientific calculations. Much has changed in the field as the industry of electronic computers has moved from vacuum tubes (1946-1952) which produced large amounts of heat, requiring air-conditioned rooms, to transistors (1952-early 1960's), integrated circuits in the late 1960's and during the 1970's moving to ultra-miniaturization providing large memory potential and reasonable physical size. Some computer scientists refer to the present generation as an explosion of specialization in industry and in the home and school setting.

In education we are concerned with the use of microcomputers in educational settings. According to Lesgold (1983), the computer revolution in education has moved from the first phase of questioning whether computers will be a force in the schools, to a second phase focusing attention on the computer as a means to meet educational goals. We now must investigate what
influence the microcomputer will have upon teaching and learning.

How is the Microcomputer Being Used in the Classroom?

In October, 1983 a conference was held at The Ohio State University on "The Young Child and the Computer: Building the Future Together." At this conference educators analyzed how computers were being used in American schools. Four major uses were identified:
1) teaching computer literacy (e.g., terminology of parts and functions); 2) programming (e.g., BASIC, LOGO);
3) drill and practice (essentially workbook pages on a screen); and 4) administrative. Word processing, student writing, graphics and electronic communication were not identified as primary uses of the computer in the early childhood school setting.

Other researchers have reviewed the microcomputer as a potential writing resource. Microcomputers with word processing capabilities allow information to be recorded on a storage medium (diskette) for easy retrieval, manipulation, revision and editing of text. Several researchers have indicated that revision serves as a major source for improving writing (Bereiter and Scardamalia, 1980; Bracewell, 1980; Graves, 1979; Calkins, 1983; Bessix, 1980; Flower and Hayes, 1984).
However, the physical labor and cognitive demands frequently discourage writers from pursuing revision no matter how large or small the task. Word processing may make text alteration easier with quick and easy key strokes to reduce effort, time and cognitive obstacles for the writer. Easy text storage and retrieval encourages students to view their work as part of a drafting process allowing room for clarification of meanings and intentions thus viewing writing as an ongoing process. This process has been referred to as a solution to the "crumpled paper" syndrome.

Few studies have examined the utilization of word processing and electronic communication as a tool for students in the classroom context (Collins, 1983; Daiute, 1984; Daiute, 1985; Rubin and Bruce, 1983; Levin, Boruta and Vasconcellos, 1983). Recent programs such as Quill (1984) developed at Bolt Beranek and Newman, Inc. create an in-class electronic bulletin board, a mail system and additional capabilities including a planner and a library that permit students to create and use text on a classroom word processor. Meaning and intention are the focus as students use the word processor to express their thoughts or address topics and experiences of common interest with peers.
Statement of the Problem

The present study investigated two areas related to children's use of word processing: composing and sending letters by electronic mail and communicating with teachers, parents and peers. The first objective was to document what actually happened in the process itself. Second, the data were interpreted to investigate the possible influence of the computer on students' writing and communicative competence.

The researcher investigated several important questions:

1. How are children served by electronic mail?
   a. What do they write about?
   b. How is language used to fulfill the children's purposes for writing?
   c. How are microcomputer graphics used and incorporated in children's electronic communication?
   d. What influence does the responder have upon the writer?

2. What was the students' transitional process?
   a. How are student perceptions of the microcomputer altered or changed with use?
   b. Does the microcomputer move from a novelty to some level of a functional tool?

Although word processing can be used for numerous purposes by students in the classroom setting, the researcher chose to involve students in letter writing. Five reasons formed the foundation for the researcher's decision to use letter writing. They were:
1. letter writing allows the writer to compose directly on the keyboard permitting ideas to flow directly on the screen, rather than from a pre-written paper;

2. letter writing can draw upon the writer's oral language competence and full range of experiences;

3. letter writing is interactive and addressed to a specific audience much like oral communication;

4. letter writing can provide an experience for the writer to focus meaning on the expression of ideas to others while becoming comfortable with the medium and tool of the microcomputer; and,

5. letter writing acquaints the writer with word processing, self-editing, and manipulation of text.

Letters were not limited to written text, but included graphic illustrations as well. The graphic illustrations were coded and decoded from binary to textual files for videotext transmission.

Locating a classroom in which children used microcomputers on a regular basis was critical. Schools and classrooms which provide students with limited computer experiences on a once per week basis, of less than twenty minutes in a shared microcomputer lab did not furnish adequate data for analysis. For this reason, the investigator selected two classrooms where one or more computers were made available for student use, multiple days each week.

This study grew out of a unique situation where The Ohio State University and a local city school district
were working on a joint research project supported by Apple Education Foundation, CompuServe and Koala Industries. The significance of the study rested in its potential to explore and document the nature of third grade children using microcomputer word processing and graphics in electronic communication experiences with a teacher and peer pen pals.

**Definition of Terms**

**Word Processing:** Microcomputer programs used to create, modify, format and process text materials. For the purposes of this study, students used the following word processing software programs: Bank Street Writer and Apple Writer II.

**Wordwrap:** A common feature of most word processing programs that automatically returns the cursor to the left hand margin of the next line when a full line of text is completed.

**Electronic Communication:** Refers to the exchange of information between available microcomputers networked by the videotext capability of CompuServe, a national information utility.

**Modem:** A peripheral device that allows the computer to transmit and receive information over a telephone line.
Supportive environment: This concept refers to a classroom where students were encouraged to question, think, solve problems, hypothesize, test, and revise hypotheses without fear of constant evaluation or reprimanding for errors made.

Transitional Process of the Computer: The development or evolution from a beginning microcomputer stage/use (e.g., novelty) to another stage/use (e.g., functional writing and communicating tool).

Scope of the Study

This study was conducted to investigate microcomputer word processing and graphics in electronic communication experiences of third-grade students, a teacher and peer pen pals. The study is innovative in the research field and provides an initial exploration of its primary objectives. The primary objectives were:

1) to collect electronic communication data in a naturalistic school setting;

2) to explore recurring patterns emerging from the data on the impact word processing and electronic communication served a group of third and fourth grade students;

3) to investigate how the use of the microcomputer by third grade students changes with repeated exposure and use;

4) to identify the implications related to the practice and organization of microcomputer word processing and electronic communications programs in the school setting; and
5) to raise questions for further research.

This research was limited to a small sample for an in-depth study of four third grade students, yet it's global nature does have implications for the entire third grade classroom of twenty-one students as well as the third/fourth grade peer pen pal classroom of twenty-five students. The restricted number of subjects and research design does limit, however, the study's generalizability to other populations and settings. This research does not yield comparative demographic data such as geographic setting, socioeconomic status, ethnic backgrounds in terms of subject response to using a microcomputer word processor and modem. It does provide qualitative data and an in-depth study of four third-grade students working with a microcomputer word processor and graphics in electronic communication experiences with a teacher and a peer pen pal in the school setting. The collected data provided documentation of the purpose, function and influential factors on the use of electronic mail by the student writers. In addition, the investigation of the transitional process of the computer as a writing/learning tool will also be documented.

The researcher participated in several roles: an interviewer, field note collector, transcriber, teacher pen pal correspondent, classroom computer teacher/helper
and analyzer of the collected data. The researcher provided continuity between the various areas of investigation and through participation in the activities in the classroom. The potential for bias on the part of the researcher was addressed. The potential for bias was weakened by using triangulation methods for data analysis; specifically, 1) the researcher's log and fieldnotes; 2) students' interviews; 3) teachers' interviews; 4) principals' interviews; 5) parents' interviews; 6) electronic communication samples; and, 7) transcribed audiotapes from the classroom context.

An additional restriction occurred when students were unable to communicate to the home setting via CompuServe due to incompatibility of interfacing equipment (i.e., telephone lines to make the needed connection with the videotext network system).

Other limitations of the study included garbled noises, high noise level (during class dismissals) and low noise level (such as whispers during quiet work periods) which made words or statements inaudible on the tapes. This problem was slightly compounded due to the difficulty experienced by hired transcribers who often had limited computer literacy background. In a great many cases the researcher was able to correct these problems by editing transcriptions using background
knowledge, drawing upon computer experience and recalling the classroom situation, thus adding sense and integrating together phrases to form the essential meaning being conveyed. Finally, the researcher was a guest in the classroom and functioned under the already present classroom rules and previously established time schedule. The classroom teacher did, however, provide the flexibility for students to work with the computer on a rotation basis during morning reading group time.

Design of the Study

This research sought to describe the nature and demonstrate the utility of electronic pen pal writing as a process of writing and communication. The study was conducted at two levels. First, it involved an entire third grade classroom of twenty-one students in a suburban district who interacted via electronic mail with their computer teacher and a peer pen pal classroom of twenty-five third/fourth grade students. Second, it focused specifically on in-depth case studies of four third grade students within the target third grade classroom. All four students were selected from a single classroom and provide a range of student learning characteristics. The formal research study design was a multi-site, multi-method study (Patton, 1980).
third grade served as the target classroom, and the peer
pen pal classroom served as a second site for data
collection. The researcher observed and participated as
a "teacher and helper" in the target classroom context
approximately six hours each week during the period

A survey interview was administered to all thirty-
six students to provide the researcher with information
about student's background experiences (refer to
appendix A). In addition, individual thirty minute
conferences with each of the four subjects were conducted
on a bimonthly basis to better review and assess the
purposes and functions that electronic communication
experiences were providing each student. Additional
interviews with the classroom teachers, school principals
and parents were scheduled to provide data for the
triangulation analysis.

The researcher served as the adult teacher
correspondent for electronic mail to twenty-one students
in the target classroom. The researcher gave all the
students a folder with two pockets. One side labeled
"LETTERS RECEIVED" and the other side labeled "LETTERS
SENT." Inserted in the front of each pocket was a form
on which to record the date, name (letter sent to or
letter received from), subject and file name (as recorded
on disk catalog). The students were requested to save each of their composed letters on their disk, as well as a classroom master disk used to store all letters composed. The classroom disk was used to upload letters into the videotext system. It also served as a means for collecting and storing electronic communication from the entire class. Pen pal relationships with a third/fourth combination classroom were established at another elementary school within the same suburban school district which also had access to a microcomputer, graphic illustration pad, printer and modem.

Cassette recorders with microphones were placed beside the keyboard near the students while they worked with the microcomputer during letter writing sessions. Vocal recordings of the students generated assessment of cognitive strategies expressed through sub-vocalizations. Sub-vocalizations were an extension of inner speech and not an a priori request for the students to think aloud. Fieldnotes, along with the researcher's log provided an on-going record of researcher decisions and the classroom environment. Selections of student-generated text and graphics were used for discussion during conferences adding a sense of context upon which the informal discussion could build.

This study was designed to explore the purposes
electronic mail offered children in oral, written and graphic forms. It was designed to provide descriptive data categories which would identify a basis for additional guided research in the areas of language, writing and communication study.

Theory and research related to this study's focus and questions will follow in Chapter 2, the Review of Related Literature. Chapter 3 will report the methodology used in the study. A description of the classroom and computer context which provide the setting from which the messages are created, shared with others, and sent electronically to pen pal friends will be described in Chapter 4. Chapter 5 will deal with analysis of interview data and the four student case studies. Chapter 6 will summarize and discuss these findings and construct a framework to guide classroom practice, curriculum planning and future directions for research.
CHAPTER II
REVIEW OF RELATED LITERATURE

The literature relevant to the study of word processing and graphics in electronic communication experiences is organized around the following topics: writing, discourse and communication, learning and the computer. In addition, a discussion of ethnography and related qualitative research methodologies is addressed.

Theoretical Base

The research stems from theoretical bases in three areas: (1) the writing process, (2) the study of discourse, and (3) the examination of how children learn and develop.

The Writing Process

In the last decade there has been a stream of interest in writing research. Many researchers in the field are turning their attention to the intellectual skills and cognitive processes used by the writer in composing. Current writing research indicates that writing is a complex intellectual process that takes
place both in the mind of the writer and on the page of the created text.

This study will capitalize on the philosophical base of the conceptual paradigm and model of the writing process stemming from Flower and Hayes' work. Flower and Hayes (1981) describe a cognitive process model with three major processes of planning, translating and reviewing with sub-processes such as generating ideas, organizing, goal setting, evaluating, revising and monitoring. An essential assertion of the cognitive process theory is that writers do not sequentially progress through the writing processes in an A,B,C order. For example, writers may begin by planning, yet throughout their composing, writers repeatedly rely on the distinctive thinking process of planning. Since the writing processes may be used at all levels in a variety of orders with optional actions, they are viewed as cognitive recursive process, rather than a linear form (Flower and Hayes 1981, Perl 1979, Sommers 1980).

The complexity of writing requires the writer to think about and perform numerous tasks simultaneously. Needless to say, it takes time and thoughtful planning on the writer's part as he guides himself through this process. Flower and Hayes' (1980) research using protocol carefully observed and audiotaped students
during a writing session. The students were requested to verbalize their thoughts while composing text. Flower and Hayes compos-a-loud research on writers suggested that flexibility in defining and redefining writing goals allowed the writer to refine his intentions. Experienced writers relied on revision to clarify their thoughts. They viewed writing as a series of drafts, building and strengthening the text. Goal setting was noted to be of prime importance in writing. Identified goals and sub-goals were used as a measuring instrument to judge information and determine the level of accomplishment or failure. Failures were translated, organized, and fed back through the composing process to be rewritten. Frequently, it became necessary for goals and sub-goals to be redefined as the writer's intentions became more formulated. Clearly, a cognitive process model of writing involved the writer in problem solving.

New methodologies to study writing have strongly questioned the linear model of the composing process: prewriting, writing, and postwriting. The linear model is used most often to describe the growth of the written product, rather than the inner process of the person producing the product (Flower and Hayes, 1981). The previous paragraphs of discussion on the writing process have postulated that as a process, writing does not move
in a straight line from conception to completion. All
the planning is not completed by the writer prior to his
putting words on a page. Nor are all the words written
prior to the writer's review and revisions. Instead,
writers move back and forth among the processes of
planning, translating and reviewing ideas, organizing,
setting goals, monitoring, evaluating and revising.

Planning engages the writer in thinking processes
throughout composing. It has been said that nearly 85%
of a professional writer's time is spent prewriting,
1% actually writing and 14% in rewriting (Marcus 1982).
Although the terminology used in the latter statement
differs from the cognitive process approach, it
undoubtedly emphasizes that a high proportion of
composing time is consumed by planning. It is during
planning that the writer creates an internal
representation of the knowledge he has chosen to express
in writing (Britton, 1975; Sommers, 1980; Bereiter and
Scardamalia, 1985). Elements of planning include:
generating and organizing content and setting goals
(Flower and Hayes, 1981).

Generating content involves gathering information
from external as well as internal sources
within the writer that can be used for writing.
Organizing entails ordering the content. Informational
sources are examined and carefully selected, thus deleting content that lacks rigor or impact for the written text. Rarely does organizing content include formal lengthy outlines (Emig, 1971).

Planning also includes the element of setting goals. Commonly, writers set two kinds of goals: 1) content goals that direct what will be said; and 2) process goals that govern the writer's behavior during writing (i.e., writing the first two sentences of a paragraph, rereading what is written and extending it with additional sentences). The quantity and quality of goals that are set by the writer differentiates the creation of good or poorly written text (Flower and Hayes, 1980). Research indicates that good writers establish elaborate networks of goals and sub-goals which assist the writer in generating content. In contrast, poor writers spend more time on local, sentence and word-level planning indicating their major concern lies in statements about the subject (Perl, 1979; Rubin, 1984; Flower and Hayes, 1981).

Translating involves the writer in drafting and transcribing text. Meaning is transformed by the writer from the symbolization of thought to another symbolization of graphic representation. Translating places a heavy demand on the writer's cognitive
processes. The writer must move from the abstract concept to the concrete written statement. Ideas must be transferred to written language, while coherence and structure of the discourse must be attended to at the same time. Fortunately, the cognitive load decreases as the number of writing skills becomes automatic (Humes, 1983).

Reviewing is a process which allows the writer to check and evaluate the clarity of the original sense intended (Perl, 1979). During reviewing the writer continues to plan, proofread for conventions of written language, consider possible conclusions and determine the need for revisions and the redefining of goals. The present level of expertise determines the level of review. Graves and Murray (1980) indicate that even young writers spend part of their composing time in reviewing their text, although it is much less sophisticated than the experienced writer.

Revising should not be considered the last stage of a process, but instead it is a cognitive and physical activity that occurs throughout the writing process (Sommers, 1980). Revising can assume many shapes and forms: 1) attempting to change present meaning to intended meaning; 2) clarifying intended meaning; 3) making grammatical changes; and, 4) correcting diction
errors. Research suggests that the developmental level of the writer influences the level of ability to revise. Young writers may be reluctant to delete and insert words because they are hesitant to mar a page of writing. When children are able to overcome this obstacle, they begin to regard draft writing as a temporary piece of text used for building and strengthening. Graves and Murray (1980) discovered that an effective developmental step for children in acquiring revising strategies was the ability to choose one topic for discussion, while making a conscious decision to exclude another. More experienced and competent writers were able to view revising as a process to restructure and reshape their discourse (Sommers, 1979). The writers’ concerns also take into consideration the audience being addressed.

Writing, in the form of microcomputer word processing and graphics, can serve children as a means to test created hypotheses and communicate with others about the universe in which they live. Problem solving is the essence of their growth as they manage underlying rules of orthography and the graphic system of English. The writer frequently finds his initial efforts in assimilating and organizing information logically leads to revisions for clarification or alteration of the
message to be conveyed. This results in comprehensible communication for the intended audience.

Research demonstrates that revision serves as a major source to improved writing (Bereiter and Scardamalia, 1980; Bracewell, 1980; Graves, 1979; Calkins, 1983; Bessix, 1980; Flower and Hayes, 1984). However, the physical labor and cognitive demands often discourage writers from actively pursuing revision. The word processing capabilities of the microcomputer may offer relief to revision blockades. Word processing offers quick and easy text alterations with the use of a few key strokes. Many writers, both young and old, may welcome the microcomputer as a tool that can reduce time, effort and cognitive obstacles when creating text.

Providing meaningful contexts for writing is a common problem faced by writing teachers. Getting children enthusiastically involved in writing is a problem for which solutions are presently being sought. Too often literacy learning in the school setting has become decontextualized and removed from the real world of reading, writing, communicating and learning. King (1981) proposes that children’s experiences with writing in the school context begin with two key concerns: what to say and how to say it. To address these concerns the school curriculum needs to be organized around situations
that children find interesting, important and worth sharing with others. A classroom context shaped in this manner would center around meaningful situations that provide children with a purpose and use for writing.

Discourse and Communication

The study of discourse within the research focuses upon thought, language, and communication with others. Vygotsky (1962) proposes that a word in context means both more and less than that same word found in an isolated setting. It means more because it obtains new content; less because its meaning is narrowed and limited by the setting. The influence of the context and the thoughts and experiences brought to a shared message help to shape the meaning of words. Language is used to learn and learning requires language to reach higher levels of psychological processes (e.g., intention, memory, thinking). It would seem logical that meaningful text challenges children's present level of competency providing experiences to create thoughts, meanings and intentions.

Thought and Language: Children acquire and develop language as active, systematic and purposeful learners. Halliday (1975) suggests that even before the child talks, he has constructed his own meaning systems.
Lindfors (1981) labeled the child as "an active observer, comprehender, questioner, producer, explorer, hypotheses maker, tester and reviser." Britton (1970) theorized that children construct their own representation of the world through personal experiences. As active participants children hypothesize, invent, discover, test and form new hypotheses about language as they interact in a multitude of environments. By building frames of reference through language and literacy events children are able to review events, think through experiences and discover relationships.

The following summary of assumptions provides a strong foundation for this study. They evolve from research in the field of education on language, literacy and learning of children. These concepts are especially important because they view the child as an active learner interacting with the environment in which technology provides new avenues for written language to occur and develop.

1. The task of language learning is approached by children in an active, purposeful manner. Problem solving is an integral part of growth and shifts in language usage (Lindfors, 1981).

2. Children formulate, test and reframe hypotheses about language as they interact in a multitude of contexts. The school context can provide experiences and opportunities for children to extend and reframe their language representations (Britton, 1973; Bruner and Ninio, 1978; Clay, 1975).
3. Children negotiate meaning through interaction. Children compare and contrast functional meanings and interaction; therefore, the context in which language is used is crucial for its interpretation (Halliday, 1975; Wells, 1981).

4. Children purposefully participate in language and literacy to learn, to relate, to express themselves, to imagine, to relate to others and understand the world (Halliday, 1975).

5. Diverse experiences allow children to build upon prior knowledge and form meaning. Since children's language is significantly influenced by the context, it is vital for the school to provide opportunities and experiences in which children use language to form meaning (Harste, Woodward and Burke, 1982; Moffat, 1983).


Communicating With Others

Written language is used to communicate. The words that are selected by the speaker are shaped by the context in which they occur. Each culture also determines the appropriate forms of register within given social circumstances (Hymes, 1978). A register is generally envisioned as being situation bound. If a person's social situation changes, he also changes or switches his register, providing he has the communicative competence to function at the appropriate level.

Field, mode and style of discourse are conceptualized as forming an intersection within register
Field of discourse is used to refer to the area in which the language operates (e.g., domestic, legal, math). Appropriateness of topics for areas is determined by the field. Mode of discourse refers to the medium in which the language is carried. It may be either spoken or written. Often language may be improvised, yet some occasions require a formal preparation. Style of discourse is used to refer to how language is shaped by the role and relationships shared between the speaker and listener, or the writer and reader.

Learning "what type of language to use" in a multitude of situations is a complex sorting and sifting process for children (Halliday, 1975). Differences between oral and written language become increasingly understood by children as their own literacy develops. Computer experiences used for communicating to others, provides students with opportunities to project themselves and see their own thoughts in written form. Addressing communication to a variety of audiences also requires the writer to switch register and make language decisions appropriate for the given circumstances.

Writing, like talking, is used to communicate meaning and intention to others. Too often, however, children in the school setting become overwhelmed with
the mechanics of handwriting, conventional spelling, grammar, order and the formal content of their writing. These obstacles can be compounded with a lack of purpose for writing. Greene's (1983; 1985) study of "The Nature and Development of Letter Writing in Hispanic and Anglo Children Using a School-Based Postal System" has provided a very strong model of communication among children for this study. There are a number of parallels between these two studies:

1. Children were given the opportunity to "talk on paper" and become familiar with the medium of writing.

2. Letter writing encouraged children to draw upon their oral language competence as they sought to become more familiar with written language communication.

3. Through letter writing students were able to write to a real audience and share an unlimited range of personal events considered interesting to them. The letter writing was also interactive, so the students could expect a response from their audience, similar to an oral language situation.

4. Learning to use a postal system (Greene, 1983; 1985) and an electronic communication system (Kumpf, 1986) was considered an opportunity for children to learn the acquisition of a cultural tool (Vygotsky, 1978).

5. Researchers, Greene (1983) and Kumpf (1986), used a naturalistic classroom setting in which children's letter writing evolved and took it's own course.

Martin (1983) points to reading and writing as being complementary, yet indicates that they are frequently
taught separately for reasons considered practical within the school setting. The question is raised: Why is this method used? Research is increasingly demonstrating the need for purpose in students' writing. At the same time, the question is being asked: Does the purpose provide experience useful throughout the students' lives? Electronic letter writing may very well be a classroom experience that helps students discover a purpose for writing and that identifies skills and experiences they can draw upon throughout their lives.

**Learning and the Computer**

As computers become an integral part of the classroom setting, educators must seek answers to questions about the impact of this technology on students' attitudes and learning. Presently elementary school children are acquiring knowledge and power as users of computers. Computers are having an unprecedented impact upon teachers and the school setting. A broader conception of computer literacy needs to be explored that incorporates personal values, ethics and motivation (Marcus, 1984). Teachers and students can learn much about this new technology together, as well as, from one another.
Role reversals and a shift in power between teachers and their students, need to be viewed as valuable opportunities for both, rather than a source of concern for the teacher. Marcus (1984) refers to an approach called "confluent computer literacy" which integrates the cognitive and affective domains in teaching and learning. Such an approach first sets out to personalize computer education by focusing on the interpersonal and social contexts in which the computer is being used. At the same time the individual's awareness, response and responsibility is being monitored. Approaching computer education in this manner requires a cross-disciplinary approach (Marcus, 1984). Although children can demonstrate astounding intellectual skills as they become competent computer users, the development of the whole child must not be overlooked.

The researcher's study occurred in the classroom setting and provides a documentation of initial efforts using computers with electronic communication across the curriculum. Within the study, children developed new interpersonal relationships and a positive self-image as a knowledgeable computer user.
Ethnography and Qualitative Research Methods

This study sought to investigate and document word processing and graphics in electronic communication within the classroom context. To describe this phenomenon in this context required examination of the classroom as a whole. An emphasis was placed on a qualitative description of the classroom context and relationships found within that setting. There was an intentional effort to study the microcomputer within the classroom context as it naturally occurred. Disruption to the classroom was avoided, and an effort was made to blend into the context as a participant observer functioning in the role as a computer teacher to the students. A video camera was used only three days during the study to assist in documenting the Writing Across the Content Areas with Computers (WACA) project. The goal was to investigate, document and interpret the electronic computer experiences of third and fourth grade students within the classroom using ethnographic methods.

Ethnographic methods of research have a strong heritage in European linguistics, and the fields of anthropology and sociology. During the last two decades educational research has sought to utilize this method to study the context of situations. An American anthropologist, Malinowski (1923), drew upon his
experiences from studying the Trobriand Islanders to observe that the Islanders utterances had no meaning outside the "context of the situation." Shortly thereafter, Sapir, another American anthropologist and linguist, formed the concept of "functional relevance." An inclusive application of this principle implies that the understanding of any phenomenon, whether it be audible or observable actions, evolves from its meaning in context. Hymes (1977) postulates that functional relevance is important at all levels of language within context. Language is conveyed not by sounds alone, but within the social context in which it is expressed. Halliday (1975), Hymes (1977), Cazden (1972), Brown (1973) and Bloom (1970) followed with scholarly research that continued a strong tradition of language and learning within context. Although this study does not profess to be a formal sociolinguistic study, it seeks to describe electronic communication in the classroom context where language and meanings served the students for their intended purposes.
CHAPTER III
METHODOLOGY

This study examined the context for word processing and electronic communication of a single third grade classroom, the teacher and peer pen pals, in order to investigate, describe and understand the process. A key purpose of the study was to document the interaction occurring within the classroom, between the students, teacher and peer pen pals. The exploratory and descriptive nature of the study suggested a qualitative methodology.

This chapter will present a schedule of the study and apportioned time spent within each phase. Next, a summary of a preliminary pilot study and findings will be reported. Finally, a discussion of the study’s phases will be addressed in the following order: 1) design of the study and articulation of the research question; 2) school entry and establishment of the researcher’s roles and relationships; 3) home entry; 4) data collection; 5) data analysis; and 6) results and dissemination of findings. Figure 1 illustrates in
graphic form the time line of the study, as well as overlapping of the research phases.

**Time Line of the Research**

The researcher was actively involved with this study for a period of one year, eight months. The phases of the study which entailed the major portion of time spent were: 1) collecting data in the pilot, classroom, and home settings; and 2) transcribing, analyzing and preparing a final report of the data. Eighty-eight days between January and August, 1985 were dedicated to data collection of the final study. Ninety hours of audio tape recordings were also collected during this same period of time.

**The Pilot Study**

Due to the exploratory nature of the study and the limited number of completed ethnographic research projects dealing with an integration of writing, communicating and utilizing microcomputers in the classroom setting, a preliminary pilot study was conducted. Purposes of the pilot study were to appraise the suitability of the research, to predict potential problems which might be encountered, to begin identifying recurring themes, to examine questions for interviewing
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<td>III. Establish Researcher Roles</td>
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<td>IV. Home Entry</td>
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<td>V. Data Collection</td>
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<td>VI. Data Analysis</td>
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<td>VII. Dissertation Dissemination</td>
<td>OSU Seminar AERA Literacy Con.</td>
<td>Pleasant School SSCO U.A. School AERA</td>
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Figure 1. Time Line of the Study Indicating Phases of Research
students and teachers, and to sharpen the researcher’s focus and articulation of the research question.

School Entry—Implementation of Pilot

Nineteen senior students from The Ohio State University were placed in the field at seven school locations within a suburban school district during Autumn Quarter 1984. Data collection was completed in late November 1984. The researcher taught both the reading and language arts methods courses to this group of students. This same group of students had been selected to participate in a strand emphasizing writing across the curriculum with computers. The researcher capitalized upon this opportunity and trained them as participant observers focusing their attention upon word processing, writing and electronic communication while completing methods field participation experiences. The Ohio State University and the school district were concurrently working on a research project sponsored by The Apple Education Foundation, CompuServe videotext network system and Koala Graphic Industries. Consequently, the university, the school district, The Apple Education Foundation, CompuServe and Koala Graphic Industries were very supportive of planned efforts to closely observe and
record information relating to student's use of the microcomputers.

Procedures of the Pilot Study:

Nineteen case studies directed by the researcher and generated by trained senior students of The Ohio State University were conducted throughout Autumn Quarter 1984 and completed the end of November 1984. The case studies focused on students from the early primary to middle school levels. The classrooms were housed in seven school buildings located in a middle-class, suburban neighborhood. Subjects were randomly selected and varied from six to fourteen years of age. Data were gathered for a period of seven weeks in three phases by nineteen trained university students. Observation notes and anecdotal comments were recorded a minimum of twice each week and stored on a microcomputer disk.

During phase one, materials were gathered focusing on the classroom as a whole. Careful observation was given to language arts and reading as it naturally occurred within the classroom context. During this time the variety and use of language, reading and writing used by the children was noted. The manner in which the classroom teacher talked about and modeled writing was also recorded.
Phase two consisted of oral, dictated and written "retellings" of a story or report completed by a small group of children, with an especially close look at one child within the group. This same child was observed in the classroom context during a variety of activities: 1) working on a thematic web; 2) reading; 3) writing; and 4) revising written work or communicating with others via electronic mail.

Phase three of the pilot study centered upon the child's self-evaluation of four selected samples collected from a range of writing events. Six questions were addressed to the child utilizing Dyson's research (1983):

1. Do you remember doing this?
2. Can you tell me how you did this?
3. Does your writing have any special purpose......who is it written for?
4. Do you consider this to be good writing?
5. What makes it good writing?
6. Choose your very best paper......how is it different? What makes it special?

Finally, on the conclusion of the seventh week in the field (approximately 84 hours of field participation per university student), a written summary was composed of the nineteen individual case studies was prepared. The studies reported each child's writing performance
(computer versus pencil and paper tasks); writing preference (computer, pencil and paper, mode of writing); writing style (strategies) incorporated (i.e., examples, metaphor, analogy, story structure, repetitive phrases); and writing production. Several questions were raised. Was there evidence of writing being freed or suppressed with the use of a microcomputer? Were the length, quantity of text and ideas expressed significantly different from pencil and paper tasks? Was the approach to the task of writing observably different?

Information Gained from the Pilot Study:

Pilot data were collected during nearly 1600 hours of field interaction, observation and documentation by university students. A large portion of this data was recorded on microcomputer disks. Each university student completed a summary report. These data were then triangulated between the researcher, the trained university student's report and the raw data. Triangulation assisted the researcher in careful analysis of the data, which resulted in identification of recurring themes among the nineteen individual studies. Listed below are eight recurring themes which were noted.

1. Both elementary students and university student teachers were frustrated with typing proficiency. Observer comment: "I even found myself becoming
anxious with the elementary student's lack of typing skills."

2. Environmental distractions were reduced when elementary students were writing with the computer (i.e., the movement of others within the classroom went unattended).

3. An eagerness was shown by nearly all students to use a word processor. Typical student comment: "Is it our turn today!"

4. Learning styles of the students ranged from a desire to perform perfectly to merely getting a few thoughts recorded in text (i.e., some students type very carefully making sure each letter is correct when entered, while other students quickly input their thoughts and edit for errors later).

5. Student attitudes toward revision of written text and frequency of revision tasks varied (i.e., some students entered text and let it remain unchanged while others edited and revised text as an on-going process).

6. Students displayed pride and pleasure when producing a hard copy on the printer of written work from diskette (i.e., quality of handwritten work and erasure smudges become eliminated).

7. Students characterized time spent working with word processing on a microcomputer as "fun and exciting."

8. Keen interest was demonstrated by students in sending and receiving messages through the electronic communication videotext network (i.e., students persistently requested that the teacher allow them to send/answer electronic messages).

Design of the Study and Articulation of the Research Questions

The study stems informally from the researcher's background, knowledge and experiences related to reading, writing and communicating ideas to others in both oral
and written forms. A text network system appeared to be best suited as a unique instrument for integrating reading, writing and communicating skills. The research questions evolved from a series of questions, concerns, recurring themes, and the literature. The pilot study, field notes, intensive observations and thoughtful reflection directed in the process of forming and reforming the key questions of the study. Finally, the writing process involved in creating the study's proposal encouraged the researcher to examine her own thoughts and written text for clarification and refinement.

Follow-Up Research Study

An interactive/reactive design for the research was used for the follow-up research study. Such a design permitted emergent questions. The research phase was initiated in January and continued until the end of the school year in early June.

Setting: The setting for the study was a target third grade classroom in a suburban school. The researcher had an opportunity to observe and supervise an Ohio State University student for seven weeks whose field experience involved participation in this particular classroom. Observation of the classroom setting indicated flexibility in student movement, interaction among
classroom peers and projects relating to classroom themes. The classroom was located next to the school's computer lab which housed a telephone line and modem to access CompuServe, a videotext information network system. Two Apple IIe microcomputers were made available on loan from the lab to be used in the third grade classroom (this number fluctuated from 1-3 times daily depending upon the needs of other teachers within the school building).

**Subjects:** Four third grade students from a suburban school district in the central Ohio area were invited to participate in the study on a voluntary basis. The researcher met personally with the parents of each child to fully explain the project and request voluntary signature for the permission of the child to participate. The researcher also met with each child prior to the study to fully explain the research study and offer the child the choice of participation or withdrawal on a voluntary basis at any time in the study. Several steps were taken to insure the subject's voluntary participation in the study.

1. A meeting was scheduled with the parents to fully explain the study and answer questions. Before the parents signed a voluntary permission consent form for their child, the researcher informed the parents that they and their child were free to participate or withdraw consent or discontinue participation in the study at any time.
2. The researcher held a personal meeting with each student to explain the research study. The researcher also explained to the student the option to withdraw at any time and/or discontinue participation in the study without prejudice to the child, parent or classroom teacher. To withdraw consent or discontinue participation the student merely needed to inform the researcher or classroom teacher. The students were encouraged to ask questions concerning the study. The researcher took time to discuss and answer each participant's questions.

3. The school principal supported the study and agreed to provide information and discuss participation with the students and parents upon request.

The four volunteers varied in skills and background experiences, yet they were all applicable and appropriate to the third grade classroom. Involvement in the study was contingent upon the agreement of the parents and subjects to participate in the data collection. The data collected was used to explore electronic communication and describe patterns of use in a third grade classroom context. Confidentiality of the specific identity of each child was maintained at all times.

Establishment of the Researcher's Roles and Relationships

Observation: This study relied heavily on the skills of participant observation employed by the researcher. Patton (1980) notes that in participant observation, the researcher shares the life and activities of the program under study, thus developing an insider's view of events. The researcher, who had
supervised a university student from The Ohio State University in the selected elementary third grade classroom. As an opportunity to interact and become familiar with the classroom teacher prior to the researcher's participant observation in the same classroom. An informal meeting was held between the third-grade classroom teacher and the researcher exploring the teacher's desire to participate in the study and the potential benefits of the study for the students.

It was agreed by both to introduce the researcher to the third-grade students as a "classroom teacher and helper." The third grade students were accustomed to university students and/or volunteers assisting and participating in the classroom. Given this flexibility and openness, the researcher first identified potential days and times to set aside for regular participation and observation serving as a computer teacher and helper in the classroom. A time block of half-day sessions, two to three days each week was considered strongly and later selected for data collection. The researcher sought to establish a regular attendance schedule to promote a feeling of consistency and familiarity with the third grade students and the classroom teacher.
The researcher observed the classroom environment, room arrangement, wall displays, teacher and student interaction, seatwork time, student activity on the microcomputers, and student's spontaneous behavior during transmission of electronic mail.

(See Figure 2 for a chart indicating roles and relationships of the researcher during data collection.)

Home Entry

During the latter part of May and beginning of June, the researcher spoke with the parents of students involved in close observation and indepth study, requesting approval to visit the home during summer school vacation. The researcher further explained that one Apple IIE microcomputer, monitor, modem, graphic illustration pad, and printer would be made available on a rotation basis for use in student's home during the summer months, under the supervision of the researcher. Although summer schedules were busy and complicated by vacations, etc., all four families responded positively to the idea of having the researcher bring the microcomputer for home visits during the summer months. The responses were very enthusiastic and mostly on the order of, "Come to my house during the summer with a computer? Wow, that'll be great! Do you know yet when you'll be coming?"
<table>
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<th>Role</th>
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<th>Role Perceived by:</th>
<th>Research</th>
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<tr>
<td></td>
<td></td>
<td>Elem Students                                             Class Teacher                                            Univ Students</td>
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<tr>
<td>Research Trainer</td>
<td>Train O.S.U. students for pilot study</td>
<td>Teacher for Pre-service teachers                                 University Field Supervisor                                      University Instructor</td>
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<tr>
<td>Observer</td>
<td>Acquaint researcher with classroom climate and context</td>
<td>Visitor, Helper                                               Research observer                                                            Field participation evaluator</td>
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<tr>
<td>Participant</td>
<td>a) Become part of classroom life. b) Seek student response</td>
<td>Volunteer, Helper                                             Volunteer, participant/observer researcher                     Field support, reading and language arts, computer trouble shooter</td>
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<tr>
<td>Observer</td>
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<tr>
<td>Computer Teacher</td>
<td>Train elem students in word process, graphics, and E-mail</td>
<td>Computer teacher                                             Computer teacher, resource person, researcher                        Field support, knowledgable in word processing, graphics and E-mail</td>
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Exploring electronic communication exp., noting recurring themes which emerged.

How is language, writing and comm. being used in the classroom context.

What purpose does electronic communication serve children?

Does a transitional process occur as students use of the microcomputer changes?
Data Collection

Data collection for the study was a very time consuming process. The pilot study required data to be collected for a three-month period from September through November, 1984. The follow-up research study spanned a six-month period while school was in session, with a planned continuation with four students during the months of June, July and August, 1985. The expanded direction for data collection time was necessary for:

1. installing new equipment and working out potential "bugs" in the system;
2. establishing computer time within the on-going classroom curriculum;
3. making contact with peers at another school who were also interested in sharing electronic mail and beginning a pen pal program; and
4. providing a period of time for the researcher to observe, record, participate and function as a classroom computer teacher to familiarize students with word processing and begin to look for growth and subtle changes.

Time Line

A month by month progression of the study is detailed below:

September - November, 1984:

Pilot Study
November, 1984:

Human Subjects Approval: Protocol No. 84B0130, approved 11/16/84

December, 1984:

Public School Board Approval to conduct research at a suburban elementary school located near Columbus, Ohio

January, 1985:

1. Contact subjects
2. Acquire subject’s consent to participate
3. Observe and participate in the classroom
4. Conduct "Background Survey Interview" with students
5. Begin field notes and audiotape recordings
6. Request that students collect writing samples on disks and in folders

February, 1985:

Continuation

1. Field notes and audiotape recordings
2. Observation and participation in classroom three days per week
3. Collection of student samples of electronic communication experiences on disks and in folders

March, 1985:

Continuation

1. Field notes and audiotape recordings
2. Observation and participation in classroom three days per week
3. Collection of student samples on disks and in folders

4. Bimonthly interview with four case study students

April, 1985:

Continuation

1. Field notes and audiotape recordings

2. Observation and participation in classroom three days per week

3. Collection of student samples of electronic communication experiences on disks and in folders

4. Dictated pencil and paper sentence (timed and recorded)

5. Dictated word processed sentence (timed and recorded)

6. Conduct parent interviews

7. Conduct teacher interviews

8. Conduct pen pal interviews

May, 1985:

Continuation

1. Field notes and audiotape recordings

2. Observation and participation in classroom three days per week

3. Collection of student samples of electronic communication experiences on disks and in folders

4. Bimonthly interview with four case study subjects
June, 1985:

Continuation

1. Field notes and audiotape recordings

2. Observation and participation in classroom three days per week

3. Collection of student samples on disks and in folders

4. Dictated pencil and paper sentence (time and recorded)

5. Dictated word processed sentence (timed and recorded)

6. Final school year interviews:
   a. four case study students
   b. classroom teachers (4)
   c. principal
   d. parents of case study students
   e. entire third grade classroom of 21 students
   f. entire third/fourth combination classroom of 25 students (peer pen pals)

June, 1985--School Summer Vacation:

Visits to Subjects Homes:

1. Joe's Home—17th through 27th

2. Dean's Home—27th through 30th

July, 1985--School Summer Vacation:

1. Dean's Home—1st through 8th

2. Betsy's Home—22nd through 31st

August, 1985--School Summer Vacation:

1. Betsy's Home—1st through 2nd

2. Ashlie's Home—5th through 9th

3. Carol's Home—9th through 20th
4. Ashlie's Home--20th
5. Joe's Home--20th through 26th

Data Analysis

The data collected from interviews, fieldnotes, student writing samples on a disk, transmitted electronic communication samples of letters, and transcribed interview tapes and audio recordings were compiled, coded, with patterns noted and categories specified. The researcher examined the complete set of student written data collected as a whole, representing the full range of ways in which third/fourth graders are likely to use electronic communication. Greene's (1983) NIE School Based Postal System study gave the researcher insight concerning data organization and reduction. Categories and patterns of coding were a by-product of the subject's responses. Analysis was a continuous inductive process as themes were constructed and reconstructed from the data, rather than approaching the data with a set of a priori notions. The researcher initially used a mapping approach with a complimentary narrative describing the links between written communication of peers and teacher pen pals. A log was maintained as guidelines were established, definitions of terms were formed and decisions were made.
The researcher realized that she would not be able to fully portray each child, but instead would rely on selected illustrative sets of electronic communication strategies to satisfactorily represent the whole. The four case studies will focus on single children.

Data analysis was triangulated in five different ways:

1. between the researcher, the recorded data, and the classroom teacher;

2. between the researcher, transcribed audiotapes of interviews and classroom interaction, and the elementary students;

3. between the researcher, student sample selections of data, and parent conferences/interviews;

4. between the researcher's observations, the researcher's recorded student comments and student's word processing/electronic mail communications; and

5. between the researcher, the gathered data, and the school building principal.

Approaching analysis from these various viewpoints served to strengthen inner-rater reliability measurers.

Analysis of data was a very painstaking, time consuming and reflective process. The pilot study analysis occurred during December, 1984 and was completed by mid-January, 1985. The follow-up research study analysis assumed its main thrust in September, 1985 and continued being refined until March, 1986.
Results and Dissemination of Findings

Below is a brief explanation of planned presentations made or scheduled which reported the progress of the study and/or summarized current findings.

January, 1985
The Ohio State University, Columbus, Ohio
Presentation: "Writing Across the Content Areas with Computers"
Addressed senior pre-service teaching students; summarized pilot findings

March, 1985
Presentation: "Utilizing Microcomputers to Improve Writing Skills of Learning Disabled and Gifted Students"
Forty-five follow-up letters were received requesting a copy of the paper presented.

May, 1985
The Literacy Connection, Columbus, Ohio
Title: Utilizing Microcomputer Capabilities in the Classroom

October, 1985
Pleasant Elementary School, Marion, Ohio
Presentation: "Word Processing: A Tool for the Young Writer --- Where Do We Start?"
Addressed teachers, computer lab parent volunteers and school principal
November, 1985

School Study Council of Ohio, Conference on Reading and Writing

Presentation: "What's New with Computers --- Word Processing in the Classroom"

Addressed teachers and principals in attendance representing school systems throughout the state.

March, 1986

Columbus Ohio Librarian Association, Conference on Technology and Media

Presentation: "What Does Word Processing Offer the Classroom?"

March, 1986

Upper Arlington Schools, Columbus, Ohio

Addressed teachers and principal from Windermere Elementary School

Presentation: "Summary of a Study Stemming from the Writing Across the Content Areas with Computers Project (WACA)"

April, 1986


Presentation: "The Recurring Question --- Where Is the Time and Place for the Microcomputer in the K-8 Curriculum?"
CHAPTER IV
THE CLASSROOM AND COMPUTER CONTEXT

This chapter describes the classroom and computer context in which the messages were created, shared with others and transmitted electronically to pen pals. One of the major goals of this study was to document the experiences of students in a third grade classroom interacting with a third/fourth combination classroom functioning as electronic peer pen pals, and as well as the general use of the microcomputer in each school context. This context was shaped by each classroom teacher and influenced by the researcher serving as a computer teacher, as well as a student teacher serving in the third/fourth classroom who also had special training and skills in word processing, graphics, and electronic communication.

This chapter also includes a figure followed by an outline and narrative description which display computer use and developmental phases revealed by the experiences children had during computer activity. Findings are presented in two chapters. In chapter four, the classroom and computer context are reported. Next, a map
of student developmental computer phases augmented with a narrative description of each will be provided. Chapter Five documents the Interview Data. The responses of thirty-six students, four teachers, two principals, and four parents of students are reported. Generalizations in the form of recurring themes which emerge from the data are identified and discussed.

A Description of the Classrooms and Computer Contexts

The Target Third Grade Classroom: Twenty-one students were housed for the major portion each school day in their home classroom. Special classes and events such as art, physical education, music, library, computer lab, lunch, assemblies and honor programs were held in various parts of the school building.

The description that follows is a representative of many days in the classroom in which the researcher served as a participant observer. Seasonal decorations created visual change, but for the most part designated learning areas remained the same. Seat arrangements of students changed three times from January to June, but the seating format of desks grouped together remained similar. (Refer to Figure 3 for a graphic representation of the target third grade classroom arrangement.)
Note: A maximum of three computers were in the room at any time. Locations varied depending on class activity.

Figure 3. Room Arrangement of Target Third Grade Classroom
The Classroom Arrangement: Each classroom was equipped with a chalkboard along the front wall with a bulletin board located on either end. One bulletin board displayed special student papers and a class calendar. The other bulletin board provided the student helper chart in a 'want ads' display. The west wall of the classroom was lined with windows which gave the room a source of natural lighting. The window ledge was used to display: 1) books; 2) student topographical salt maps; and 3) models generated from student book reports. A classroom library was housed in the front right northwest corner of the classroom. The library was carpeted. Students sat on the floor while relaxing with a book.
The science table, located just outside the library corner, displayed a globe and special materials relating to the present science focus, such as a three-dimensional, land features map. On occasion, this same table would be used as a materials supply center (i.e., paper, markers), a resource book center, a study table, and a student interest center displaying items shared by students within the classroom. The classroom teacher’s desk was situated on the far west side of the classroom by the glass windows approximately eighteen feet from the front of the classroom. The teacher’s desk contained basic teaching equipment such as a pencil holder with
pencils, markers, and scissors, stacked paper trays, reference books, and a teacher planning book. Additional reference and teaching materials were located in a file cabinet placed at the front right corner of the classroom teacher's desk. The window counter and wooden shelves found in the southwest corner of the classroom served as supplemental space for teaching resources, skill development reference material, children's reading material (i.e., comic books, magazines) and games used during indoor recess.

The right northeast corner of the classroom served as the reading group area. Shelves holding basal books and related instructional materials joined an attractive wall display of a giraffe saying "stick your neck out and read." A semi-circular reading table with students' chairs and a teacher's chair faced a small chalkboard with reading group names and basal book pages for each group to refer to for the day's lesson. A third bulletin board was positioned on the wall at the left side of the chalkboard. Students' work, such as narrative writing with illustrations, was often displayed in this area. When student work was not on display, the bulletin board area emphasized a concept that was being studied in the curriculum, such as simple machines. Beyond the doorway entrance to the classroom a table supplied manipulative
materials such as geometrical shapes and geoboards for a
math center. The back wall of the classroom provided
students with lockers for coats and boots. Each locker
face was periodically decorated by the students with
artwork denoting an upcoming holiday season, or special
student papers portraying their "best work." A sink and
counter was adjacent to the lockers on the southwest end.
The students' desks filled the center of the room as
they formed a "U" shape. Desks were grouped in two's on
the side of the "U" with a single row forming the lower
portion of the "U".

Within this same classroom space Apple IIe micro­
computer were rolled in on carts from the microcomputer
lab three mornings of each week. Throughout the six
month period the computers were placed in one of three
open areas in the classroom:

1. in the front of the classroom near the
chalkboard (if students did not need to read
information from the chalkboard to complete morning
deskwork)

2. along the east room entrance wall near the
entrance, or

3. along the outside window wall near the southwest
corner of the classroom.

The change of microcomputer locations within the
classroom resulted from different needs of the students,
The classroom teacher and the computer use.
Schedule of the School Day: Each morning the classroom teacher would write the date and schedule of events for the morning on the front right hand side of the chalkboard. A sample morning schedule is listed below:

April 16, 1985
1. Opening
2. Writing
3. Work Time
   A. Recopy Story
   B. Spelling
   C. Language
   D. Math
4. Reading
5. Recess
6. Reading

The principal opened the school day by making morning announcements over the public address system. Following the announcements, the students would sing a patriotic song and recite the pledge of allegiance to the American flag, led by a selected peer. Oral language of the students was facilitated each morning by student selection to serve as the group discussion leader. The leader would call upon students to engage their participation, share events, ideas, and/or objects with fellow class members. Students were able to listen to one another and ask questions pertaining to the information being shared. The classroom teacher closed this portion of the morning by commenting on the shared experiences. Students were complimented on their sharing
of topics, questions and courtesy shown to the speaker. A brief lesson was often conducted by the classroom teacher on cursive writing. The lesson typically emphasized a particular letter and words within which the letter was written. Students devoted attention to the formation of letters during these lessons. Writing papers were collected followed by an explanation of the morning seat work given by the classroom teacher. These items would be listed under the heading of "work time" on the morning schedule found on the chalkboard. Events such as recopying/editing stories, spelling words/practice, math reinforcement pages, language and grammar exercises regularly occurred on the list.

A full explanation of directions for each study activity was first provided by the classroom teacher and later followed by students' questions. The teacher then began working with her three reading groups, one at a time. This activity was usually scheduled for 9:00 a.m. During this time, the researcher worked three days a week with two to three students at a time. The classroom teacher would allow each student to substitute computer word processing time for reading group time once each week. In many cases this was unnecessary because the rotation system encouraged students to work with word
processing when their particular reading group was "not" in session.

Morning recess was held from 10:00 to 10:20 a.m. A very popular request from the students was to stay inside during recess time to work with the computers. During the entire time the researcher served as a participant observer in the classroom setting, there was not one day that passed in which she was not requested by one or more students to continue or begin word processing during recess time. When recess was over, students reentered the classroom and began their work, which continued until lunch time. The classroom teacher reconvened her reading groups and the researcher continued supervision, as needed, with students using computers. As the end of the morning work period approached, the classroom teacher would announce that it was time to prepare for lunch. During the first ten weeks that the researcher worked with the target classroom, the students ate lunch during the late lunch period. This meant that the students were entitled to thirty minutes of recess before lunch break. Repeatedly, the researcher found herself being approached by students to use the microcomputers during the pre-lunch noon recess period. With the approval of the classroom teacher the researcher was able to provide additional computer time to students by staying on hand
to supervise and guide students at both morning and noon recess periods.

It should be noted that this alternative would not be feasible for a full-time classroom teacher since it virtually left the researcher with no free time from the beginning of the school day through the lunch session. The researcher gained quite a reputation as a "workaholic." The classroom teacher acknowledged the amount of energy and dedication the researcher put into the research study. It also demonstrates the difficulty a single classroom teacher would encounter when initially instructing and assisting students with a word processing, graphics and electronic communication program.

The Third/Fourth Peer Pen Pal Classroom

Much like the target classroom, the twenty-five third/fourth grade students spent a large portion of each day in their home classroom, leaving only during scheduled times for special classes, school events, lunch and or recess.

The account which follows is a representation of weekly visits in the classroom from January until June, 1985. Wall displays changed and expanded as study within the classroom grew and developed with the introduction of
new and related areas of interest. Student work areas remained in nearly the same places, but were used for different tasks as the need and purpose dictated. For example, grouped tables could be used for drawing areas to carefully sketch the gear found within a hand-powered, coffee grinder. Later these same tables provided space for students to make journal entries and reactions to read aloud sessions relating to a chapter book entitled *Bridge to Terabithia* by C. Paterson (1977).

The Classroom Arrangement: The classroom itself was located within a cluster of three small buildings situated across the playground area from the larger, two story school building. The school staff commonly referred to the grouping of smaller buildings as "pods." Informal classroom settings promoting the integration of curriculum study were located within the "pod classrooms." Figure 4 shows a close proximity of the room arrangement found in the third/fourth peer pen pal classroom. A narrative description will follow the pictorial room recountal.

The classroom entrance was located on the northwest corner wall. Tables and chairs used by students were found in small groupings scattered about the room. For example, six chairs and tables resided along the center
Figure 4. Room Arrangement of Third/Fourth Peer Pen Pal Classroom
of the west wall; three chairs accompanied a round table a short distance from the north wall; three additional chairs with desks were butted up against the northwest wall; while six to eight more chairs and four tables were grouped together to form a large working area in the northeast corner of the room. Three to four chairs could also be found in the quiet/private area or gathered around other small table groupings near the bookcase off the east wall.

The classroom teacher and student teacher used an open area near the middle of the room for large student group gatherings to plan, discuss and share learning events. Since the entire floor was carpeted, the children could comfortably sit on the floor. This large group area is designated on the graphic illustration of Figure 2 with a broken line. Although the line forms a circle, it should be noted that each elementary student would select a comfortable spot somewhere within the large open space facing the teachers, but was not required or requested to sit in a circle formation. On the northeast side of the circle the classroom teacher and student teacher would take turns sitting in an upholstered chair facilitating student discussions and writing key points on a large tablet of chart paper.
The south and west walls of the classroom were nearly a continuous section of windows providing the room with natural lighting and a feeling of open space. Often, large mounting boards were hung from the ceiling near the windows, providing additional space for displaying examples of student writing and illustrations.

The teacher's emphasis on books and reading was observed in the materials she made available to students in the classroom and her use of space. More than two hundred selected literature books were housed in the classroom's book cases. A large comfortable sofa and wooden bench provided students with comfortable ways to curl-up with books and read. A loft with accessories of large pillows, bean bag chairs and cushions was often used by students for this same purpose.

An Apple IIe microcomputer was rolled in on a cart for the students to use within the classroom. It was usually placed either near the classroom entrance on the north wall or in the southeast quiet working area. It was necessary for this same computer to be shared with two other classrooms on a rotation basis.

Teachers within the same "pod" provided the microcomputer for the third/fourth classroom to use if it was not needed in their own classroom, however, they still remained unable to use the microcomputer word
processor on a daily basis. During the months of April, May and June this particular problem was solved when an Apple IIc became available for permanent placement in the third/fourth grade classroom.

**Schedule of the School Day:** Each morning the classroom teacher and student teacher assembled students on the carpet to discuss what had occurred the day before. This discussion was skillfully interwoven with questions about the previous day's events and answers about new ideas and interests. Key ideas and questions were recorded by the teachers on a large chart of paper which sat attached to an easel next to the teacher's chair at the edge of the large circle gathering. Often, books relating to the theme, such as "machines" were used as resources from which children shared ideas, illustrations and new knowledge.

The teachers would ask several students what they intended to do during the morning work time. Each student shared information with his peers about the particular machine being studied and how to pursue the next step to learn more about it. In some cases, the teachers offered ideas and possible directions for pursuing student studies. Much of the emphasis on learning in this setting stems from the philosophy which views the child as an active constructor of knowledge and
is reflected in the classroom's nurturing support allowing students to become involved in the "process" of learning.

"Machine" work time extended throughout the morning with group announcements or gatherings occurring as needed. After spending a number of hours on repeated visits to the classroom, it became apparent that the entire span of the curriculum had been skillfully integrated within the theme of "machines" and was later naturally extended into the study of "inventors."

Following the noon recess periods the class would usually find a comfortable spot on the rug or sofa to sit and listen to oral reading presented by one of the teachers. At the close of a chapter or two the students would discuss the characters portrayed, the feelings the words conveyed, and their own personal reactions. Many of the thoughts shared during the book discussion provided a starting place for student journal writing.

During afternoon writing and work time, the student teacher began one-on-one microcomputer word processing graphics and electronic mail instruction. Since a number of students had computers in their own homes they adjusted quickly to using the computer and learning word processing. Once this time schedule for working with the microcomputer was established, the researcher made most
of her classroom visits within this same time frame to function as a participative observer.

Witnessing the discovery learning that was occurring within the classroom, as well as listening to the rich student discussions of ideas and questions related to their work, the researcher could be nothing less than excited in determining the extent to which these same communication skills could be transmitted to other peers via an electronic mail system.

Patterns of Development Phases

Figure 5 gives a graphic presentation of computer use and the developmental phases displayed during the study. An outline and descriptive narrative of this same behavior follows:

I. Keyboard Basics

A. Areas of training

1. Special function keys
   a. escape
   b. return
   c. control
   d. shift
   e. arrow keys
   f. open and closed apple
   g. reset
   h. layout of letters

Descriptive Narrative: Each student was given one-on-one training with the microcomputer. During the initial training sessions the students were
Figure 5. Graphic Display of Computer Usage and Developmental Phases

- Keyboard Basics
- Learning Word Processing
- Novelty - Source of Entertainment
- Using Graphic Pad
- Print Shop Graphics
- Learning E-mail
- Gaining Control of Computers
- Seeking Chances to: Extend, Use, Share Skills

Useful Tool
introduced to the computer, learned how to turn it on, insert a disk, boot-up a program and find special function keys such as control, escape, and reset. The students also noted that the keyboard was not laid out in an A-B-C order. Interaction with a computer outside of school or in the school computer lab made this job more of a review session for a number of the students.

B. Student Status

1. Generally slow, hunting for keys
2. Eager to learn - novelty of equipment
3. Frustrated at times

Descriptive Narrative: Nearly all the students were very eager to learn more about computers and regarded the time spent with the participant observer and the computer as a privilege. The novelty of the equipment appealed highly to the students. Beginning skills on the keyboard were generally slow with pauses as the user hunted for keys. For a number of students, the pauses were interspersed with feelings of frustration.

II. Learning Word Processing

A. Areas of training

1. Booting up program
2. Creating text
3. Editing text
4. Storing text on a disk
5. Naming files
6. Recalling files from disk onto the screen for extending and revising
7. Printing files

Descriptive Narrative: The participant observer worked on a one-to-one basis with each student from the third grade classroom for a period averaging forty-five minutes to introduce word processing. Previous knowledge and skills that each child brought to the situation helped to determine the pace of these training sessions. Basic procedures for booting-up the program, creating text, editing text, naming files, saving files and recalling files were dealt with briefly. As the need arose, instruction was given on printing files.

B. Student Status

1. Requiring one-on-one or one-small group guidance
2. Slow and awkward
3. Confused at times
4. Forgetful about required procedures
5. Difficulty creating "names"

Descriptive Narrative: Early phases of the writing process conducted on a word processing program required the participant observer to provide one-to-one or small group guidance. The students' finger dexterity on the keyboard appeared slow and awkward. Facial expressions often revealed confusion. Although an index card with clear directions for starting the word processing program, saving files,
recalling files and printing files was attached to the computer cart, the students still remained forgetful of the sequence of steps and often did not remember to insert their disk before pressing the return key to save a file. They had similar difficulty in selecting a simple related name to label their file.

III. Using a Graphic Illustration Pad

A. Areas of training

1. Making selections from the menu
2. Manipulating the stylus
3. Saving graphic on a disk
4. Naming graphic file
5. Recalling a file from disk to edit
6. Printing graphics display

Descriptive Narrative: Time spent allowing the students to become familiar with the Koala graphic illustration pad was essentially exploratory in nature. It first encouraged students to use computer information with which they were already familiar, i.e., turning on the computer and booting up the program. Second, the program enticed the users by graphically displaying its menu beckoning them to select an item to see how it functioned. The participant observer provided a small demonstration for the students to show them how the stylus and graphic pad worked. Shortly after an introduction, the students tried their own hand at
creating, naming, saving and recording graphic files. Explanation for printing graphics was also given.

B. Student Status

1. Requiring individual or small group guidance
2. Eye hand coordination clumsy at times
3. Easily confused
4. Eager to learn - novelty
5. Delighted in graphic display
6. Eager to share
7. Difficulty in selecting brief file name

Descriptive Narrative: Eye/hand coordination skills were challenged as the students manipulated a stylus on a graphic pad and viewed the results of each movement on a monitor screen. A few students were easily confused by the complex menu selection, and the need to move from the menu screen, to the illustration screen, to the save and storage screen. However, all the students were eager to learn and delighted with the novelty of colors and patterns that they could create and view. One of the most recurring situations faced by the student was the difficulty in selecting a short concise file name for their colorful geometric designs. Often they tried to come up with titles such as "the amazing whirlly maze." These titles extended beyond the number of characters the computer program accepted, thus providing an error message. Through a series of
trial and error experiences, the participant observer encouraged students to choose key words depicting their graphic display or abbreviations that they might use for their lengthy titles. The enthusiasm and delight expressed in their individual work commonly urged others to gather around their monitor to take a look and help confirm their success. "Hey, Mrs. Kumpf, come over here and take a look at this now! It's turning out really great!"

IV. Print Shop Graphics

A. Areas of Training

1. Answering program questions
2. Positioning paper and printing
3. Using program to print Koala graphics

Descriptive Narrative: Once again this program encouraged students to use their existing knowledge and skills concerning computers and extend it a step further by requiring them to read a number of screen prompts, make a decision from alternatives given, and answer questions. This particular program also provided additional practice and familiarity with the printer and the positioning of paper within the printer. All of these skills were very helpful when the students began producing hard copies of their Koala graphic illustrations via the "print shop program."
B. Student Status

1. Eager to learn - novelty
2. Eager to share with others
3. Slow, thoughtful, or indecisive
4. Text and graphic often unrelated

Descriptive Narrative: Most students were anxious to try their hand at the "print shop program." They were enthusiastic about learning and prided themselves in the uniqueness of the product they created. Student response to program questions ranged from slow and thoughtful to indecisive. Initially it was not uncommon to find little relationship between the graphic illustration and the written text. Later this pattern changed and was replaced with student comments of self-evaluation and an indication of pre-planning. For example, one student stated while lightly chuckling: "This doesn’t make sense, a birthday cake and then the words 'world's greatest Mom.' I didn't even say happy birthday!"

V. Becoming Familiar with Electronic Mail

A. Areas of Training

1. Logging on
2. Making menu selections
3. Learning electronic mail page index
4. Writing text
5. Sending text
6. Up loading text
7. Down loading text
8. Filing mail
9. Printing mail message
10. Transmitting graphics by coding

Descriptive Narrative: Developing electronic communication skills was the most complex experience in which the students were involved. Compared to the other endeavors of the students, the electronic mail required far more sequential steps. The students were given opportunities to log-on, make menu selections, use electronic mail page index, write messages and send messages. In addition, they were acquainted with up-loading text stored on a disk, down-loading text onto a disk and filing mail messages into a storage bank within the videotext network system. As the students' skills and interests in communicating a variety of information expanded, the need to transmit graphics surfaced.

Since the student graphics were stored as binary files it became necessary for each file to be coded, with the aid of a developed program, into textual files for videotext transmission. The students also learned how to decode graphics files received through electronic communication from textual, back to a binary format so they could be viewed via the Koala graphics program.
B. Student Status

1. Lack of initial comprehension
2. Intrigued by capabilities
3. Eager to learn
4. Eager to send and receive mail

Descriptive Narrative: The students initially lacked full comprehension of what was actually occurring over the telephone lines. They had difficulty visualizing how the computer they were working with was linked to another computer located elsewhere. A number of students overgeneralized this new use of the computer assuming that if someone they knew had a computer they could also send them an electronic message. "Mrs. Kumpf, could I also send a message to my friend, Sarah? She has a computer at her house." Undoubtedly, the students were intrigued by the capabilities of a videotext information network system. What many of them did not realize was that the uses with which they were familiar were only mere particles of the system's full range of capabilities. They were very enthusiastic about learning how to use an electronic mail system and even more eager to send and receive actual messages.
VI. Gaining Control of the Computer

A. Opportunities for use made available

1. Three mornings each week
2. Morning and noon recess time
3. Participant observer available as needed
4. Computer lab sessions scheduled

Descriptive Narrative: Students had access to a computer three mornings each week, as well as morning and noon recess time. The classroom teacher also scheduled the entire class for computer lab time once each week, which was directed by a resource teacher. During all of this time, the participant observer was available to guide and support students as needed.

B. Student Status

1. Relaxed and confident with computer
2. Good control over cursor movement
3. Able to boot up, recall file, edit and print
4. Understands electronic communication and is familiar with transmission procedures

Descriptive Narrative: Observations confirmed that students had become relaxed and confident using the computer. They mastered the cursor movement and were able to boot up a program, as well as recall, edit, name and print a file. Conceptually they began to understand electronic communication and became familiar with transmission procedures.
VII. Seeking Opportunities to Extend, Use, and Share Computer Knowledge and Skills

A. Opportunities to use, discuss, and collaborate with peers and others about the computer:

1. During school hours in the classroom and computer lab
2. At the local library
3. In the home setting

Descriptive Narrative: Students continued to use the computer in the classroom and computer lab settings during the school hours. They began openly discussing additional places that they could access and seek permission to use computers, such as the local library, friend's homes, parent's offices and relative's homes.

B. Student Status

1. Using computer for a wide range of purposes
2. Initiating ideas for computer use in school
3. Asking questions to understand beyond the basics
4. Requesting to use computer on a daily basis
5. Stating needs for computer use
6. Spontaneous occurrence of peer teaching
7. Spontaneous occurrence of peer collaboration
8. Seeking opportunities for computer usage outside the school setting
9. Hall displays of computer output
10. Computer graphics and text created for special adults and friends.
Descriptive Narrative: The students began using the computer for a wide range of purposes, e.g., bibliographies, narratives, letters, poetry, illustrations, cards, banners, branching stories and electronic communication. They initiated ideas for using the computer at school and, at the same time, requested the need for daily use of the equipment. Spontaneously peer teaching and collaboration occurred. They assisted one another with questions and answers, and often supported each other as new decisions were made and new functions of a program were explored. Students delighted in sharing their hard copies with others through hall displays, special computer graphics cards/illustrations and text written for adults and friends. Occasionally, students would share their work with others by allowing peers to transfer and store specific files on a peer's disk.

The patterns of developmental phases are not proposed by the researcher to imply that all the students became fully independent on the computer in a six month period of time. Nor are the phases intended to indicate that there was a staging of growth necessary at one level before the students moved on into other phases. Instead, the researcher
views the developmental phases of computer experiences as an on-going process, much like that shown in the related areas of research in language (Cazden, 1983; Brown, 1958; Heath, 1983; Snow, 1977; Ninio and Bruner, 1978) and writing (Emig, 1982; Daiute, 1983; Schwartz, 1983; Flower, 1983).
CHAPTER V

A CLOSER LOOK: INTERVIEW DATA AND FOUR CASE STUDIES

This chapter is divided down into two major sections. The first section presents the analysis of the interview data and how the information was used. It first provides information derived from interviewing thirty-six third and fourth grade students. Second, insights are reported from four teacher interviews. Third, responses from the target school principal, and the peer pen pal building principal are shared. Finally, an account of interview data collected from four parents of students within the study is given.

The second section presents an account of four individual case studies. Data were drawn from: 1) student language recordings within the classroom context; 2) formal and informal interviews; 3) writing and graphic samples; and 4) field notes recorded by the researcher. The case studies focus upon two boys and two girls within the target third grade classroom.
Interview Data

Clusters of interview data are discussed and emerging themes are identified. Identified themes were triangulated in two ways: 1) between field notes, interview data and the researcher, and 2) between field notes, context data (transcribed audiotapes and communication products) and the interviewee.

Triangulation was used to strengthen or question the validity of each theme. Interview data was significant in order: 1) to gain background information about students participating in the study to aid in analyzing context field notes and audio language tape recordings containing student comments and reactions to computer experiences; 2) to gain information concerning teachers' and principals' perceptions, attitudes, philosophical and theoretical perceptions of the use of computers in the school setting; 3) to gain parents' input regarding their own informal observations of their son or daughter who was involved in a variety of computer experiences in the classroom on a regular basis for five months; and 4) to explore the network of links and branches between communicating, writing, and the computer.
Interviews with Students

The target classroom of twenty-one third grade students and the peer pen pal classroom of twenty-five third/fourth students were interviewed individually during the first month of the study and again during the fifth month. The interviewing sessions were taped and transcribed for analysis. Students responded to a series of questions designed to give researcher some background information about each participant. These questions focused on previous computer, keyboard and writing experiences, as well as perceptions about how computers are used. At the end of each discussion session the target classroom students were asked to complete two timed writing samples: the first, a dictated sentence completed with pencil and paper and the second, a dictated sentence completed on the computer with a word processing program. The time that was required by the students to complete each sentence was recorded. In the research sample, dictated sentences were completed and recorded only during the fifth month of research for the peer pen pal classroom.

Previous Computer Experience: Over 90 percent of reported previous computer use among the students was obtained primarily from "computer games." Many of the students were initially confused about what "word
"processing" was and openly stated that they had "played" with computer games but had not used a word processing program. In the target third grade classroom only eight had a computer in their homes. Out of this group of eight only two had Apple computers like those being used at the school. In contrast, the number of computers found in the peer pen pal student's homes was nineteen out of twenty-five students. Eight of these were Apple computers (refer to Table 1).

A wide range of experiences on the keyboard was demonstrated by the students. This experience ranged from using one or two keys for activating a game program to enrolling in summer workshops giving keyboard instructions and using a keyboard training program. The majority of the students fall into the first description. Table 2 shows the breakdown and range of keyboard experiences of each classroom involved in the study.

In general, computers were used very little for writing. The bulk of writing that was described in the first interview was "writing computer programs." This type of writing was shared with a computer teacher, a parent or done solely for self pleasure. When asked if there were advantages to using the computer and a word processing program, the students' replies initially referred to how the computer helped others, such as the
Types of Computer Usage Before Study
Target and Peer Pen Pal Classrooms
Percent of Total

<table>
<thead>
<tr>
<th>Activity</th>
<th>Target Class</th>
<th>Pen Pal Class</th>
</tr>
</thead>
<tbody>
<tr>
<td>Computer Games</td>
<td>28</td>
<td>19</td>
</tr>
<tr>
<td>Skills and Drills</td>
<td>19</td>
<td>14</td>
</tr>
<tr>
<td>Computer Graphics</td>
<td>14</td>
<td>14</td>
</tr>
<tr>
<td>Programming</td>
<td>14</td>
<td>3</td>
</tr>
<tr>
<td>Word Processing</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>Electronic Communication</td>
<td>0</td>
<td></td>
</tr>
</tbody>
</table>

Students with Computers in the Home Setting and Students with Apple Computers at Home

- Target Class
- Pen Pal Class

Table 1. Previous Use of the Computer by Students
Experiences Students Had on the Computer Keyboard
Before Participating in the Study

<table>
<thead>
<tr>
<th>Activity</th>
<th>Target Class</th>
<th>Pen Pal Class</th>
</tr>
</thead>
<tbody>
<tr>
<td>Use one or two keys for games</td>
<td>100</td>
<td>100</td>
</tr>
<tr>
<td>Use keyboard training program</td>
<td>16</td>
<td>14</td>
</tr>
<tr>
<td>Attend summer workshop</td>
<td>0</td>
<td>5</td>
</tr>
</tbody>
</table>

Table 2. Previous Student Keyboard Experiences
businessman, but made no real connection of how the computer was presently helping them as an individual.

During this same period of time the students saw no link between word processing programs and the development of their own writing skills.

Within the total group of thirty-six students, all described the use of a computer and a word processing program as a fun experience. They also recognized the computer's "educational" benefits and uses. The educational component was supported by skill and drill games with which they had been exposed. The researcher speculates that this may also be an indicator of the influence of the media within their lives.

**Follow-up Student Interviews:** The follow-up interviews with students showed signs that a "developmental process" was occurring among the participants in regard to their perceptions and use of the computer. Their use of the computer expanded from the school and home to a friend's house, the local library, grandparent's home, and parent's office. The self confidence and level of independence they acquired enabled them to seek new settings for using the computer and convinced parents that they were now ready to take on computer experiences without the need for constant on-one-on-one guidance.
Since the subjects had used the computer in both the lab and classroom settings, the researcher was curious from a curriculum planning and development viewpoint where students "preferred" computers to be located in the school setting. A 92 percent student response indicated a preference to have computers housed in the classroom. Four reasons were given: 1) comfort 17 percent, 2) convenience 61 percent, 3) flexibility 8 percent, and 4) the ability to concentrate better on a given task 6 percent. Table 3 provides a summary of information gathered reflecting the students' preferences for computer location in the school setting.

"In the lab they tell you what to do and you don't learn. They tell you to press and you just press buttons -- like press this and press that. But in the classroom I think you learn a little bit more because then you learn what you need. So I think the classroom is better."

"As individuals, the participants began reflecting upon how the computer had helped them during the previous months. They revealed that working with the computer enabled them to "learn new things." Their perception of its use also changed and was noted by the researcher, classroom teachers and parents in the subtle use of terminology. They evolved in the expanse of user experience form a role of "playing" with the computer to "working" with the computer. The phrase "can I play with the computer?" addressed to the classroom teacher,
Table 3. Student Preference for Computer Location in the School Setting
researcher and parents was transformed into another phrase self-initiated by the students, "can I work on the computer?" Many of them were very realistic to point out that they had learned to spell and use new words, i.e., computer, reset, escape, monitor, processing, yet they did not feel that they were presently a better writer from exposure to the computer. As one student openly stated: "Computers are pretty new to me."

The students acknowledged that they were at a beginning point in their growing process of computer writing experiences, and given time and experience, they would improve. They looked forward to future use and did not dwell on their current shortcomings. The students were given an open ended phrase to complete with descriptive words as follows: Working with computers is __________? The responses during the fifth month of the study once again indicated the students had moved from the basic response of "fun" to more specific descriptors including adventurous, challenging, exciting, interesting, and important.

While establishing electronic communication channels and a series of sequentially building experiences within each classroom, the positive interest in these activities generated by both classrooms indicated the value and benefit of such a program. Unanimously, the thirty-six
students were eager to pursue contact with a peer pen pal during their next school year. Their varied reasons included the following:

"It gives me a reason to use the computer."
"I like writing to people."
"I like meeting new people and making new friends."
"It gives me someone to talk to that doesn’t know me."
"I can tell them what I’m doing and interested in."
"Sometimes I can send some writing I’ve done to see how she likes it."
"It’s more toward the future to send letters over the computer."

Finally, the researcher constructed a verbal hypothetical experiment by asking the student to complete a writing task using the materials and supplies on a shelf at the far side of the classroom. The supplies consisted of a computer with a word processing program ready for use and a pad of paper with pencils, pens and markers. The students were asked what they would select to complete the writing task. The computer was chosen more than 95 percent of the time; however, several students responded with a qualifying statement such as; "I would choose the computer if I was not given a short time limit. I’m still a faster writer with pencil and paper." These students showed signs of how self-evaluation was being used as a natural process of knowing ones limits, strengths and areas for growth.

Some students however, conceptually did not make the link between their timed dictated sentences using pencil
and paper and the computer with a word processing program to real writing tasks. This group of students over generalized that "computers are faster," even when timed results on an individual showed that in many cases it took longer to complete a single sentence on the computer versus using pencil and paper. There was a third group of students who qualified their remarks by saying "computers are faster for making small changes and rewriting." This cluster of students had begun to recognize the power of word processing for their own writing as a editing and revising tool.

Interviews with Teachers

Four teachers were interviewed in depth. They were; 1) the classroom teacher from the target room, 2) the classroom teacher from the peer pen pal room, 3) the student teacher from the peer pen pal room, and 4) a special resource teacher serving selected students in the target classroom. The classroom teachers of the target room and peer pen pals were each interviewed informally during the first month of the study and in-depth during the fifth month. The target classroom teachers also granted a formal interview session after the research was underway for several months. A student teacher under the researcher's field supervision had a very active role in
the peer pen pal classroom. Weekly contact was logged and informal discussions relating to computer experiences frequently occurred. The student teacher was also formally interviewed during the fifth month. Finally, a special resource teacher serving selected students from the target third grade classroom was additionally interviewed.

Informal interview sessions were logged, while pre-planned formal interviews were all taped and transcribed with the intention of further analysis. Informal discussions dealt with daily comments, questions, concerns and "snags" encountered during implementation of computer experiences. Formal pre-planned interview sessions focused upon three topics: 1) teaching philosophies, 2) the computer's role in the curriculum, 3) and triangulation of field notes, student response and classroom teacher insight.

**Informal Teacher Interviews:** Informal interaction occurred each time the researcher was in the classroom settings. Short informal sessions transpired on a weekly basis, reflecting upon student responses, implementation of computer experiences and projected plans.

The following group of topics related to the time demands in the school setting and reoccurred in formal discussions. 1) Time was initially necessary for one-on-
one computer familiarity and word processing training of students. 2) Time was demanded throughout the study for individual students to have access to the computer for writing, responding to pen pal letters and creating graphic illustration. 3) Training of new programs such as graphic illustrations and story branches claimed new blocks of time. 4) As it became necessary to use the microcomputer modem and the videotext network system time was required to teach logging-on procedures and the steps used to transmit messages and graphics. 5) Time was needed to make plans to incorporate the computer into classroom life and continue guided support as students' needs arose.

A second group of recurring topics focused on common stumbling blocks in classroom computer experiences. First, availability of equipment was noted as a drawback. Computers and printers used on a rotation basis frequently meant that classrooms could not count on daily use of computer equipment. Second, electronic communication required telephone lines for videotext transmission. Neither of the classrooms involved in the study had the luxury of telephone connections within the classroom. This meant that students assisted by a student teacher or the participant observer were required to travel to a computer lab or library area specifically
prepared with a computer and telephone line service. Early in the study the delay of telephone connecting service for computer use became a concern as severe winter weather made it difficult for the telephone company to make wire installations at both schools. This issue was further exacerbated by paper requisitions from administration offices.

Third, daily school schedules often fragmented with special "pull-out" classes, assemblies, recess and lunch periods left little time for the computer if it was considered an "add-on" to the school day, rather than an integrated portion of the curriculum. This issue reemphasized the first predominate question of time. If the computer was to become an integrated part of the curriculum, time for pre-planning and teacher/student training had to occur.

**Formal Teacher Interviews:** While a great deal of information was gained and documented through the use of weekly informal interaction, the researcher elected to also conduct formal in-depth interviews with the teachers. The teachers described their own developmental process of computer use. They acknowledged that often beginning phases were not remembered as being comfortable.

"They (computers) were here one day and the next day; we had them. It really almost happened that
way. Yes, you know computers are coming, but they were here! That is scary."
"It's been my choice and it obviously hasn't been that important to me to really want to dig and to learn, to take the time."

"I took a university course on computers. It was all programming. We were not ready for programming. The whole group was turned off -- overwhelmingly. He (the instructor) scared the devil out of me!"

"Oh, I have been thinking -- a little guilty -- I know that there are possibilities out there, but I guess there is doubt if you have not had the opportunity to work with it as much, to understand -- sure you're going to shy away from it."

"It was fun to take the courses (writing across the content areas with computers) and through that I felt comfortable . . . ."

"I spent a lot of time just learning myself. That's what it takes."

"Computers don't scare me like they used to. I don't feel threatened by them."

During this early phase the teacher's outlook toward the computer was not entirely positive. One teacher reflected in retrospect that her initial lack of comfort and resistance may have influenced her students.

"Children read you very well. Your most successful things are the ones that you buy into. Probably in the Spring of 1982 I didn't buy into them (computers) very well."

At the end of the fifth month of the study the researcher asked the teachers how the computer could be integrated into the curriculum. They strongly indicated as a tool for learning, writing and communicating.

Collected interview comments indicate teachers'
reflections of how the computer functioned as a learning tool in their classroom.

"... it is another mode of learning. Another tool for learning and communicating."

"I think a one-on-one basis is how we function ... the aspect of teacher and child learning together. I feel comfortable with that."

Much of the learning was directly related to student writing since the major thrust of the computer placement in the classroom rooted itself in word processing and graphic illustrations.

"I think it is important that they know what it (computer) is, what it can do and how they can use it. I would sit here and watch you -- I could see them just sitting there composing at the computer. And it seemed to (lessen) the task of writing. ... the skill of handwriting."

"I see the computer as an opportunity for children to definitely work with their writing in revising as a creative experience. I think that some marvelous things could be done ... I know it's a wonderful tool."

"... they did a better job of (self) editing and cleanup knowing that they didn't have to recopy it. ... I just had that feeling that they got their ideas down. They edited a friend's. I should have started sooner. There again I'm learning."

Electronic pen pal writing was noted by the teachers as a means for students to communicate with others.

"Being able to put their thoughts down into words .... they were seeing it (electronic pen pal writing) as a useful task .... There was a purpose. I think you can see that in any writing."
The issue of where and how the computer fits into the curriculum was closely tied to the predominate issue of time. The teachers were questioned if they considered the computer to be an "add-on" to their current curriculum. Their responses indicated that they desired for the computer to be an integrated part of their schoolday, but that required additional planning time and thought.

"I think where it is considered an add-on (to the curriculum) is it's another area of which we must do planning. Let's face it -- it's going to require planning time."

"I don't mean just the time frame per se but having to be knowledgeable on it (computer), to think of new ways to do things and to incorporate it. I feel children do learn better when it is all integrated. But it is hard and that takes a lot of time and extra thought."

Interwoven in the teacher's discussions of time was a second concern, work-related stress.

"... it's just trying to cover everything that we need to cover. ... and the thrust of excellence. The thrust of competency."

"HOW? that's the big question. (The principal) was talking with me about stress and all the things that need to be done and how do we do it?"

"What can we do to help ... teachers? ... it's providing time for the teachers. ... It's time during the day ---- it's not after school when you're worn out. You keep giving your all and you don't have the energy when you have already given your all."

Finally, the teachers reacted to an inquiry considering what would be necessary conditions to make
computer experiences in the classroom work for them.
Time, accessible materials, equipment location, and
curriculum planning were the key ingredients cited by the
teachers.

"The provision of the materials being here at hand
and not having to go searching around to find the
printers and different equipment."

"... it's hard to believe the time that you lose
-- the time spent making all these connections
-- getting this to work and that and it's very
discouraging."

"The hook-up (for the electronic communication) --
having to go so far ... It's really far to send
them on their own -- well you can't send them on
their own. They're responsible kids, but you don't
do that with equipment such as this."

"... it's (writing text) very abstract on the
computer and if you print it out, it becomes
concrete. I did it -- I produced that! You can
push a button and it's gone. You say to
yourself, did I really do that? Or, how do I share
it with others?"

"I think in the classroom is where they (computers)
belong. The novelty has worn off."

"It might be something that they work up to and by
fifth grade you would want to do that (minimum
number of writing papers created, edited and revised
on the computer). I think by exposure --
realizing what the computer can do, hands-on
activities and building on that. I think that is
the way it should be put in the curriculum."

These teachers with more than forty combined years
of experience were very aware that the computer, like the
rest of the curriculum, does not come to the classroom
with a "recipe" solution for success. Their candid
replies "I'm still struggling with it," followed with
comments such as, "I'm learning!" reinforced the researcher's premise that computer experiences in the classroom follow a developmental process for both students and teachers.

**Interviews and Contact with Principals**

The principals of the target school and peer pen pal school were each contacted for informal sessions to describe the proposed study and begin to outline the procedures to gain permission for school entry from the school administration office and board. Upon approval by the school administrative office and board the researcher set out to begin work in the schools. The researcher routinely stopped by the offices before reporting to the classrooms. Frequently, brief conversations transpired between the principals and the researcher in the building office area, the teacher's lounge, or in the hallway. Both principals were interested in providing their students with computer experiences and building familiarity/skills leading to competent use.

Principles demonstrated their "user friendliness" by having computers in the school office. The main function that the computer served for administrators was word processing.

"I use it for word processing, primarily. I use it here in the office as well as at home."
Like teachers, the principals were able to reflect that in retrospect they had encouraged opportunities for student's use of microcomputers, but that they had resisted taking the computer challenge themselves.

"I see the computer as a tool in the curriculum; however, I felt the kids should have had opportunities last year to get on the computer, and learn about the computer as quickly as possible even though I was resisting at that point. So it was one of those things --- 'do as I say, not as I do' last year. Through encouragement from (a building teacher) and then this year (another building teacher) I turned on to it (the computer). And then started using it on a regular basis and regular being almost a daily basis."

Both principals considered the need for students to acquire hands-on experience with the computer as an important issue. They verbalized this concern as well as strongly encouraged teachers to house computers in their own classrooms on a rotation or sign-up basis, thus making the computer more readily accessible for student use and incorporation into the existing curriculum.

"... I think getting experiences, or hands on experience on the computer is very important. The kids are more receptive to using it as a tool and to learning all the things it can do for them, how it can be of assistance to them more so than adults are. If they gain exposure now, they're not going to be so hesitant and frightened of it at a later time."

"I've talked more with staff about getting the kids on the computers and make certain that they are in the classroom . . . ."

"Last year I read a research report that was conducted here . . . by several graduate students from Harvard University. And their findings and
recommendations for computer instruction was that the best place to teach children how to use the computer was to have the computer in the classroom. . . . I did agree with them that the best place to have the computers was in the classroom . . . .”

The decision to place computers in the classroom was consistent with the principals' view of how computers should be integrated fitting into the curriculum.

Classroom access to the computer supports the developmental process of the students as their familiarity and use of the computer grows and becomes an educational tool to facilitate learning.

". . . I see the computer fitting into the curriculum as a tool and not as a curricular area, by itself. The computer should be used as an educational tool to facilitate learning and help the children attain or meet the goals and objectives set by the curriculum. It should be a tool as a pencil is a tool and it should help us think; it should help us write. It shouldn't be the end, it should be a means to an end. . . . I see it as a tool integrated with curriculum versus being outside separate parts of the curriculum.

The central theme, "time" was strongly voiced as an essential ingredient for the computer being infused into the curriculum rather than as an "added-on" component. Continual reinforcement, staff development and identification of alternative means to provide computer instructions were also named as additional variables enabling progress to occur within the school setting.

"Well, a change takes three to seven years. I think it's going to take time and continual reinforcement that it isn't an add-on."
"It's going to take time and it's going to take more staff development inservice. But (a building teacher's) enthusiasm with (two other building teachers). . . have really bought into it and have become the disciples and crusaders for it. And that will gradually continue to filter down."

"There are different ways to give children opportunities of computers, too . . . taking the expertise of a parent. Bring that parent in, and then have the parent provide the instruction to the children . . . the kids are still getting the exposure to the computer and becoming computer literate, without the teacher being the main disciple."

". . .(the teacher) does realize that it is an important tool and it's going to be around from this time forward and knows that the kids need the exposure. So she is finding them an alternative way to provide instruction . . ."

The principals indicated that curriculum guides for elementary schools in the district on computer education were not available. However, a concept paper addressing the topic of computer literacy had been developed and adopted to serve as guidelines for the expectations of children within the district at beginning, intermediate and advanced levels.

". . .there are three major education objectives relative to computer literacy here . . . the development of an awareness of what a computer is and what it can and cannot do; second, to develop knowledge and skill and the use of a computer, and; three, to develop an understanding of the role and impact of the computer on society.

Much like the students, the researcher found the target principal "looking ahead to the future" with an idea of how the computer and electronic mail could serve
school and students. Two new possibilities for the use of electronic mail were identified to the researcher. Both uses involved the need and desire to communicate with others: 1) transmitting letters and cards for patients at the Children's Hospital, and 2) transmitting and receiving pen pal letters on Compu-Serve international lines to Paris, France via the school's established French students' study and exchange group.

"We have a school community partnership with Children's Hospital . . . our children could write letters, . . . develop print shop cards and send it down to the kids (at the hospital)."

". . . we have the French school back to back program here. French students and these kids write pen pal letters to each other introducing themselves prior to going to France. Then they write back to the children prior to coming here. . . it would be real interesting to be able to send the letters electronically through the computer over to Paris, France. That would be real exciting!"

Parent Contact and Interviews

Informal interviews were conducted with over 75% of the target third-grade parents during a school open house/parent's day. The information gained from the informal parent discussions provided additional documentation data and insight into the parents' perspective of computers in education.

The parents of the four case study students granted their consent to the researcher to conduct formal
interviews that were audiotaped and later transcribed.

The parents were very open to discuss their knowledge and experiences, or lack of knowledge and experiences of computers with the researcher.

"I have never used a computer. I was talking on the telephone the other day and I was looking at this computer sitting in front of me and I was thinking I don't even know how to turn it on."

"I tend to think everytime I go to touch it, that it might break."

"I grew up in a computer family because my father started with IBM 30 years ago. So I grew up at the beginning of computers and the punch cards and . . . I progressed myself working at IBM and knowing computers and working with them."

Comments shared by parents revealed that as adults they were presently experiencing different developmental phases in terms of their own computer use. Subtle references of how computers were used by them or their children reflected differing patterns of use and personal perspectives.

"She plays on the computer when she is through with her work (Learning Center for Mathematics) . . . That is where she gets her word play."

"I'm an art teacher and my skills are in the Arts. Computers really kind of buffalo me and Betsy keeps telling me, it's really, really easy Mom. I don't have any contact with it."

"It's challenging . . . I enjoy working on them."

"You can see how much they can do for people. How they eliminate so much of the drudgery of doing menial tasks."
"You have to sit down . . . to experiment with them. You just can't read a book. You have to work with them. Work with the programs yourself . . . Unless you are in there and have something that you have tried you don't know your capabilities."

The predominant themes among the parent discussions and interviews focused on: 1) the enthusiasm and pleasure their child brought to using a computer; 2) the progress and growth they had witnessed in their child's use of the computer; and, 3) their strong approval of the computer experiences that were being provided to their child through their participation in the research study.

The enthusiasm and pleasure relating to the children's computer experiences were noted by parents in both verbal language and behavioral actions.

"She (child) talks about it a lot."

"At dinner time it was like, "Can I go upstairs now (to use the computer)?" She really enjoyed it."

"When anybody would come into the home the first thing she wanted to do was take them up, show them the computer. And then we would lose our house guest for about 45 minutes. What was strange is that most of the people did not want to come down and get away from her."

"He is definitely interested in it . . . He likes to share that special place down there (computer area) with anybody."

"He has really spent some long hours working on it. I haven't seen that kind of interest on the computer before."

"He has enjoyed it and looked forward to it."
The progress and growth parents had noted in their children's use of the computer was a second recurring interview theme. Parents observed their children becoming more comfortable and relaxed when using the computer. As the computer became more familiar to the children they began exhibiting an instructional role to others.

"I guess he was beginning to feel more and more comfortable. He is more relaxed, I think."

"He is more relaxed even with ours now, even though they are different the concept of course is the same."

"I think he has used our computer in a different way, since he has had this one, than he did before."

"His sister does not know nearly as much as he does about the computer. He was the teacher."

"I think she also liked giving instructions . . . She enjoyed that a lot. It was almost a role reversal for her to be in the know rather than to be told."

"He loves the challenge of it and he's gained so much . . . expertise that it's not nearly as frustrating."

"That would be an area of growth for him because at times the computer did make him angry and very frustrated. I think that's another plus from him getting a lot more confidence with it. It works a lot more now, than it did before. And he really has stuck with it . . ."

Finally, a strong approval of the children's computer experiences in the research study was conveyed to the researcher by the parents.
"It was a wonderful opportunity for her to get one-on-one instruction on the computer."

"We have enjoyed it . . . It has been a unique opportunity for her."

"They (his friends) haven't had the time with you for one thing and it's just too frustrating . . . to stick with it over the frustration."

The researcher found that the parents expressed a number of positive remarks concerning the computer knowledge and skills their children were acquiring throughout the study. Their supportive actions also conveyed that they valued the computer and its potential use for both their own lives and their children.

**Parent note to the researcher:**

"Again thank you for all your extra above-and beyond-the-call-of-duty effort in allowing (my child) to use the computer."

**Four Student Case Studies**

An extensive voluminous account could have been written about each of the children in the study. It was beyond the realm of practicality to attempt such a task. For this reason, each account is condensed. Selected samples of oral language (from interviews and the classroom context audiotapes), field notes (of antecedotal comments and observable behavior) and computer print-outs (of word processed messages, letters, stories, cards, and graphic illustrations) were used as
an illustrative set that reasonably represented the whole. In this regard, the methodology resembles the work of an artist more than that of a scientist (Eizner, 1981; Greene, 1983).

While the whole was not being fully accounted for through qualitative methods, the extracted parts of the full account demonstrate much of the energy and enthusiastic spirit of the children's experiences with the computer (Greene, 1983). Four case studies were carefully followed and recorded throughout the study. Each student brought to the process his own unique approach, past experiences, and objectives for learning and working with computers. A complete section is used to focus on a single child, one at a time, for the case study discussions.

Dean - Case Study 1: Dean was a third grader who could often hear his name being said by the classroom teacher with an affirmative statement such as, "Dean, sit down in your seat," or "Dean, get your seatwork done." He was full of energy but he unfortunately manifested it in what was considered inappropriate behavior at school.

Classroom teacher: "If I was on Dean for every classroom rule he broke, I'd lose him . . . I guess I just look at the individual . . ."
Dean's behavior beyond the rules of the classroom was often directed towards making his peers laugh. He admired Bill Cosby's ability to make people feel good by giving them a laugh. As a result, he would frequently overemphasize gestures and facial expressions or provide an unexpected answer during recitation time in an effort to make others laugh.

Reading was one of his stronger subjects and allowed him to receive positive feedback as he read aloud during reading group time. His writing ranged from nearly illegible to neat, depending upon how poorly or carefully he used his time and applied his effort. Dean did have some difficulty trying to get his thoughts to print and often became frustrated with the mechanisms of writing. Because Dean had problems with attention and was easily distracted or bothered his peers, the classroom teacher felt it necessary to separate his desk from his peers or carefully select where he would sit in the classroom.

Dean enjoyed movement and action. He would take a break from his morning seat work by strolling over to the pencil sharpener; talking to peers while coming and going as well as while sharpening his pencil. As he completed each morning's assignment he would walk across the room to deposit the paper in a basket on the window sill.
Classroom Teacher: "Dean and I have come a long way since last September. Although, he still drives me crazy some days."

Despite his lack of conformity to school rules, Dean was a very bright and likeable boy. He was imaginative in his creative thoughts and unconventional approaches to the common world. For example, when the school held a "Pride Fair" where the students shared hobbies or created displays of personal interest, Dean made a model of a "nuclear reactor" with each part carefully labeled. This was a quite a deviation from his peers' stuffed animals or sticker collections. He displayed a strong interest in computers, yet admitted that he had not worked with computers similar to the ones at school.

"I had an Odyssey, but that wasn't a very good computer."

In January, Dean began to automatically associate the word "computer" with "game." Though he understood how computers could be useful to business, he could not identify how a computer could help him, other than by providing entertainment with games. His keyboard experience was limited to the use of only a few selected keys to make a menu selection within a game program.

During his first one-on-one computer session with the researcher serving as a participant observer, Dean caught on very quickly. He was very eager to learn keyboard basics and the fundamental procedures of word
processing. He assumed a spontaneous role of peer teacher within less than a month. He was eager to help his classmates find keys, name files and save files on their own personal disks. His fascination with the computer enabled him to tackle new experiences with zest. The printer moved the student's work from an abstract form found on the monitor to a tangible object, referred to as "hard copy." At the end of his first experience with the use of the printer, he was ready to act as a troubleshooter for the rest of his classmates.

The computer experiences gave Dean a heightened school interest. Even though the computer was not used as a reward, but rather as an opportunity for each student on a rotation basis, Dean began applying himself more on morning assignments. He was eager to take advantage of an opening at one of the computers so that he could resume the previous day's work. He also wanted to be ready to collaborate with his peers, read over their shoulders, and see what kinds of text they were creating on the screen. The majority of these experiences were very positive for Dean.

In March, the target classroom was introduced to the Koala Graphics Illustration Pad. Dean promptly learned how to move from the menu screen to the working screen. He tested a number of brush strokes and then cleared his
screen to begin creating a look-alike logo of "ghostbusters" derived from a current popular movie, see Figure 6. He worked repeatedly at refining his picture. As he gained more control with the stylus, he began to explore different graphic details.

The participant observer noted that Dean was developing a more caring and unselfish attitude. He was feeling good about himself and what he was able to create on the computer. As students crowded around the computer monitor while watching Dean's work, they exclaimed "oohs and ahs" at Dean's skill in inserting facial features and details. While Dean was proud and felt good about his accomplishments; he was sensitive to his fellow peers. One classmate asked to copy Dean's ghostbuster graphic on his personal disk. Dean was able to see that a friend admired his work, and although his friend was unable to create a graphic at the same sophisticated level, his friend felt good about sharing Dean's accomplishment by storing it on his own disk. This same feeling of good will inspired Dean's willingness to share hard copies of his graphic.

As Dean began receiving more and more positive feedback from graphics and text created on the computer, he became more inclined to seek additional time and access to the computer. First, he requested that his
Figure 6. Dean's Ghostbuster Computer Graphic with Poem

GHOSTBUSTERS
GHOST GOT BUSTED
HE'S IN A JAIL
HE WAS SO BAD
HE GOT PALE'

BY Dean
mother reserve a time frame for him at the local library. Second, he sought permission to take his school disk home on those days he had scheduled computer time at the public library. There he would explore new programs and continue with the work stored on his disk.

His first visit to the public library proved to be frustrating, as he became insecure outside the school setting. Within a couple of weeks, he had rehearsed booting up procedures, word processing and print shop until he was able to function more independently. As Dean’s computer competence and interest grew so did his relationships with fellow classmates. Conversations between peers started to focus on potential purchase of computer equipment; greater access to computer equipment (i.e. public library, grandparent’s, friend’s house); new programs, and an exchange of information about each others work. As other peers began to select Dean for computer advice, his previous descriptive “clown” behavior decreased.

Electronic communication between Dean and his pen pal became very limited due to an injury his pen pal sustained which resulted in absence from school for several weeks. Dean’s pen pal, Mark, was quick to point out in his return reply that he realized the massage was so slow he might be considered a “former” pen pal.
Dear Dean, my name is Mark W.

THIS MAY SEEM WIERD, but when I was 4 years old, there was a girl my mom babysitted, and there was a boy across the street who came over to play named J. Dean M. If there's any connection you know of, please inform me. I have not seen ghostbusters and I don't have an atari, and allow me to ask what the heck is an odyssey? And also, please give me some details on this robot.

Your former pen pal and maybe previous friend, Mark W.

Even with the delay in electronic communication Dean was not disconcerted or frustrated. Instead, he wrote a brief note to Mark acknowledging his accident. This letter was expanded by Dean to include a short narrative he had composed in class entitled "My Summer Vacation at Cedar Point."

5/31/85

DEAR MARK,

I HOPE YOUR FEELING BETTER, I HEARD YOU HAD AN ACCIDENT.

MY SUMMER VACATION AT CEDAR POINT

I want to goto CEDAR POINT, I might even find an alien there! BYE I'm on my way to CEDAR POINT. VARDOOM. Well, we're finally at CEDAR POINT, Uh Oh, here comes an alien, He said "CAN YOU TELL ME HOW TO GET TO SESAME STREET?". Ahhh he finally left! Well now that we're here I guess I'll go on the DEMON DROP! Bye Bye Byyye!

Your friend,
Dean M.

His final letter before summer confirms his friendship with his pen pal and anticipation of making contact once again next year.

DEAR MARK,

I hope you have a nice summer
I was very sad that you got hurt!
I'm sorry we could not talk more.
Next year we can talk more.
BYE! BYE!

YOUR FRIEND,
DEAN M.

During the summer months Dean continued his frequent visits to the library to use the computer. When the researcher arrived at his home with the computer, Dean was in his front yard anxiously waiting. He was full of questions and eager to make all the needed connections to get the computer in running order. He was interested in hearing how other classmates had been using the computer and wanted to start working right away. He noticed a new package of software and asked if he might begin exploring how it worked. The program involved creating text to form a branching story. Dean was intrigued with this idea and began drawing from his own experiences of playing "dungeons and dragon games" to create a story sequence which built with clues and events. Later, he added graphic illustrations to compliment each page of the branching story.

During the time the researcher was not providing guidance in the home setting, Dean functioned on an independent level. He enjoyed the ability to share his creation on the computer with his parents. He also continued to develop his peer teacher role as he invited neighbors and friends to his house to work with the computer.
Parent: "... the interest and sharing ... it's right here in the house and he can show it right away that really does (make a difference). When he would create computer items from school maybe he would not get to bring it home until days later.

He can go get a friend to come down ... and he's in control ... He likes to share that special place (the computer area) ... with anybody. He baffled all his other relatives talking to them on the phone. I have this and they don't have any expertise ... So they are really fascinated by it."

Electronic communication would have been a natural extension to Dean's home experience, but the telephone wiring connections were not compatible with the videotext modem telephone adapter system thus making on-line experiences impossible. Dean accepted these circumstances and directed his energy toward the equipment and software that was available to him.

During January to July Dean progressed through a number of the developmental phases cited earlier in Chapter Four. Dean had acquired familiarity with the keyboard, a word processing program, a printer, a graphic illustration pad, print shop text/graphics, and story branching. He had shown signs of gaining control of the computer by appearing relaxed and confident. Booting up programs, recalling files, editing text and graphics and printing files had become common procedure.

Researcher sharing with parent in an interview: "... it's just automatic ... he's really into the flow of it, it's almost spontaneous. He knows and anticipates what the next step is; what disc he
needs, what button he needs to push in order to get it (the program) to progress . . . He'll be a real asset to a teacher in a classroom because some of the teachers are not as familiar with the computer as he is."

Although experience with electronic communication was limited, Dean gained an understanding of the concept and became familiar with transmission procedures. He felt positive about what had occurred through electronic communication and looked forward to opportunities for more use. Finally, Dean gave evidence that he was independently seeking opportunities to extend use and share his computer knowledge and skills: 1) by showing interest in scheduling computer time at the public library, 2) recurring performances of peer teaching and collaboration, and 3) a desire to make and share printed hard copies with others. These actions confirmed for the researcher, the classroom teacher, and the student's parents, evidence that the computer had begun to move from an object of games and entertainment to a functional device on which Dean had achieved a high level of competence.

Dean: "No, I don't think (computers are a toy). It depends on what you're using it (the computer) for. . . . It's not something you play around with . . . they are helpful, exciting and a challenge."
Lisl - Case Study 2: Lisl was a fair skinned girl with long blonde hair. Lisl performed on an average level for a nine year old and blended in well with her third grade classmates. Her personality was pleasant and she made friendships easily with her peers.

Lisl thoroughly enjoyed self-selected reading. Her desk top usually had one or two library books each consisting of more than one hundred pages waiting for Lisl to open and read during any of her spare moments of the school day. Although she was an avid reader, she was not considered part of the class’s top reading group. When Lisl was called upon to read aloud, she often made miscues that were not self corrected. Frequently, her miscues and stumbling over words distorted the meaning of the text or made it difficult to understand. Lisl’s classroom teacher considered reading of this nature to be “sloppy.”

Classroom Teacher: "... I think my emphasis this year has been on comprehension ... Most of them read fairly well although I’ve had some sloppy readers this year. I still believe in oral reading. ... she (Lisl) is a sloppy reader. Do you know what I mean? She’ll insert a word, leave out little words that can change the whole meaning. I think that part of my role now is to be sure that they are aware that, hey, a little word can change the meaning."

In spite of the fact that Lisl’s oral reading had flaws, her exposure to literature and written text was transferred to her own love of writing. Frequently she
used dialogue, a series of sub events leading to her main story climax, or poetic language in her writing.

Classroom teacher: "I love that 'happiness is a bluebird singing in a tree with a fiddle on it's knee.' I think maybe she read that someplace. Maybe not. That was one of her very best ones."

"Lisl is a very imaginative child. She is a creative child and I think that happens in her writing . . ."

Lisl’s use of writing for self-expression was hindered by the number of unconventional spellings she would use. She would often write as many as eight pages of text for a narrative assignment. Her biggest problem arose when she would be required to prepare a final copy to be handed in for a grade. This became a demanding task for Lisl since she had to correct much of her invented spelling and also recopy multiple pages in her best cursive writing. The initial vigor she brought to creating text was often replaced with a feeling of drudgery.

Classroom teacher: " . . . at first I went along with invented spelling a lot and made no corrections . . . I just let them work . . . I think now they need to be a little bit aware that this should be corrected. That doesn’t mean that I expect every comma and semi-colon and period, but if it is a word that I feel should be in their vocabulary -- like I’m still seeing went as W H E N T -- I don’t think that’s right . . . But I wouldn’t certainly mark down a grade because of their inventive spelling . . . I think certain final copies need to be their very best.

Boy, Lisl comes up with them (inventive spelling). Lisl has a processing problem, I think. . . double
The word processing program offered Lisl some assistance with her writing problem. Revision, insertions and deletion of characters and spaces made by a simple keystroke. However, several obstacles remained before Lisl would be able to utilize the computer's editing ability. First, Lisl was familiar with computers through both her parents' work related computer use. Her experience on the keyboard, however, was limited. Therefore, the first narrative that she chose to enter on the computer took her more than two hours with one-on-one guidance from the researcher serving as a classroom computer teacher. Needless to say, it became necessary to work with Lisl twenty minutes for more than six days in order to enter her first winter story. Once the "winter story" had been entered into the computer and stored on her personal disk, she began making a list of words she would like to edit and change. This too, took time as she re-read her entire text and jotted down words on a list to look up in a dictionary, or self-correct if known.

During this span of time Lisl began to feel anxious about her morning seatwork and voiced concern that she was having trouble getting her assignments completed each day, especially if she worked on the computer for nearly
twenty minutes. An additional feeling of stress occurred as the classroom teacher announced that winter stories would be due the next day. Lisl's eyes quickly gazed in the direction of her classroom computer teacher across the room. Lisl grew visibly anxious about the assignment. As time permitted Lisl worked on the last section of her text to replace invented spelling with conventionally spelled words and insert some additional punctuation marks to eliminate a few run-on sentences. The building printer was not available, however, so she had to save her work on the computer disk until she was able to make a hard copy.

When she finally printed her imaginative winter story, entitled "Bogey and Big Hill," she appeared relieved to be finished. She was proud of her accomplishment and wanted an additional copy to take home and show her parents. The researcher granted her request, acknowledging the time and effort she had painstakingly given to her work. The computer had been helpful to Lisl, and in this case it was far from being considered as "taking the easy way out."

As late as May, Lisl was still struggling with letter sounds, blends, and understanding how letters are grouped together to form very common vocabulary words appropriate for third grade. One example of the
frustration and peer pressure she felt concerning this matter came during a spelling game that had been used in the guidance counselor's lesson focusing upon cooperation and team work. The classroom of students was divided into two teams -- one yellow, the other green. Each student was given a card with a large single letter on it. The guidance teacher would announce a word, e.g. "bat" and each team would find a place at the two ends of the lines and jointly form the word. The first team to complete the word received a point.

(yellow team)

B A T
X X X
X X X
X X X
X X X

B A T

(green team)

Though a game of this nature sounds fun, it can be very difficult if the student does not know how to spell the words that are being called out.

Field log entry - May 27, 1986

"Spelling in a standardized form is difficult for Lisl. Today during the spelling game she appeared frustrated and often went up to be in line at inappropriate times. She relied on others rather than thinking it through herself. She commented: "Everyone keeps telling me what letters should be up." When the word "careful" was called out, Lisl had the letter "e." Carol said, "There's no 'e' in careful." After a long pause, the guidance counselor stepped in saying, "Yes, there is an 'e' in careful." Then Lisl said, "Oh, Yal!" with an
assertive inflection in her voice as if to say; "I know that."

A word processing program with a spell-checker feature was not available for Lisl to use. Under comparable guidance, a spelling checker program could assist Lisl to increase her independence and encourage growth in her self-confidence. Some educators view spelling checkers with suspicion. They feel students will rely on them and never learn to spell. Many classroom teachers must first accept such programs as an assistance. In the researcher’s opinion, Lisl would profit from the assistance of a spelling checker to reduce her editing requirements and place more emphasis on creating text.

Lisl’s first letter to her electronic pen pal included a number-letter code system. It was created so that Lisl and her pen pal might send coded messages back and forth.

DEAR PIN PAL,

A B C D E F G H I J K L M N O P Q R S T
Y V W X I Z
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26
SEE NUMBER 1 IS THE LETTER A AND 2, B, 3 IS C AND SO ON AND SO ON. SO IF I WANTED TO SAY HELLO I WOULD RIGHT B, 5, 12, 12, 15. DO YOU GET IT? I HOPE SO. NOW WE CAN RIGHT SECRET MESSAGES. PLEASE RIGHT BACK! LISR B.

When Lisl's return letter did not acknowledge her coding system and related a story about her pen pal sleeping with favorite stuffed animals, Lisl was disappointed.

DEAR LISR
I'm fine how are you? I'm also 9 1/2 and I go to B_____. Yes I have one brother. His name is Charlie. My name is Frances, my favorite movie is Beverly Hills cop. I thought it was funny. I have a special teddy bear at home that I sleep with. Do you have something you like to sleep with? well I have to go by

Love, Frances f.

She interpreted her pen pal's lack of response in a coded message as disinterest in her idea. She did not maintain her original enthusiasm about transmitting coded messages. Lisl discontinued addressing the topic or using the coded system in her messages. She dismissed the idea completely and returned to basic questions related to interests in computers, and whether her pen pal was a boy or girl because the name Frances was appropriate for both.

Compared to the other students in the study, Lisl showed less interest in the Koala graphic illustration pad. Lisl admired her aunt who was very artistic and often prepared sketches for Lisl when she would visit.
Lisl's home. Lisl was impressed with the way her aunt was able to create a desired effect by shading parts of her sketch. Lisl had begun to experiment with sketching as well (see Figure 7). Her new interest in sketching was quite different from the art media she could create on the computer graphic illustration pad. Shading parts of a picture was not possible, yet different texture effects could be selected and used in this manner. Lisl also showed some difficulty in manipulating the graphic stylus in a way that she desired. For these reasons, she discontinued working on specific images, and spent her time on the graphic illustration pad, making geometric designs. As the school year progressed and the target class was sending graphic designs accompanied with poems to their pen pals, Lisl appeared indifferent.

Field log entry: April 29, 1986
"Lisl is not interested in sending her graphic to her pen pal. She did not write about it, nor did she desire to code her picture into a textual file for sending. She is presently reading a book entitled, A Touch of Light, The Story of Louis Braille by A. Neimark. It has fifteen chapters and is 186 pages in length.

Field log entry: April 30, 1986
Informal interview with Lisl:
Lisl gave no real reason for her lack of participation in transmitting graphics and text. She just didn't want to send a graphic and a poem. Yet, in the interview she stated poem writing and graphics were two favorite things to do on a computer.

There was an observable inconsistency in her behavior that she did not explain or clarify. Lisl's electronic
Figure 7. Lisl's Chipmunk Freehand Sketch
mail communication to the researcher was warm, friendly and personable. She frequently wrote about family, pets and school.

"Dear Mrs. Kumpf

I really enjoyed your letter. I think it's fun to have electronic mail system. I have one little brother that's always curious too. He is very cute but, he is funny. My mom and dad are in San Francisco, California. They are visiting Gina and Larry, in San Francisco. They called me and said they were having a wonderful time. They said the weather is great. They are even going skiing. I think I'm going to San Francisco next year. I have one cat and it's name is Potev. I think you are nice! I really have learned alot. What is Ohio State University like? I really like W____. You have really made W____ happy! To bad W____ is not called Mrs. Kumpf! Well, I'll be seeing you! Good luck!

From,

Lisl B."

Lisl also communicated about exciting events in her life. In the following excerpt she closes her letter with "thank you." The letter was interpreted by the researcher as meaning "thank you, Mrs. Kumpf for listening."

"MAY 9, 1985
DEAR MRS. KUMPF,

HOW ARE YOU? I'M FINE. DID YOU KNOW THAT I WAS GOING TO FRANCE, MAYBE. I MAYBE BE GOING TO FRANCE NEXT YEAR. I MEAN. WELL WHAT I'M DOING THERE IS THAT YOU GO THERE AND LIVE THERE FOR 3 WEEKS THAN THEIR CHILD WILL COME HERE FOR 3 WEEKS. BUT I HAVE TO TAKE FRENCH FOR A YEAR. I DON'T MIND I WOULD LIKE TO TAKE FRENCH. THERE IS ONLY ONE PROBLEM, ONLY 18 PEOPLE CAN GO! SO I MIGHT NOT GO! THANK YOU, LISL B."
Although Lisl's parents were very pleased for the use of a computer in their home during the summer, it was difficult to find a free block of time in the family's busy schedule. One week in August was set aside between relatives visiting and a vacation flight to South Carolina. Lisl, her mother, and her two year old brother eagerly greeted the researcher as the computer equipment was brought inside Lisl's home. Lisl's bedroom was chosen as the place to set-up the computer. The room was spacious, contained a sturdy table for the computer and printer, and had a compatible telephone outlet for connecting the modem.

In the home setting, Lisl's enthusiasm for the computer was increased. As she described her experience with the researcher each morning, her she demonstrated a new excitement and enthusiasm. More than eighty percent of her home computer use had been collaborative experiences. Lisl engaged a friend in working with the computer and spend as much as six hours of uninterrupted use on it. It gave Lisl an opportunity to use her poetry and other types of media in self-expression. These interests could be detected in the girls collaboration (refer to Figure 8).

Lisl and her friends were able to see the link between their created text and the graphic illustration.
IF PEOPLE WERE PICKED LIKE FLOWERS,

I WOULD PICK A BUNCH OF YOU!
Figure 9 provides a sample which shows the relationship between graphic and text generated by Lisl and her friends. The computer in the home setting had a social context as well. Unlike the school setting Lisl and her friends didn’t have to observe classroom rules and were able to stay with the computer without the time limits imposed at school.

During the week Lisl shared extensively her computer experiences with the researcher, a classmate, her babysitter, the cleaning lady, the cleaning lady’s daughter, her younger brother, a neighbor friend, and both of her parents. She recorded in her journal that one day she used the computer before breakfast, after breakfast, after swimming, before supper, during supper (print shop was printing a sign) and after supper. It’s obvious that the computer was used extensively.

Parent: “She spent a lot of time on it. Probably averaged out to three hours because one day I remember she spent six hours . . . She would have her friends over and they would just set up there for hours.”

Lisl enjoyed sharing her hard copies with others. She indicated to the researcher that she valued her computer work and that she felt others did as well. On the third day that the computer was in her home she created a banner for her parent’s birthdays. Both parents had a birthday in December and she carefully
YOU DON'T HAVE TO FEED ME BECAUSE

I'M ALL READY STUFFED!!

Figure 9. Lisl's Graphic of Stuffed Bear, Illustrating a Link in Meaning Between Text and Graphic
planned and figured out how she could use it for each of
them. She began with a birthday cake graphic, followed
by the words "Happy Birthday" and completed with two
separate print outs of "MOM!!" accompanied with a mama
bear graphic and "DAD!!" accompanied with a papa bear
graphic. She proudly showed the birthday banner to the
researcher with great pleasure of her accomplishment.
She carefully outlined how she would attach the separate
words "mom" and "dad."

Field log entry: August 7, 1986
Lisl: "Won't that be great!! They will really be
surprised!!"

The electronic communication system was used while
the researcher was in the home two hours each morning.
Lisl's mother, who was quite knowledgeable about
computers, spent some time with Lisl using the directory
to locate information about vacation parks outside of the
state. They also made an unsuccessful effort to place
airline reservations for a flight through the videotext
network system. Lisl's mother clearly saw the computer
as a tool to help accomplish particular goals.

Parent: ". . . It is fun to play games but also this
thing (computer) can really expand your horizons . . 
. they can see the whole realm of the computer ---
that it does do Print Shop, that it does do word
processing, it does do filing and ordering and
marketing materials. It does do numbers and it does
do mathematical facts so you can record numbers and
be able to logically put things into groups and ask
for certain information . . . I don't think they
should . . . just play games. I just can see the
Figure 10. Lisl's "Computers Are Great" Graphic Display
children experimenting in every area and getting that exposure and communicating too -- communicating devices --- wonderful motive . . . It should be a regular integrated course of their learning program."

Lisl had progressed through a number of developmental phases as her experiences with the computer became more sophisticated. She worked independently with the keyboard, loading programs, saving files and printing hard copies. She indicated a personal preference for collaboration with others in using the computer and found this flexibility easier in the home setting. Lisl had acquired the concept of electronic communication and became familiar with the logging-on procedures. Her Print Shop sign in Figure 10 reflects her basic feelings about computers.

**Joe - Case Study 3:** Joe was a strong athletic boy in the third grade who was equally as strong academically. He was recognized as a class leader and was voted to serve on the student council by his class peers. As the school year progressed, Joe was selected by his team members to serve as the coach and captain for a third grade basketball team.

The classroom teacher could usually count on Joe to have the right answer. Even when new concepts were being introduced and questions were being posed to the classroom, Joe had the ability to draw from past
experiences and knowledge to make predictions rather than wild guesses.

Classroom teacher: "Joe would be wonderful in an informal classroom. . . Joe would be happy anywhere. What a joy."

Joe did well in all the subject areas, though he had just begun to enjoy reading for pleasure.

Classroom teacher: "Joe's mother was sure that he would never read for pleasure. Now we can't keep him from reading."

The classroom teacher also noted Joe's improvement and advancement in writing from a first grade level to his third grade level.

Classroom teacher: "I didn't think when I had Joe in the first grade he'd be writing like he is today. The first experience of writing I read If I Lived on Mulberry Street. And then I passed a paper and we put "Fair Street." That was a dictation activity. Joe could think of nothing, nothing! Now we (teacher and parents) can't stop him from writing."

Although, Joe excelled in most of his school-related activities, he remained cautious with unfamiliar people. Because the third grade classroom teacher had also taught Joe in the first grade, Joe was very relaxed and comfortable in his class. He did however, appear rigid and stiff during his initial interviews and one-on-one computer instruction with the researcher serving as a participant/observer and classroom computer teacher. His responses to open ended questions were very brief and often as short as one or two words. His parents
confirmed that this was not unusual since Joe was typically shy with people on a first meeting.

Parent: "Joe has always been a cautious child around people with whom he is unfamiliar. I don't know why, but he is."

Joe had been introduced to computers through the playing of games. Writing on the computer was restricted to the "writing" of BASIC computer programs. The time that he spent on the computer was for the fun of it. Even at the early stages of the research study, Joe viewed the computer as a machine that provided advantages to its users. With his limited use of an Adam computer in his home he had found that corrections and erasures were relatively easy when writing a program, and that the computer cartridge or disk could be used to store the program that was created.

Joe's uncomfortable feeling toward the researcher began to diminish as he was exposed to the regular presence of the participant/observer several days each week. For the first several weeks, Joe did not reveal any outward indication of enthusiasm toward the time he spent working on the computer. By early March, Joe would eagerly approach the researcher who was serving the role of a classroom computer teacher. He quickly discovered the keyboard and the function keys which were most frequently needed and used.
His interest began to peak at the time the Koala Graphic pad was introduced. Outwardly, he showed enthusiasm and interest toward the computer. Very skillfully, he introduced the graphics pad to his peer who had been absent from school when each student was given one-on-one basic instruction and guidance. He did not become nervous or concerned when his peer began asking him questions concerning the program that he was unable to answer. Instead, he admitted that he didn't know, and suggested trying to see what happens when a certain key was depressed. Joe continued testing, trying and taking reasonable risks with the computer.

In two particular class sessions led by the building guidance teacher Joe shared his interest and the importance that he had begun to place on computers. The first session involved the entire class planning for a hypothetical situation: "We are going to the moon for the rest of our lives -- what will you pack in the space ship?" The guidance teacher began making a list of items on the chalkboard. As Joe raised his hand and was called upon to speak, it became clear that he saw a real "need" to take computers on the trip.

Several weeks later, the guidance teacher began discussing careers. After an introduction to the topic she requested students to come up to the front of the
classroom one at a time, to pantomine what career they hope to train for in the future. After several students had performed their "careers" Joe boldly raised his hand. He began making motions like he was using a keyboard and viewing a monitor. Five or six voices exclaimed "computers -- he's using a computer!" Joe stopped and nodded his head while his face swelled with pride. "Yes, a computer operator!"

During April, Joe became very interested in sending electronic mail. He began asking the researcher/computer teacher as soon as she arrived each morning if he could "send mail today." Up to this point he had not shown such intense interest and drive regarding the computer.

Field log entry - April 24, 1985
"Joe is very interested in sending E-Mail. (We tried yesterday but ran into problems). Joe asked me two times if we could work on electronic mail today. Then I brought him back to the classroom after working for 20+ minutes, when his reading group was meeting. As soon as it was over he wanted to send E-Mail. I asked him in the hall if his seatwork papers were finished. He said NO, he had three more papers to do. I sent him back and said that the classroom teacher wants them all done by 11:10, and I didn't want her to be upset when his work was not completed. He returned to the classroom --- confronted the classroom teacher. After 5 minutes he came back to me and says he's ready! I ask if ALL his work was done already. He replied, "(classroom teacher) said I didn't have to do some of them today." His face beams, "Can we get to work now??"

Later the researcher noted that Joe had become more and more interested and outwardly enthusiastic toward her
as the computer teacher, and computers. He had become eager to spend time each day on the computer and try-out new things on the computer. Even when it became necessary to repeat procedures a second or third time to code and decode graphic files to prepare them for videotext transmission, Joe did not become frustrated. Instead, he would often chuckle lightly and say, "I'm going to have this memorized!" or he would say, "I guess we'd better try again."

Interviews with Joe in August revealed that computer games had moved from the forefront to a position of lesser importance. Computers were now fun because they provided him with a challenge to explore, investigate and learn new things. If one was to place the students' computer experiences on a continuum, basic keyboard skills would fall at one end while the transmission of electronic mail would be located at the opposite end.

This challenge and opportunity to learn new ways to use the computer through electronic communication that strongly appealed to Joe. The multiple stepped sequence of logging-on to the videotext system became effortless for Joe as he flowed smoothly from one step to the next. Joe learned how to upload files into the videotext system and frequently assisted fellow classmates when sending their electronic mail. He also took great interest in
learning how to download files and printing incoming mail. Several times he assumed the role of electronic postman and delivered hard copies of incoming pen pal mail to his classmates.

Conceptually, Joe had a greater understanding of the electronic communication system than most of his classmates. His background experience in BASIC programming gave him a fundamental knowledge of computer language. When it became necessary to code binary graphic files into textual files for transmission into the videotext network system, Joe had an understanding as well as the knowledge of the needed procedures to accomplish such a task.

Before school dismissed for summer vacation, Joe sought additional opportunities for using the computer through scheduled time at the public library. This event was marked with enthusiasm and a strong need to share the news with fellow peers and classroom computer teacher.

Field log entry - May 6, 1985
"Joe walked over to me and eagerly informed me that he had made a scheduled appointment to use the computer at the local public library. He asked if he'd be using the computer tomorrow, which would be Tuesday. I replied, "Yes, if you want to. Do you have something special that you want to do or finish?" This is when he began filling me in on the details of his visit to the library. "I will be taking my disk home, so it won't be here."

As the school year closed Joe's parents consented to allow a computer, monitor, graphic illustration pad,
modem and printer to be placed in their home for more than two weeks under the guidance of the researcher. The day that the computer and its peripherals arrived at Joe's home it became clear that the computer was considered a "top priority" by the entire family. It was carefully placed on a table in the dining room. Soon it became apparent that the necessary telephone connections to use the modem for the videotext network system could not be made; thus, eliminating the possibilities of electronic communication in Joe's home. Acknowledging the problem, the modem telephone wires were set aside and other avenues of interest were pursued.

Joe used a branching story software during May and requested that he continue working on it to extend and illustrate his present story. This activity proved to be a stimulus for other peers who spoke with Joe over the summer about how he was using the computer.

The Print Shop program was repeatedly used to create hard copies that could be shared with others. Room signs, stationery, birthday cards to grandparents and short messages to family members became a source of enjoyment to create and a pleasure to share. The luxury of time, materials, and equipment made the computer in the home setting unlike that in the school. Similar to Lisl and Dean, Joe and his parents enjoyed the
spontaneity of sharing computer generated products with family members as it was created, rather than waiting days or even weeks later.

Joe communicated with his classmates several times for information or troubleshooting advice concerning computers during the summer months. This gave him the opportunity to use some of his newly acquired computer skills and provided a positive self-concept building experience.

Interview with Parent and Joe:

Researcher: "How did you feel when Carol and Dean called you for assistance when they had the computer?"

Joe: "Surprised! It was hard for me to understand, especially Carol. She was excited too, when she was trying to explain it to me."

Parent: "Dean called too."

Joe: "Oh Yal. It was on Story Tree and he wanted to know what to do to end it on one of the branches. I just told him how he could take care of it."

Parent: ". . . I remembered when Dean called, I could tell by the look on your face --- how you felt!!"

Joe: (chuckles lightly)

Parent: "I think he was flattered!"

Joe had progressed through the developmental stages outlined in Chapter Four rather quickly. He spent the bulk of his time and energy during April, May and early June refining his skills and expanding to new areas as
they related especially to the videotext network system and the communication to others. The classroom teacher’s, researcher’s and parent’s observations of Joe’s growth were confirmed by Joe’s words and actions. The computer progressed from a playing machine to a working tool which Joe saw as a challenge, an opportunity to learn, and a necessary part of the future.

Betsy – Case Study 4: Betsy was a small slender third grade girl who appeared frail at first sight, but on further observation showed signs of being a wiry individual. She wore a pair of thick lensed glasses during each school day. Betsy’s speech was difficult to understand at times, because it was unclear and muffled rather than clearly enunciated. In an effort to understand, the classroom teacher would often ask Betsy to repeat what she had said. The researcher encountered the same difficulty with Betsy’s speech and found the transcriptions of her audiotapes to be tedious. Betsy’s vocabulary was well developed and reflected many of her own experiences which she freely expressed in her oral language. Occasionally she would become frustrated when a listener, such as the researcher, would not understand what she was saying. She would resort to spelling out
each letter of a word, until the word and meaning were clear to the listener.

Betsy seemed immature for her age and repeatedly showed signs of being less emotionally mature than many of her peers. The guidance counselor posed a hypothetical situation to the class: We are going to the moon for the rest of our lives --- what will you pack in the space ship? Betsy’s contribution to the potential list of items to take on the trip was "Betsy’s bed." Betsy’s voice indicated that she was serious and was not attempting to be humorous. Many of Betsy’s classmates responded with higher level needs for mankind such as food, oxygen, water, and clothing.

She was openly accepted and welcomed by her classmate peers, much in the manner older children accept and condone younger siblings’ behavior. Betsy and her classmates’ recess activities usually differed. It was for this reason that Betsy interacted more freely with one or two other friends in another section of the same grade level.

Betsy enjoyed physical closeness of one-on-one attention from her classroom and computer teacher. She was attracted to the novelty of the computer and looked forward to the one-on-one computer teacher/student
contact that was provided during the introduction of new programs and during guided computer use.

Betsy showed a very strong interest in experimenting with the keys on the computer keyboard. She would be absorbed in her computer work showing little, if any notice to distracting noises or other classroom conversation that was going on at the same time. Initially, Betsy’s lack of keyboard experience would caused her to ask where particular keys were located. From the beginning she indicated her control over the computer through subtle references in her speech. Instead of asking, “Why did the computer do that?” she would take the full responsibility asking “How did I do that?”

Field log entry: March 4, 1985
“Betsy has one sentence completed on the word processor. She asks questions:
   Where’s “y”?
   How did I do that? HAPPY(space).
   She changes it to HAPPY.
Betsy enjoys experimenting with the delete key.
   C(space)A
   C(space)A - placing cursor over letter “A”
   CA - moves “A” over deleting space.
The class chuckles loudly, but Betsy doesn’t even indicate that she notices.”

Betsy’s drive to complete a particular piece of work often stemmed from her desire to share it with a particular person. Although the study’s communicating focus was between the target third grade, peer pen pals, and the computer teacher, Betsy was one of the first
students to request sharing her work with parents,
teachers and friends outside of the classroom. Even when
Betsy had a particular purpose or interest in what she
was writing, her work was characterized by false starts.
Below is an example of Betsy repeatedly changing her
text.

Field log entry: April 25, 1985
"Betsy requests to write a letter to her dad at his
office.
She starts: DEAR DAD
deletes all letters
writes - dear dad
deletes lower case d's and inserts D's
now has - Dear Dad
deletes - Dear Dad
writes - Dear Pen
deletes - Dear Pen
writes - Dear Dad
Finally, we create a letter together and she keys
the letter in as we think it through. It is time
for her to go to a special class outside the
classroom. She insists on saving the letter before
she leaves.
> S: dad (quickly she writes)"

Betsy's greatest obstacle in using the computer was
her indecisiveness and difficulty in categorizing files
to easily organize work. In the log entry of April 26,
1986 (above) Betsy wrote to her father. She began with
lower case letters, went back to insert capital letters,
deleted the line and considered writing her pen pal
instead of her father. She wrote "Dear Pen" and deleted
the line as she reconsidered go writing a letter to her
father and began once again with, "Dear Dad". When Betsy
independently named a file she would go through a similar
process as she thought of possible names for files that she could use, often unable to recall later what name she had actually chosen to use for the file. As a result she needed to gain familiarity with the steps used to read her disk’s catalog in order to read file names and load a particular file to complete or revise her work. As her computer experience grew, so did her ability to return to a program, solve problems and make revisions.

Researcher: I noticed that . . . if Betsy decided she wanted to change her mind and do something different, on her own she figured out how she could escape and go back in the program and change it and then go back forward.”

Betsy eventually developed a sense of accomplishment and was able to look at her disk catalog and view the number of entries she had created over the months.

Field log entry: May 1, 1985
Betsy: “Can I look at my disk and see EVERYTHING that I’ve done?!”

Betsy’s delight in using the computer never vanished, even during the last month of the study in August. She continued to have "false starts" when writing text whether it was creating the date line of the letter or the opening words. She also persistently asked what might happen if she were to push "control" keys when not needed.

Field log entry: May 1, 1985
Betsy: I wonder what will happen if I push "control F"
Field log entry: May 13, 1985
"Betsy quietly got out of her chair and walked directly to the computer and the researcher.
Betsy: Can I experiment?
She has her cap locks down and tries the shift key.
"W W -- it makes a capital both ways!"

Betsy created her own entertainment when using the computer by amusing herself with the manipulation of letters and text by using special function keys. She periodically referred to the "computer" as if it were another pet, like her cat, Maxwell.

Field log entry: August 23, 1986
Betsy: "Is it time to feed it? What do you feed a computer? P's I's will do fine.
Betsy chuckled at herself as she filled the monitor full of lower case p's and i's, then upper case P's and I's. She paused, found the delete key and erased all the letters a row at a time.
Betsy: M-m-m-m-m-m, that's better. It should be nice and full now."

Like Dean, Betsy was interested in what other peers were working on while they were using the computer and chose to look over classmates' shoulders and read their text on the screen. What she didn't anticipate was a social skill, namely that some students, particularly girls, viewed their messages as personal in nature.
Their reaction to Betsy's interest was to conceal their messages from her.

Betsy was eager to see the researcher and begin working on the computer each day the researcher visited the classroom. As soon as she would see the researcher enter the classroom's doorway, Betsy would quickly get
out of her chair and walk directly over to the researcher with hopes of being able to work on the computer.

Field log entry: May 6, 1985
"Betsy finishes her turn at sharing time . . . and walks directly over to the computer. She immediately begins sorting through the disks and folders for her own. Observing her one can note she is making deliberate preparation moves to begin working with the computer, i.e. positioning her chair, opening the disk drive door. During this time the researcher is rolling a second computer into the classroom.
Betsy turns to the researcher and says, "I’m ready, Mrs. Kumpf!"

In the school setting, computer letter writing became a token of friendship, a “gift” that Betsy would create for others. She wrote letters, poems, or graphics to her computer teacher, her classroom teacher, a special area teacher, her father, her pen pal, and two other school friends outside her own classroom.

"Dear Dad
I am writting a latter on our school cumpter. I hope that you like it!
I’ll see you to night.

Love,
Betsy"

"Dear Brandy, 5-3-85
I’m glad your coming to my cabin.
Do you want to hear my poem, Different Colors.
DIFFERENT COLORS
BY BEISY
A PICTURE IS NICE BUT, THE ONE I DID IS NICER.
IT IS BLUE, PURPLE, ORANGE-RED AND WHITE.
ONE PART IS CHECKERED AND STRIPED.
Sincerely,
Betsy"
Dear Mrs. Brown, 5-6-05
I hope you like my letter
Mrs. B. I like the way you teach.

Love,
Betsy S.

Her letters were brief and to the point. She responded to previous letters without making reference to them. Betsy would answer questions that were addressed to her through incoming letters but provided very few references to link her subject to the previous letter in a smooth coherent manner. Instead she would supply a statement or two answering each posed question and sign her name to close her return letter.

"5-6-85
DEAR MRS. K.
BRANDY LIKED HER LETTER.
MY PRIDE FAIR WAS A CHINESE GIRL AND AMERICAN girl.
It's in hide away hiles.

From,
Betsy"

Betsy’s communication to her peer pen pal was also short and lacked written transitions from one topic to another. Betsy’s teacher noted that her pencil and paper writing samples displayed traits much like those noted by the researcher in her computer writing.

Classroom teacher: (referring to a note written about a school field trip) She'd said it all right there. She felt that was exactly what she wanted to
say to them and that was it. She wrote in her note, "I had fun doing everything!" She said to me (her teacher), "Well, that covers it. Why put down a bunch of words when you don't need to?"

Betsy felt disappointed when her peer pen pal was slow in responding to an electronic message that she had sent. Once again her message was brief and dealt directly with what was on Betsy's mind.

"Dear Amy,
I have not received your letter.
from,
Betsy S."

Another letter was used to remind her pen pal again that she had not received a letter. This letter is extended with a poem that was written by Betsy to describe a graphic illustration she had created.

"April 22, 1985
Dear pen pal,
I have not received your letter.
I want to tell you my poem.
Different Colors is the name.
DIFFERENT COLORS
By BETSY
A PICTURE IS NICE BUT, THE ONE I DID
IS NICER.
IT IS BLUE, PURPLE, ORANGE-RED AND WHITE.
ONE PART IS CHECKERED AND STRIPED.

GOOD BYE
FROM BETSY S."

Even though Betsy repeatedly notified her pen pal that she had not received a reply, incoming electronic communication was infrequent. Betsy shared her feelings of discouragement and disappointment with the researcher.
Interview: June 6, 1985
Researcher: "Would you like to have a computer pen pal next year?
Betsy: Yes . . . Because now would be the time to write to see what they want to do.
Researcher: Did you feel disappointed because you didn’t get very many letters? Did that bother you very much, Betsy?
Betsy: Yes it did bother me."

Betsy was unaware that her pen pal’s outgoing electronic communication had been censored by classroom and student teachers due to the sensitive materials being expressed by the pen pal. Electronic communication and the concern or need for teacher censorship will be further addressed in Chapter Six.

Betsy enjoyed the flexibility of creating a poem or text on a word processor, saving it on her disk, and then being able to insert it in her messages whenever she chose. Word processing was a vehicle for Betsy to share special pieces of writing with many people. The poem and graphic sent to her peer pen pal were also shared with the researcher and a school friend.

"Dear Mrs.Kumph

I hope you like my poem. And the pictcher i did on the comtuter.
Here is my pictcher and poem.
DIFFERENT COLORS
BY BETSY
A PICTURE IS NICE BUT, THE ONE I DID IS NICER.
IT IS BLUE, PURPLE, ORANGE-RED AND WHITE.
ONE PART IS CHECKERED AND STRIPED.

Did you like” On the comtuter my Kala pad it came out great. FROM BETSY S."
Figure 11 highlights Betsy's poem and graphic that she shared repeatedly in her correspondence to others. The ability to extend her text by using other stored files as inserted material gave Betsy a new satisfaction when doing word processing. Although Betsy was very conservative with her use of words to describe her thoughts in written text, she equated quantity of text with quality. Often she would ask the researcher if the page header on the word processing program was adding the number of letters that she had written in her message. She delighted in seeing the numbers increase and would pause and demonstrate satisfaction at her efforts of writing as she pointed to the page header.

Field log entry: May 1, 1985

2 Mem:44883 Len:124 Pos:34 Tab:0 File:Mrs.KG

Betsy: "Are there 34 letters on this line? (pointing to Pos:) Wow, look at it now! (pointing to Len:124)"

The insertion of stored files, such as poetry, into her messages enabled Betsy's numbers within the page header to climb quickly. At the same time Betsy appeared to be feeling good about herself and the amount of text she was able to prepare.

As the school year drew near its end, the researcher made contact with Betsy's parents to see if they would permit the computer, and its peripherals to be placed in the home for two weeks during the summer months. The
DIFFERENT COLORS
A PICTURE IS NICE BUT, THE ONE I DID
IS NICEER.
IT IS BLUE, PURPLE, ORANGE-RED AND WHITE...
ONE PART IS CHECKERED AND STRIPED.

by Betsy

Figure 11. Betsy's Poem "Different Colors" with Graphic
researcher would visit during the two weeks. Betsy's family welcomed the idea and gave their approval for Betsy to be given the opportunity to have additional time and instruction on the computer.

The researcher arrived in July to find Betsy looking forward to the summer computer experiences. An upstairs study room was selected for the placement of the computer where a built in study desk provided a sturdy table top for the computer and a nearby telephone outlet made modem connections very convenient.

Initial time was spent setting up the necessary electronic and telephone connections to the computer, printer, illustration pad and modem. A brief review of familiar software and the reading of an incoming "E-Mail" letter followed. Betsy had good recall of material learned at school and soon used the computer with little prompting from the researcher.

Nearly 80% of her time was spent making messages, cards, signs or banners as "gifts" for others. Thank you cards, welcome home notes, and "I like you" messages were made for her friends, parents, parent's friends, babysitter, and the researcher. Betsy referred to her cards as "card letters." The researcher noticed a pair of scissors and a large roll of tape near the printer table. That same day the researcher received a card
letter from Betsy which had been cut in an uneven fashion along the edge and tape was placed across a tear.

Researcher to Betsy's parent: "I noticed on a card that she had made for me that there was a tear and it was taped . . . she sometimes had a little trouble getting her paper out of the printer . . . I asked Betsy "Did it bother you? Betsy replied "No, not really. I could fix it."

Her first few cards showed no obvious connection between the selected graphic illustration found on the front and the one shown inside the card. Her "welcome home, Mom" card displayed a graphic picture of a two-story house which she colored with crayon to represent her home on the front of the card. Inside the card Betsy chose a graphic picture of a ground hog stepping outside its hole with the words "Love, Betsy." A few days later Betsy planned and related selected graphic illustrations to the written message. She carefully made a banner for her cat, Max, that was to be placed above her pet's sleeping area. It read: "NO DOGS" and included a graphic of a cat with its back arched high as if its hair were on end. Betsy's mother indicated the growth and change that she, too, noted in this area of development.

Betsy: "... tennis rackets, that was for my Dad! Mother: She worked real hard at picking out symbols to go with people. She did real well at it."

Each day as the researcher arrived, Betsy would be excited to share with her what she had been doing on the
computer while the researcher was away. Her mother was quick to point out that Betsy was an early riser in the morning and would often be working independently on the computer and printing at 6:00 a.m. Her mother chuckled that the family alarm clock had taken on a new sound -- the sound of a computer printer.

Originally the researcher had felt some concern leaving the computer in Betsy's home with periods of time requiring her to work independently. The researcher did not want the computer to become a frustrating experience for Betsy in the home and for this reason had spent the initial two hours reviewing with Betsy the computer and a few familiar programs.

Mother: "She did have one incident where something went wrong . . . I had absolutely no knowledge at all and my girlfriend was here and she said come on Betsy we'll figure it out and they were gone a good half hour and they figured it out. Whatever the problem was -- between the two of them they worked it out . . . she (Betsy) was real proud of herself that they solved the problem."

Much like Dean and Lisl, Betsy enjoyed showing anyone who entered her home the computer and what she could make it do. She informed the researcher that she liked to make different kinds of hard copies (cards, banners, word processing, electronic mail message) so she could have "samples" to show visitors. Betsy amazed the researcher, her parents and family friends at her ability
to function independently, as well as explain and teach home visitors how to use the computer.

Mother: "I think she also liked giving instructions. She liked taking adults up there and being in control . . . the role reversal. Her being able to teach which I think she enjoyed. I think it was a confidence booster and she felt very confident about doing most of the programs on it. She would go in and flip on all the machines and do everything. She enjoyed . . . making cards for different people. Very few times did she make something for herself."

Betsy had spent on average, two hours each day on the computer while it was in her home. She had been willing to take a risk with programs and computer peripherals and learn how they could best suit her needs. She was, however, reluctant to use the electronic mail system without the researcher's assistance. The number of sequential steps required for logging-on was overwhelming for Betsy. This, coupled with her concern that she might forget to log-off at the end of a session and cause a large on-line fee, prohibited any attempt at independent initiation of this activity.

Researcher: "I was pleasantly surprised at how much Betsy tried on her own. But she didn't tackle that (electronic communication). There is a lot . . . to remember -- the passwords, and eight digit numbers -- code numbers of the sender and receiver."

". . . she was very conscientious about taking care of it. She would ask -- do you think we are talking too long? Is it overheating? Do we need to turn it off? She said, "I was a little nervous. I haven't done it before -- before at school."
Betsy had progressed through a number of the developmental stages cited in Chapter Four. She had become familiar with the keyboard, the loading of programs, word processing, print shop, graphic illustration pad and the printer. She had reached an independent level in many areas and required very little assistance in others. Her knowledge, skills and understanding of electronic communication, however, remained at a minimal level. She overgeneralized the use of the videotext network system, thinking that she could send an electronic message to any friend who also had a computer. She found the logging-on procedures too cumbersome and refrained from using the system unless the researcher was available to assist her every move.

Her progress and growth need not be overshadowed by the electronic communication facet of the study. Betsy might well fit an old proverb: "Children's play is their work." To the passer-by, Betsy appeared to be exploring the computer in a way different from many of her peers. She manipulated the text, pressed any and all the keyboard buttons and obtained great pleasure in feeding the machine letters. She did, however, gain computer skills and knowledge over time that she saw as being helpful to her. And most important, she felt good about what she was able to create and share with others.
A recurring comment made by Betsy reflects why she liked working with computers.

"It's helped by helping me and it makes me feel good. . . . it makes me feel happy and I really like it. I done a whole bunch of games but I like the writing a lot better cause I like the way the printer does it . . . I have to sit and guide the pencil -- write about two hours . . . If I make a goof-up I can always push delete."

Another teacher who worked with Betsy on a regular basis shared with the researcher these recorded comments in an effort to triangulate data information.

"She can say things through the computer that she doesn't want to say herself or work at saying . . . Nobody's criticizing her and nobody's correcting her."

"It's self evaluative. Either she thinks good work or she says oops. I'm going to do this over. . . . But it's nobody else judging . . . that could mean a lot to her."

Summary of the Chapter

The purpose of this chapter has been two fold. First, to report and discuss the interview data from: 1) thirty-six third and fourth grade students; 2) four teachers; 3) two school principals; and, 4) parents of students participating in the study. Second, to provide an in-depth account of four individual case studies followed over a period of nine months. Emerging themes were identified and triangulated between field notes, interview data, and communication products.
Although each component of the chapter provides only a "slice" of the whole and deals with recurring focal points pertinent to that subheading, there remains one broad theme through the entire chapter discussion: patterns of developmental phases. Students, teachers, principals and parents showed evidence of growth and change in regard to their own lives and how the computer served as a useful function for their needed purposes. Each of them inquired about the computer's usefulness to their personal as well as professional lives.

Parent: "... it is really crucial that the equipment be utilized because it is only going to become a greater and greater portion of our lives."
CHAPTER VI
SUMMARY, CONCLUSIONS AND IMPLICATIONS

Introduction to the Chapter

Chapter Six includes a review of the nature, purpose, rationale and methodology of this study of microcomputer word processing and graphics in electronic communication experiences of third and fourth grade students in their classroom and home contexts. Themes and generalizations which emerged from the study and have been reported in Chapter Five are extended further as the entire pool of data is considered as a whole. Finally, general guidelines are drawn from the study to construct a framework to guide classroom practice, curriculum planning and future directions for research.

The Nature and Purpose of the Study

This descriptive, naturalistic study of microcomputer experiences involving electronic communication was implemented in a third grade classroom and linked electronically to a third/fourth informal combination classroom. Data were gathered over eleven months. The pilot study and its analysis occurred during the first
four months of the investigation (September through December). The classroom portion of the study covered an additional five months, with an extended three month period for the researcher to continue tracking progress and growth on four case study students during the summer months (January through August).

Initially, the focus for the research study represented a somewhat general topic: communicating via computers within the classroom setting. Therefore, classroom events, materials, computers and discourse held potential relevance to the study. At the close of the pilot study, the researcher realized that the formal primary research study would require more than cataloging and tabulating. The key idea was to explore how these combined elements related to one another in context. Where did writing, communicating, learning and using computers fit into this complex network of relationships? How does electronic communication serve children? What influence did the responder have upon the writer? What was the nature of the interaction between two people? As a result of student use of microcomputers, could an observable transition be detected in the students? Were student perceptions of the microcomputer altered or changed with use? Did the microcomputer assist children in creating, revising and increasing their power and
control of written communication? The emphasis was thus on the recurring themes found linking together the context, computer experiences, written products, language, learning and communicating. The researcher's goal evolved to include investigating, documenting, describing and exploring the relationships between the above questions. Ultimately, the question centered on purpose; what purpose(s) did the personal computer serve children if they were given multiple opportunities each week in the classroom setting to use the computer as a tool to communicate with others. In a very real sense the study has a final focus on the relationship of computer experiences and student goals.

Relevance and Significance of a Study of Electronic Communication in the School Setting

The enthusiasm for microcomputers has waned in the past several years leaving many schools with underused or unused computers. Current research studies have addressed sources of disillusionment for microcomputer use within the school setting (Sloan, 1985; Pearlman, 1985). Items cited are: poor software; lack of convenience and accessibility; time restraints and insufficient teacher training.

A study of electronic communication in the school setting is a very timely concern from both practical and
theoretical perspectives. At the pragmatic level, there is a growing awareness by both educators and parents that computer literacy is a requirement for everyone to function effectively and successfully in our modern society. Theoretically, common computer usage in the elementary school context is relatively new. Much research is required to understand the role of computer experiences in children's learning processes and developmental growth.

This study focused on microcomputer use in the classroom setting. Developmental phases were identified as students became familiar with the computer and later extended their uses of the computer, building to electronic communication experiences. Essentially, the study described a relatively new area and use for the computer in the school setting. Three functions of cognitive processes (learning, writing and communicating) worked together in this study forming a unique relationship interwoven together through the use of the computer.

Figure 12 is a Venn diagram of four intersecting circles representing: 1) learning; 2) writing; 3) communication; and 4) computer use. The intersection, where each sector meets, represents the nucleus of the integrated relationship explored in this research study.
Figure 12. Venn Diagram: Four Relationships; Learning, Writing, Communication and Computers
This study focused on the described portion that represents the shared variance of all four factors. At the same time it acknowledges the relevance and influence the individual circle portions possess.

Research Base for This Study

Ample evidence in the literature is available about the concerns, issues, and theories in regard to learning, writing, communication, and computer use in education. However, the number of resources integrating these components is very limited and becomes more scarce when one looks specifically at classroom electronic communication and its relationship to writing, communicating, and learning. The available research did influence and shape the researcher's theories within her own mind and this study.

Learning as a Developmental Process

Children learn and develop as active, systematic and purposeful learners. Lindfors (1981) labeled the child as an active observer, comprehender, questioner, producer, explorer, hypotheses maker, tester and reviser. The developmental learning theory places importance on the process rather than the product. This development is considered a life-long process within each individual.
The writing process: Recent research conducted by Flower and Hayes (1981) describes a cognitive process model of writing where complex decisions of planning, translating and revising must be made, but do not sequentially progress in an A, B, C order. Writing decisions take on a cognitive recursive process, rather than a linear form as authors create text and embody their thoughts. For example, a writer may rethink through his planning, carefully monitoring and evaluating his work. Symbols on paper representing thoughts and recursive thinking processes of the writer are transformed to language and writing for others (Vygotsky, 1962; Moffat, 1979).

Research in the developmental writing process of children has provided educators with an understanding of how children construct their own writing system and move from global awareness and uses of environmental print (Harste, Burke, and Woodward, 1982) to a means of communication enabling them to convey their ideas to others. Clay's (1975) work of children's early writing behavior identifies recurring principles that are spontaneously practiced and refined by young writers as they gain more control over writing conventions, and move from invented spelling practices (Read, 1975) toward standard spelling of words.
Communicating with Others:

The area of research that most directly influenced this study dealt with oral, written and electronic communication. Meaning and intention are of central importance in each of these communication modes. Hypotheses are formed, tested and reframed about language as children interact in a multitude of contexts and seek to be heard and to be understood by others. Through interaction, children negotiate meanings and purposefully participate to relate, to express themselves, to imagine, to relate to others and to form concepts and an understanding of the world in which they live (Halliday, 1975). Children's language is used to accomplish a task that stems from a purpose. Early in life children begin to understand the power of language and how it can be used to persuade, convince and question others. Diverse experiences, such as electronic communication, allow children to build upon prior knowledge and form meaning. Since children's language is significantly influenced by the context, it is vital for the school to provide opportunities and experiences in which children use language to form meaning.
Rationale for Methodology

Because the context in which word processing and electronic communication took place was considered a very relevant and necessary part of investigating and documenting the computer in the classroom setting, a naturalistic method of data collection was desired. Therefore, the daily schedule of school events was disrupted as little as possible. Actions and reactions of children were studied naturally over a period of time as the researcher gathered materials and compared information in an effort to identify recurring themes and generalizations.

The time line of the study fell into a sequence of phases beginning with designing the study to formulating results and dissemination of research. Portions of the time line overlapped on occasion as it became necessary for the researcher to attend to multiple events occurring during the same time frame (e.g., gather school/classroom data and obtain home entry for summer months for the four case study students).

The Study

Duration: This investigation of word processing and graphics in electronic communication experiences encompassed twenty (20) months from the initial stages of
the research design and selection of the school context to the completion of the research report. Within this period of time, eighty-eight days were dedicated to data collection and ninety hours of audio tape recordings were gathered.

Selection: The target third grade classroom and third/fourth combination peer pen pal classroom were selected for several reasons. First, both classrooms were already involved in a joint research project with The Ohio State University which was supported by Apple Education Foundation, CompuServe, and Koala Industries. Second, the building principals and teachers were open and supportive to introducing word processing, graphic illustrations and electronic communication in the third and fourth grade classrooms. Third, the target classroom was considered a "contemporary" classroom, while the peer pen pal group was considered an "informal" classroom. If students chose to electronically discuss school life there existed an opportunity for them to consider, study and describe commonalities and differences of their classroom settings. Finally, the researcher had previous contact with both classroom teachers during the pilot study and found them both highly regarded as experienced teachers willing to take
on the challenge of new research by their respective principals.

**Entry and Establishment of Roles:** The researcher performed four different roles during the study. First, she acted as a research trainer, training university undergraduate students for the implementation of the pilot study. Second, she assumed the role of an observer as she acquainted herself with the children and classroom context. Third, she became a participant observer and an accepted part of the classroom context. And, fourth she served as a computer teacher providing initial one-on-one guidance to students in the target classroom to introduce word processing, a graphics illustration pad and electronic communication. A trained student teacher served this role in the peer pen pal classroom. These roles were established over a period of five months. The roles functioned smoothly as each role built on the others. By establishing a regular visitation schedule, the researcher became very familiar to the classroom students. In interpreting the data attention was given to each role.

**Collection of Material:** Data collection involved gathering the materials in several ways. Field log entries were made in the course of observing and participating in the field. Narrative inserts were
regularly and systematically added by the researcher to her journal to extend and clarify field notes. Student behaviors and responses within the context were also recorded and often amplified and reflected upon in the researcher's log.

Several sources of data were recorded on audiotapes. Audiotapes were placed beside the computers to record students' comments and interaction related to the computer experiences. Whole group and small group sessions led by the teacher were also recorded. Informal discussions were documented primarily from notes taken during and immediately following the sessions. A total of ninety hours of audiotapes was gathered, transcribed into a typed format, and bound into volumes. The raw data is secure and provisions and safeguards were made to protect confidentiality. Due to the confidentiality of the data, the researcher cannot make this material available for public review.

Photographs, slides and video recordings were taken and used as an additional sources of documentation. They were used as a means to recapture a portion of the energy and enthusiasm children conveyed for the research study that could not be fully reflected in log entries or audiotapes.
Microcomputer disks were used by the students to save all their work completed on the computer. The researcher used class disks to form a master file of student work for each classroom. Hard copies of students' work were made, compiled and bound into a volume for easy reference during data analysis. These materials provided the researcher with samples of the student's written products. Occasionally hand written first drafts of written text were available to the researcher. In such cases the students' writing was borrowed for photocopying and immediately returned by the researcher.

Finally, each student maintained his/her own file folder used especially for filing computer experience materials and a chart which logged in-coming and out-going electronic communication. These materials were also borrowed, photocopied and returned to the students. All of these sources of data were used in forming the documentation and interpreting students' microcomputers experiences.

Analysis of Material: Patterns began to emerge as field data was accumulated and continued through to the writing of a final report. At the end of the pilot study, an analytical report was written. Emerging themes were
tentatively identified. Throughout the follow-up study reflective comments were made in the field log as recurrences were noted and the number of themes increased. Interviews with students, teachers, principals and parents were used to form triangulations among each of the four elements. Audiotapes from the field work were transcribed, reviewed, and edited. Nine hundred and seventy-five pages of typed audiotape transcripts were photocopied and later bound into volumes.

Transcripts from interviews, the classroom context and computer experiences along with the researcher’s field log and student’s writing products were explored: 1) individually; 2) cooperatively with other sources of data; and 3) as an entire whole body of information. Relationships were carefully examined and revised through the process of analysis. The identification of themes from the gathered materials were derived from the use of triangulation. Triangulations also assisted the researcher by supporting, questioning, or calling for revision, thus strengthening the validity of the final emerging themes and generalizations.

**Interpretation and Reporting of Findings:** The preparation of the final report served to continue the
analysis process. As developmental phases of the computer experiences emerged, and themes arose, examples were selected which added precision to major and secondary relationships. Earlier in Chapter Five the researcher indicated that it was not possible to account for all the data, but rather selective illustrative samples were made to support generalizations. During the course of selection all the data were surveyed, and tested by triangulation.

Portions of the interpretation and findings relied less on the researcher's judgment. First, information pertaining to the number of students who had computers in their homes, and how the computer was used prior to the study provided data for a matrix of numbers and a list of uses. This data was tallied into percentages for the purpose of discussion.

The study explored a way of looking at the growth of children through descriptive developmental phases of the process. The study clearly reinforces the uniqueness each individual brings to the computer, and is reflected most strongly in the four case study discussions.

Themes and Generalizations

How do children use the computer word processing and graphics in electronic communication within the classroom
setting in order to explore their "purpose." This question introduced in Chapter One, addressed in Chapter Five, and again highlighted on the opening pages of this chapter will now be evaluated to seek meaning from the research study.

I. How does electronic communication serve children?

A Means of Introduction: Electronic communication provided the students with a means for introducing themselves to unfamiliar people such as a new computer teacher and peer pen pals located at another school. The letters basically shared the students' interests and favorites. Repeatedly the students named their favorite foods, movies, and/or recreational pastimes.

"DEAR JUSTIN 5/7-85
MY FAVORITE FOOD IS MY MOMS B.Q. CHICKEN.
SHE HAS A SPECIAL RESEPE.I HAVE ONE SISTER HER NAME IS TERI.SHE IS VERY PRETTY AND SHE HAS LONG GOLDEN HAIR.I ALSO HAVE A DOG HER NAME IS KOOCHY.MY BIRTHDAY IS IN APRIL 1975, I AM 10 YEARS OLD.MY DAD HAS A NEW RESTAURANT NEXT TO (a movie theater). WHAT DOES YOUR DAD DOI FOR A LIVING?I AM ON A BASEBALL TEAM,ARE YOU ON ENY CIND OF SPORTS?
P.S. PLEASE WRITE BACK JUSTIN.
YOUR FRIEND,
PHIL"

Birthday dates were also considered an important piece of information to share with others.
"DEAR PIN PAL,

FROM, 
EXIE"

Nearly 95% of the letters of introduction included a description of their family members and often the household pet. One student went one step further in his letter to the computer teacher and gave his address, house description and telephone number.

"DEAR MRS. KUMPFF I PLAY BASKETBALL I PLAY ON TEAM 3 FOR (school name) JOE IS ARE CAPTAIN I DON'T COLLECT ANYTHING I HAVE ONE DOG TWO GOLDFISH AND ONE GUINE PIG I ALSO HAVE A BROTHER HIS NAME IS ADAM MY DOGS NAME IS RAGS ARE GOLDFISHES NAMES ARE BETSY AND SCOTT MY GUINE PIGS NAME IS WHISKERS MY MOMS NAME IS SUE MY DADS NAME IS CHRIS I USE TO PLAY SOCCER MY BROTHER IS 6 I AM 8 AND A HALF I CAN'T TELL YOU HOW OLD MY MOM AND DAD ARE THAT'S ONE OF THOSE THINGS YOU CAN'T TELL I LIVE AT (street address) MY PHONE NUMBER IS (home phone) IT LOOKS LIKE THE SECOND HOUSE BUT IT IS REALLY THE FIRST HOUSE MY HOUSE IS BROWN IT IS NEXT TO THE WHITE HOUSE WITH GREEN SHUTTERS.

FROM, 
PETE"

Those students creating word processed messages for close friends, familiar teachers or family members who
undoubtedly already knew one another personally by-passed introductions and began by addressing the purpose for writing the message.

"Dear Nick,
I'm sorry you can't come to my cabin.
From;
Betsy S."

Establishing or Maintaining Friendship: Students seeking to establish a friendship used their lives as efforts for building a shared context through mutual interests (Greene, 1983; 1985). The introductory letters unveiled areas considered as common grounds such as family, food and recreational interests. Since the messages were being created on a word processor and transmitted electronically the topic of "computers" was also considered an area of mutual interest.

"DEAR PEN PAL
4-23-85
HOW ARE YOU. I WAS WONDERING IF YOU ARE GOING TO WRIGHT ME PRETTY SOON CAUSE I WILL BE WAITING. WHAT HAVE YOU BEEN DOING ON THE COMPUTER LATELY. MY CLASS IS MAKING GRAPHICK PICTER. HOPE TO HEA FROM YOU VERY SOON.

YOUR FRIEND,
BARBARA"

"Dear Mike, 5/25-85
I heard that you have a computer what kind do you have?
I have a computer it's an ATARI 800 XL. You must feel bad!
I feel sorry for you!
Do you like your computer?
I like mine!
Bye Bye
I hope you write back soon

Your friend,
Dean"

Complimenting the other person in writing was used as a positive way to maintain a friendship.

"DEAR MRS KUMPF I REALLY LIKE WORKING WITH YOU. I HAVE A SISTER NAMED CORKY. SHE HAS BLOND HAIR AND SHE IS FOUR. I HAVE TWO DOGS. YOU ARE VERY NICE. THANK YOU FOR SPENDING YOUR TIME WITH US. MY MOM AND DADS NAME IS NANCY AND RON. I LIKE WATCHING T.V. AND DANCEING. THANK YOU FOR THE LETTER.

FROM

KIMMY"

5-6-85

"Dear Mrs. Brown
I hope you like my letter
Mrs. B. I like the way you teach.

Love,
Betsy"

"Dear Justin
It is a long story about my stitches. and I do not have the time so I will tell you later. My baseball teams name is Mohican. What is your phone number? My phone number is (home phone) call me some time and I will call you. I THINK YOU ARE COOL. What pool do you go to? I go to H _______.

Your pen pal,
Phil"

Writing Letters to Get a Response: Letters were written in many cases for the purpose of receiving letters (Greene, 1983; 1985). When the reciprocity of letter writing was delayed for some reason it was not uncommon for the students to send additional letters conveying the
message: "please write back" because "I haven't heard from you."

"DEAR JUSTIN 5/14/85
HOW ARE YOU? I AM FIN. I SAW YOU IN THE NEWS PAPER. SOME TIME I WILL MEET YOU. WHY HAVEN'T YOU WROTE ME?
YOUR FRIEND, PHIL
P.S. PLEASE WRITE BACK"

"Dear Pen Pals, April 23, 1985
I am real glad that you are both my pen pals! I sent a poem and a graphic you for you to see. The graphic I sent for you is Donald Duck and a poem about Donald. I would really like it if you would write back!!
Your Friend, Carol"

"DEAR JANE
DO YOU LIKE TO COLOR? THIS IS MY POEM
CIRCLE HEAD
MONSTER
FAT, CUTE
FAST, QUICK, SPEEDING
HAPPY, GLAD, SAD, MAD
WIERDO

BY LOUISE
WILL YOU PLEASE WRIGHT I HAVE NOT HEARD FROM YOU. FROM LOUISE"

"4-22-85
HI I AM YOUR PEN PAL I HAVE BEEN WAITING FOR YOU TO WRITE BACK. I MADE A DESIGN ON THE KOALA PAD AND MADE A POEM FOR IT AND IT'S NAME IS BOXY HERE IS THE POEM.
BOXY'S THE NAME
FOUR SQUARE IS THE GAME!!
WELL BYE.
YOUR FRIEND,
JOSH"
DONALD DUCK

WHITE DUCK
TEMPER NEVER STOPS
FURRY, SILLY, CRAYZY DUCK
DONALD

BY CAROL

Figure 13. Carol's Illustration of Donald Duck Graphic with Poem
Figure 14. Louise's Illustration of Circle Head Graphic with Poem
Figure 15. Josh's Illustration of Boxy Graphic with Poem
An Emotional Outlet: Special events within the lives of the students that caused feelings of happiness or sorrow were shared in electronic communication. Mindy’s letter to her computer teacher discusses the loss of her pet hamster.

"DEAR MRS. KUMPF,
I LIKE OHIO ALOT. MY BROTHER ATTENDS MIDDLE SCHOOL. WELL, I LIKE BASKETBALL THE MOST BECAUSE, I LIKE TO RUN. MAYNARD DIED ON MONDAY. WE THINK HE WAS JUST OLD. FANCY IS A FANCY KIND OF HAMSTER SO WE CALL HER FANCY. WE GOT THE NAME MAYNARD FROM,GOOD STUFF MAYNARD. FANCY IS A BROWN AND WHITE HAMSTER. NOW FANCY HAS MAYNARD’S CAGE SO SHE PLAYS IN IT. WELL, GOOD BYE.

YOUR FRIEND,
MINDY S."

Another student who was very quiet in his classroom behavior shared his strong feelings concerning the divorce of his parents.

"Dear, Mrs. Kumpf
I will tell you about my cat’s. they are crazy little criters. They dip there paw in my milk glass. There name’s Hefee,Sona and chester.I am going to get a cunstruckabot today.My Mom and Dad are getting devorst.I am very sad.

From
Frank"

Some student responses might be questionably exaggerated by the writer, but undoubtedly these letters provided an outlet for expressing emotions and feelings. In interviews with these same students, they indicated they felt "safe" when confiding information with
their electronic pen pal because he/she never talked with their regular school friends.

"DEAR BETTY LOU 
May 23, 1985
I LIKED YOUR POEM.
MY BROTHER BOB IS BEING SO MEAN TO ME I AM NOT GOING TO BUY HIM A TOY FOR HIS BIRTHDAY WITH MY OWN MONEY BECAUSE I WILL BE WASTING MY MONEY AND WASTING MY TIME LOOKING FOR THE TOY.
MY BIRTHDAY IS COMING UP AND I WANT A TEN SPEED BUT MY MOTHER AND FATHER SAY ITS TO MUCH MONEY.
IF YOUR THINKING WE ARE POOR WELL WE ARE NOT ITS JUST I DO NOT THINK MY MOTHER AND FATHER LOVE ME (censored remark)
LOVE,
MAY"

More often students shared the anticipation or highlights of events they considered to be especially happy or newsworthy. One student shared his excitement of a planned visit to his grandmothers. He enthusiastically asked if he could have two hard copies of his letter to take with him on his trip so that he could give each grandmother a copy of the letter. The letters enabled him to share with his grandparents how he used computers at school. These letters became a "gift" from Josh to his grandmothers.

"I hope you have a good spring break too. Are you going anywhere? By the way I am going to my grandmothers for spring break. It is always fun to go to my grandmothers house because she is always fun to be around. My dad will not be with the rest of the family he is going to Florida we are going to St. Claresville well write back.
YOUR FRIEND
JOSH"
Some letters were used to report personal injuries to others. Phil reflected to his pen pal that his letter writing had occurred over a two day period. He used the word "continued" with each day's date (i.e., 4/26/85) to indicate his second writing session.

"DEAR JUSTIN 4/24/85
HOW ARE YOU JUSTIN? I AM FINE EXCEPT I HAVE STICHES ON MY FOREHEAD AND I AM GETING THEM OUT TODAY AT 4 P.M.
CONTINUED -- 4/26/85
WHEN I GOT MY STICHES OUT THEY TOOK THEM OUT TO EARLY AND IT MITE SPLIT OPEN AGEN.
P.S. PLESA WRITE BACK SOON!
YOUR PEN PAL
PHIL"

This same student became interested in writing about his anticipated adventures during summer school vacation and especially his first airplane flight. He extended his message by combining his word processed text with graphic illustrations from a Print Shop program as seen in Figure 16.

Descriptive text of student travel following school vacations naturally transpired as children wrote without restraints upon topics that were of special interest to them.

"WELL I DIDN'T GO TO MISSOURI. BUT I DID GO TO WASHINGTON D.C. WE SAW THE WHITE HOUSE AND WE TOOKA TOUR OF IT. AND WE ALSO SAW THE MINT. THE MINT IS WHERE THEY MAKE MONEY. WE ALSO WENT TO TWO PARTS OF THE SMITHSONIEN MUSEUM. THE AIR AND SPACE AND NATURAL HISTORY. WE WENT TO THE WASHINGTON NONUMENT TOO. FOR EASTER WE HAD OUR UNCLE WHO LIVES IN MIAMI FLORIDA COME TO OUR HOUSE. MY PRIDE FAIR THING WAS MY COLLECTION OF COINS WELL I GOT ALL MY COINS FORM THE
THIS SUMMER I AM GOING TO NAPLES FLORIDA ON AN AIRPLANE. THIS WILL BE MY FIRST TIME ON AN AIRPLANE. I BET IT WILL BE FUN. I WONDER WHAT I WILL SEE OUT THE WINDOW. WILL THE PEOPLE AND CARS LOOK DIFFERENT?

MY GRANDPA IS ALSO TAKING ME FISHING AND CAMPING. I AM GOING TO DO A TON OF THINGS THIS SUMMER, LIKE GO TO THE POOL WITH MY FAMILY AND FRIENDS AND PLAY ALL DAY. I WILL ALSO HAVE LOTS OF FUN

BY
PHIL
PLACES I'VE VISITED. WELL I HOPE WRITE SOON
BYE-BYE.
FROM, SANJEEV"

Sharing School Accomplishments and Events with Others:
Electronic mail created in the classroom setting showed a
strong relationship between the type of information that
was expressed in text and the context in which it was
generated. In the first paragraph of Angel’s letter she
asks her pen pal several questions about school life in
her classroom. Essentially, Angel is trying to compare
and contrast how their classrooms are alike and
different. She also includes some of her own classroom
writing and requests a response of approval from her
electronic pen pal.

"Dear Chris May 31, 1985
I was glad you wrote to me because I was going to
get lonely. My birthday is March 1976 I am 9 years
old. Right now our art teacher is going to go some
where else. What reading group are you in? I am in
ten times around. I want to show you what we are
doing in our class we are doing a story it is about
our Summer Vacation I will show you my story, here
it is: My Summer Vacation

I want to go Ethiopia and to help the people. I
will do the best I can to help the people get their
food. If not I will try again to see if I can do it
better. I will try to do some thing for their water
supply to keep them from dying. I hope to help them
learn how to read so some day when they get older
they will know how to read. I will help the babies so
they won’t die so quickly. I want to make their
country to be the way they want it to be. So
someday they will be like we are.
THE END
The influence of oral language was very evident in many of the student's letters. Lisl uses a "guess what" approach to her reader as she sets the stage to describe important events occurring within her own life: 1) new neighbors; 2) friends moving away; and, 3) making a book jointly with her mother.

"DEAR MRS. KUMPF,
WELL, GESS WHAT! MY LITTLE BROTHER GAGE IS ABOUT 2 YEARS OLD. HE REALLY IS ABOUT 20 MOUTHS OLD.MAYBE THEY BOTH THEM CAN PLAY TOGETHER.ALSO THESE NEW PEPOLE ARE MOUING IN NEXT STORE.THEY ARE FROM GREAT BRITEN.WELL, MAYBE YOU REMEMBER ABOUT GINA AND LARRY IN THE LAST LETTER AND GINA AND LARRY USE TO LIVE NEXT STORE.SEE THEY MOVED AWAY TO SAN FRANCISCO. BOY THEY WERE NICE.SO THE NEW PEPOLE ARE MOVING IN THEIR HOUSE. HOW ARE YOU? I HOPE YOUR FINE! WELL I"M FINE.I HOPE YOU HAVE A NICE DAY!OH, GESS WHAT!!MY MOM AND ME ARE MAKING A BOOK!WE ARE GONG TO RIGHT IT AND THEN WE ARE GONG TO TAKE IT TO MRS. BIRD.SEE SHE IS A WONDERFUL ARTES.WHAN SHES DONE WE ARE GOING TO TRIE TO GET IT PUBLESED. WELL THEN IT MITE BE AT THE BOOK STORE.
FROM,
LISL"

The school setting was considered to be a very common ground linking the two classrooms together. As students sought to establish a shared context between themselves and their electronic pen pal, reference to school recurred in their transmitted messages.

"APRIL 22,1985
DEAR SUSAN AND LAURIE
I AM WAITING FOR YOUR LETTER.I AM LOOKING FORWROD TO MEETING YOU.WHAT ARE YOU DONG IN SCHOOL.DO YOU LIKE
Mindy shared in her message to her electronic pen pal a poem that she had composed at school and the fact that she brought her pet hamster to school to show her classmates.

"DEAR WENDY, 
HOW ARE YOU? I AM GREAT. COULD YOU WRITE BACK PLEASE? AND TELL ME ABOUT YOURSELF. I LIKE TO PLAY SPORTS. HERE IS A POEM I MADE. _S_H_A_P_E_S
CIRCLES, RAYS
ROUND, ROUND
INTO SPACE
SPINNING, FLYING
OVER, OVER
THE END
TODAY, I BROUGHT MY HAMSTER "FANCY". SHE IS A GIRL FROM, MINDY A."

Students were eager to share selected pieces of writing that they had created as part of their on-going curriculum. Carol started a letter with a brief opening statement about her subject matter before she presented her written report on Henry Ford. Exie's opening was much briefer, supplying only "Dear Mrs. Kumpf;" while Angel just assumed that her reader would know the message was intended for her and went directly into a title followed by a description of Amelia Earhart's life (copies of the letters in their entirety may be found in the Appendices).
"S/9/85
Dear Mrs. Kumpf,
I did a report on Henry Ford and I would like to share it with you.

I chose this book on Henry Ford because I have an interest in him ever since we went to . . . . . . . . Henry Ford was a brilliant inventor!!

By Carol"

"DEAR MRS. KUMPF
THE NAME OF MR. BRAILLE IS LOUIS. HE WAS NOT BORN BLIND. BUT HE GOT BLIND . . . . HE WAS ONLY THREE HE INVENTED BRAILLE.

FROM EXIE"

"Amelia Earhart
Amelia always had to try something new. She was never afraid of . . . . the Japanese Navy captured them.

By Angel"

Louise announced in her opening line that her father had assisted her with writing George Washington's biography.

"MAY 9, 1985
DEAR MRS. KUMPF
THIS IS MY BIOGRAPHY THAT MY DAD AND I DID. THIS BOOK IS ABOUT GEORGE WASHINGTON AND HIS LIFE. WHEN GEORGE . . . . IS CALLED THE FATHER OF HIS COUNTRY.

BY LOUISE H."

Writing Used to Persuade the Reader: Students within the target classroom used their electronic communication to request privileges and persuade the reader that these privileges were reasonable.

"DEAR MRS. KUMPF
I WOULD LIKE TO DO PRINT SHOP TO MAKE MY ISLAND STORY TODAY. I AM GOING TO GIVE IT TO MY MOM, IS THAT OK WITH YOU. COULD YOU HELP ME WITH IT.

YOUR FRIEND, MITCH D."
"DEAR MRS. KUMPF          MAY 13-1985
THERE IS SOMETHING I WOULD LIKE TO DO AND THAT IS TO WORK ON THE KOLW PAD. I AM HAVING FUN IN SCHOOL. I LIKE HAVING YOU AS MY COMPUTER FRIEND.
FROM
LOUISE H."

What Influence Did the Responder Have upon the Writer?

Models provided by a more mature writer often influenced less experienced writers. The computer teacher noted especially how her own actions and letters were used as a pattern from which students attempted to shape their own behavior and letters. Keyboard skills displayed by the researcher were a source of marvel and amusement for many of the students. Interviews with students revealed that they too wanted to be able to breeze along on the keyboard, putting down their writing thoughts in quick easy key strokes.

Field Log Entry: March 13, 1985
"Gee, how do you put the letters on the screen so fast? I hope someday I can do that . . . I'm faster than I used to be!"

The researcher also noted students' approach to writing was influenced by the types of letters they received and how language was used within them. For example, the researcher began one of her letters with an apology for not returning a reply letter sooner and accompanied a reason for the delay to the reader.
(letter condensed for example)

"Dear Pat,

I'm sorry that I haven't written for awhile, but April has been a very busy month for me. I went to Chicago to a convention, celebrated Easter with my parents in Indiana, and kept busy with my school work at O.S.U.

I'll anxiously be awaiting your reply!

Your Computer Friend,

Mrs. Kumpf"

Shortly the researcher was receiving delayed student letters opening in a similar fashion with an apology followed by a reason.

"DEAR MRS. KUMPF

I AM SORRY I HAVEN'T WROTE IN A LONG TIME. I HAVE BEEN PRETTY BUZZY WRITING TO MY PEN PAL. HOW ARE YOU? I AM JUST FIN.MY DOG JUST HAD SUGRY.MY ANT AND UNCLE JUST GOT BACK FROM GREECE. I AM ON A BASEBALL TEAM.

SINSELY, PAT"

The researcher's closure of letters was also replicated by students in an abbreviated form. The researcher frequently signed her letters "Your Computer Friend." Over 80 percent of the students used a similar closure during their own letter writing, reducing this phrase to "Your Friend."

Lack of correspondent's feedback was often interpreted as negative feedback. As described earlier in Chapter Five, Lisl's peer pen pal greatly influenced her by disregarding the code system for conveying messages that Lisl had shared and requested her pen pal to use. When peer pal letters were not received, the
target classroom began creating shorter messages with one main theme, "please write!"

Frequently the students shared word processed text and graphics with their computer teacher, the researcher. In each situation positive feedback was generated and a feeling that their work was "valued" was conveyed by the researcher. Students shared similar pieces of work with their peer pen pal in hopes of receiving the same positive response.

*What Was the Nature of the Interaction between two People?*

Letter writing in a variety of situations (within the classroom with the computer teacher; with peer pen pals; and to other special friends and relatives) usually stemmed from a shared context between the reader and writer. More than 90% of this shared context between the writer and receiver was based on similar interests, background experiences and/or pursuits of goals.

The inserted electronic letter passages (below) show how "Ramona" books by Beverly Clearly became a shared context for interaction between a student named Sanjeev and his computer teacher.

"Dear Sanjeev,

Thank you for replying to my letter!!

I was especially glad to hear that you enjoy reading! Although I didn’t mention it in my last letter, I love to read! Have you read any good books
lately that you would like to tell me about? I found the Ramona books by Beverly Clearly to be fun reading. If you haven’t read any of them you might want to try one. I have a copy that you may borrow. Do you read aloud to your little sister. My husband or I read every night to our sons before bedtime. We read everything from fairy tales, children encyclopedias and poetry to camping safety tips and memos from school. Please, tell me what kinds of things you like to read.

Your friend,

Mrs. Kumpf

"DEAR, MRS. KUMPF

I’VE READ ONE OR 2 RAMONA BOOKS.
I DON’T KNOW WHAT I’LL NAME MY DOG. ZERO ZAP IS A GAME WHERE YOU ARE A GUY YOU CAN SHOOT YOURSELF AND YOU HIT NUMBERS AND THAT IS YOUR SCORE.BYE PLEASE WRITE BACK.

FROM; SANJEEV"

"Dear Sanjeev,

Gee, Sanjeev it sounds like you are already a step ahead of my book suggestion, since you have already read two Ramona books!! What did you like best about them?

Your Computer Friend,

Mrs. Kumpf"

"DEAR, MRS.KUMPF

THE BEST PART OF RAMONA QUIMBY AGE EIGHT WAS WHEN SHE GOT COVERED WITH EGG YOLK. THAT WAS FUNNY. WELL WE MIGHT GO TO MISSOURI AND WE MIGHT NOT. WELL IF YOU HAVE ANY QUESTIONS ASK ME IF NOT THATS O.K. TOO BYE BYE PLEASE WRITE BACK.

FROM, SANJEEV"

Much like oral language, the nature of communicating through letters involves taking turns. Sanjeev closed his last letter (in the passage above) by requesting his sender to ask him more questions so that he may take another turn at responding. He openly conveyed signals that “it’s your turn” to the researcher by enclosing the words, “please write back.”
II. Was There an Observable Transitional Process the Computer Initiated in Students' as Their Use of the Microcomputer Changed?

Students were eager and willing to learn new information and skills concerning computer use from the first day of the study. Background interviews conducted with the students indicated that over 90 percent used the computer for games and recreational purposes. Computers were strongly associated with the word "play." Keyboard experiences were limited to one or two keys pushed to activate a game.

In a period of eight months, with access to a microcomputer in the classroom setting multiple times each week, the students showed through their actions and discussions that a transitional process was occurring. Students requested to use the computers to "work on" rather than "play with." Keyboard skills increased dramatically, although most students were still slower writing with word processing than manually writing. The use of the computer changed from being used mechanically for games to creatively being used as a tool. Word processing and graphics in electronic communication were used for student generated purposes. Familiarity, confidence and competence grew with repeated exposure and a variety of computer experiences. Nearly 85 percent of the students became independent and required a minimal
amount of guidance and support by the fourth month of the study.

Were Students' Perceptions of the Microcomputer Altered or Changed with Use?

Student interviews indicated that prior to the study students acknowledged computers as helpful to business, but had not explored the use of computers to assist them. Follow-up interviews showed that their initial responses had shifted. They viewed the microcomputer as a meaningful tool that provided benefits to them, even at the third and fourth grade level. They described working with computers as a challenge, and an important element in their future. Most importantly, the computer was considered a toy only if it was used like one.

Student: No, I don’t think (computers are a toy). It depends on what you’re using it (the computer) for... It’s not something you play around with... they are helpful, exciting and a challenge.

Did the Microcomputer Assist Children in Creating, Revising and Increasing their Power and Control of Written Communication?

Within the full group of thirty-six students (twenty-one housed in the target third grade classroom and twenty-five housed in the third/fourth peer pen pal classroom) initial discussions with students revealed that ninety percent felt the computer had "no impact"
upon their writing. In fact, many of the students were very unfamiliar with word processing and not clear how it could be used. The follow-up student interviews indicated a change in the student response to this same question. Students were outspoken in their view that computers did not help them learn to write, but that computers can help them to become better writers. Ten percent of the total number of students conceptually thought they were faster at writing tasks on the computer even though timed writing tasks taken revealed that they could write more quickly with a pencil and paper. Some of the students who noted the inconsistency in their answers suggested that revisions and preparing a final copy was much faster on a word processing program. Teachers also began observing positive signs of writing that was completed on the microcomputer.

Teacher: . . . they did a better job of (self) editing and cleanup knowing that they didn't have to recopy it.

Teacher: . . . I could see them just sitting there composing at the computer and it seemed to take out for many of them the task of writing . . . the skill of handwriting.

As students became more familiar and competent with the computer, they increased their power and experiences by initiating new challenges for themselves using the word processor. One student, named Pete, created the text and corresponding graphics for his first grade
reading buddy (refer to Appendix M for a copy of Pete's story entitled, *Centepide Soup*).

**Problems and Issues Encountered**

Problems which arose throughout the study were viewed by the researcher as a challenge, not an obstacle. First, time, care and a cooperative effort between the researcher and the target classroom teacher was required to establish time for working on the computer within the on-going classroom curriculum. Second, it required time and patience for installing new equipment and working out potential "bugs" in the system. Without a telephone line, modem and computer designated for electronic communication located and operating at the target school and the chosen pen pal school, videotext transmission would not have been possible. For more than two months at the beginning of the study, delays in office requisition forms and scheduling of service at the telephone company prevented inter-school communications.

Third, making contact with students at another school who were also interested in sharing electronic mail and participating in a pen pal program demanded close contact and supportive guidance on a continual basis. Fourth, the transcription and editing of ninety hours of audio tapes taken from the classroom context,
computer experiences, and interviews was a tedious job requiring several months of labor.

Issues encountered during data collection were viewed as a part of reality. The issue of "time" was important from the planning viewpoint. Teachers needed time to plan and integrate the computers into their schoolday and classroom curriculum. Students needed one-on-one computer training time, plus additional time to use and explore the computer's capabilities and selected word processing and graphic programs. Time outside of the classroom was necessary for transmitting electronic mail. Binary graphic files which were chosen to share with an electronic mail friend required time for coding into a textual format to enable it to be transmitted. Receiving files of this kind also required time, since a decoding program was necessary to transfer the coded file back into a binary form and visible graphic illustration.

A second issue which arose in the field setting was the question of teacher censorship of electronic mail. If letter writing is considered a personal act allowing students to share private experiences with others, it must also be recognized as a potential form for emotional expression. Teacher censorship violates the anonymity that could be established between two pen pals as they share personal information with one another. The
opposite side of this issue reveals the responsibility of the teacher to monitor student behavior and language within the school context. Electronic communication is considered a public communication system and can result in punishment by law if used improperly. The classroom teacher needed to be certain that such violations were not being generated by her students. A potential situation exists where information shared in peer electronic communication calls for "help." Such help whether it be a child abuse agency, a drug abuse agency, or a suicide prevention agency could require the assistance of an adult teacher. Information of this magnitude may also provide the classroom teacher with insights and understanding regarding a particular student.

One message dealt with a very sensitive subject and was withdrawn by the classroom teacher from the files to be transmitted. One of the most unfortunate parts of this particular censorship was that both the sending pen pal and the receiving pen pal were not informed that their message had been censored. Consequently, a slight breakdown in communication resulted between the students, as the receiving student thought the pen pal didn't write and the sending pen pal remained unclear as to why her emotionally forceful message received no reaction. No
response to electronic-mail may be interpreted to the sender as "I'm not interested -- I don't care."

Conclusions: The Researcher's Interpretation

The research questions raised in Chapter One concerned: 1) the purpose(s) microcomputers serve children in a classroom setting where they are given multiple opportunities each week to use the computer as a creative tool to communicate with others; and 2) the transitional process the microcomputer can initiate in students' as their use of the microcomputer changes. Interpretations of these questions will be proposed in the following discussion.

Purposes Microcomputers Serve Children In a Classroom Setting:

First, microcomputers, word processing and graphics in electronic communication served children in the classroom by providing an opportunity to learn new things. The energy and excitement that each student brought to this study should not be overlooked or forgotten but rather should be used to proclaim the natural response children have for learning. Repeatedly, children indicated they liked computers because they were adventurous, exciting, and challenging.
Second, microcomputers provided an opportunity for role reversal. Students participating in the study found that they were more knowledgeable about computers than an a peer, a teacher, a sister, a brother, a babysitter or parents. The student was in the know for a change rather than being instructed by others. Within the classroom context a different type of role reversal took place. Ten percent of the students that were shy and quiet revealed an emerging extroversion in their personalities as they worked with the computer. An additional fifteen percent showed signs of teacher leadership and freely acted as trouble-shooters for their peers when a problem would arise. They also provided one-on-one instruction on new software for students who had been absent. During open house/parent visitation day the students were eager to exhibit their computer skills and knowledge to their parents using computers located in their classroom. All three types of role reversal investigated in this study provided positive self-concept building situations.

Third, microcomputers and electronic communication provided a context where "gift giving" and sharing were natural components. Letters, poems, biographies, reports, stories and graphics were considered "prized" possessions by the students as they carefully removed the printed sheets from the printer. Computer experiences
were viewed as important work, and well worth exchanging with others.

Fourth, electronic communication served as a means to establish and maintain friendships. It provided opportunities for building new friendships, and establishing a context where interests, events and concerns could be shared. For some students, electronic communication supported the opportunity for anonymity and the open discussion of deep concerns and unvoiced feelings. The electronic communication/mail system provided the student writers with a captive audience with whom they could discuss wide range of emotion. The same students possibly felt inhibited sharing such their inner-self with classmates or did not feel others would be willing to "listen" to their problems. For these students the electronic mail friendship became a conduct for emotional outlet.

Fifth, electronic communication experiences opened up opportunities for students to re-enact events at school, and home through a written narrative in word processing later transmitted to a reader for reaction and acknowledgement. The use of narrative in this way assured a free reproduction of the event and became a version of a life story encountered in one media and transformed in electronic media. The potential exists to
be a highly creative process as the writer extracts a "slice" of experience and begins giving it meaningful shape (Rosen, 1986). Graphics, as well as text, created in the school context, were eagerly shared with teachers, classmates and peer pen pals.

The Transitional Process of the Microcomputer Can Initiate in Students' as Their Use of the Microcomputer Changes

Patterns of developmental phases which emerged from the data were identified and discussed in Chapter Four. The following subheadings are synopsized in a brief discussion and interpretation of the study's findings.

1. The Computer As a Novelty: Student background interviews indicated that ninety percent of student's use related to the computer was for game or recreational amusement. In this early phase the computer was used as a novelty or toy. Little consideration had been given as to of how the microcomputer might help the students at their age in their daily endeavors.

2. Guided Instruction on the Computer: The students within the study were given guided instruction on:
   1) keyboard basics; 2) a word processing program; 3) a graphic illustration; 4) a graphic/text Print Shop
program; and, 5) electronic communication via a videotext transmission system. Computer skills and knowledge grew quickly in the students as they recognized how the computer could be used to learn new things and help them.

3. Gaining Control of the Computer: Through multiple uses of the computer each week students gradually progressed and showed of confidence, enthusiasm, and independence. They acquired skills in booting up programs; and recalling, naming, editing, saving, and printing files located on their disks. Conceptual understanding of electronic communication and its transmission procedures was clearer. Most importantly, students acquired attitudes of competence and control when working with computers.

4. Expanded Use and Frequent Sharing of Computer Knowledge and Skills:

In the latter months of the study the students used the microcomputer for a variety of uses: letters, poems, graphics with descriptive text, biographies and stories. The use of the computer was sought by students in the classroom context, during school recess period, at local library and in the home settings. The level of independence that many of the students had acquired enabled a variety of computer experiences to be conducted.
in a number of settings with limited guidance needed. Teachers and parents recognized the students' skills, competence and desire to expand their present range of experiences as they used the computer more and more for self-initiated personal needs and purposes relating to the students' present interests.

Students enthusiastically shared their computer experiences with others through oral discussions, electronic mail, hall displays, hard copies, and file disk transfers. Skills and knowledge were spontaneously used for peer teaching, collaboration, and adult/student role reversals.

5. Using the Computer As a Tool: Throughout the last months of the study the data indicated that computer use by many of the students had progressed from a novelty to a creative useful tool. The students saw the importance and benefit of microcomputer application not only for business, but also for application for their own lives. The use of the computer by students was directed by its purpose and need. Computer games were still enjoyed by students, but their function no longer served as a primary role. The follow-up student interviews revealed that they considered a computer to be a toy only if it is used as one. Instead, students saw the computer as a
helpful tool used for writing, creating, and communicating with others.

Implications for Constructing a Framework for Practice and Future Research

Interpretations made from gathered data seek to provide a valid description and documentation of the target classroom's and peer pen pal classroom's computer experiences which were under study. An automatic transferral of this study to other classrooms would be highly improbable unless several conditions must be present: 1) computers and printers be located within the classroom setting several days per week; 2) computers are approached as an integrated part of the curriculum; 3) initial student training (preferably one-on-one, or small group) for computer basic skills; 4) additional student training for a word processing program, graphics program, coding/decoding graphics program, printing, and electronic transmission; 5) continual student support and guidance; 6) two modems, one located at each school connected to a computer and telephone line; and, 7) interested and supportive teachers and administrators who believe in the value and purpose of electronic communication in the school context.

However, general implications can be drawn from the study to construct a framework to guide classroom
practice, curriculum planning and future directions for additional research. The underlying reasons for this transferrability of implications are: 1) learning, writing and communicating were viewed as a developmental and cognitive growth processes; and 2) the relationships between learning, writing and communicating can be found in most settings although the given characteristics may differ.

A Proposed Framework from which Practices May Be Guided:

The following framework provides a set of potential guidelines for the development of electronic communication in the classroom context within the K-8 curriculum.

1. Language, literacy and learning are approached by children in a purposeful manner as they use the microcomputer as a communicative tool.

2. Children set out to accomplish a task as they to express ideas, interests, concerns and emotions through electronic communication with others.

3. Problem solving is an essential part of growth in children's language, literacy and learning processes. A variety of microcomputer experiences provides children with the challenge of
additional avenues to test their problem solving strategies.

4. Children freely test, explore and experiment with language as they interact in a variety of contexts. The microcomputer located in the classroom setting provides students with a familiar context and a new tool to extend and reframe language representations.

5. New and challenging experiences with electronic communication allow children to build upon prior knowledge and form new meaning and conceptual understandings. For example, computers connected by telephone wires and a modem for videotext transmission may be better understood by children if they are able to use a simple analogy of a bridge. A familiar student image such as a bridge connecting two pieces of land enabling people from island A to transfer goods and materials to island B via the bridge may assist children in their conceptual understanding of computer modems and videotext transmission.

6. The young writer reveals a compelling urge to be understood by others. Knowing that someone will read and respond to his words often gives a purpose to a student's discourse. Electronic communication
between students, their computer teacher and peer
pen pals provided the students with such a purpose.

7. Efforts to communicate to a particular person
through electronic letter writing, provided the
young writer with a particular audience for exchange
of writing.

8. Narrative is a highly creative process with a
potentially liberating force (Rosen, 1986). Electronic letter writing allows students to reenact
in written narrative their version of events encountered, as well as to release emotional
responses to concerns that they are confronting.

9. Communicating to others through writing provides a
way of listening as well as a way of telling (Rosen, 1986). Such experiences as electronic letter
writing enables the writer to learn about himself,
as he seeks to construct his self image.

10. Research supporting the understanding of writing as
a complex process, must also emphasize the
importance of assisting students to learn how to
manage that process by utilizing accessible tools
such as the microcomputer and word processing
programs to lessen the burden (Hull and Bartholomae,
1986).
Implications of the Proposed Framework for Guiding Classroom Practice:

1. Teachers interested in guiding children's language, literacy and learning in to a purposeful context can place primary importance on classroom experiences that are meaningful to students. Computers housed within the classroom context and used as an interactive tool for communicating ideas with others can attempt to build relationships within the children's world.

2. A classroom context which views problem solving as an essential part in children's language, literacy and learning process must also create an atmosphere where risk-taking by students is supported and not reprimanded. In such an environment, writing is used to communicate meaning and deemphasis is placed on form and standard conventions during first drafts of the text.

3. Teachers who furnish models of concepts and various ways to relate to others (both in oral and written language) enable children to expand their use of language. This expansion occurs as children test, explore, hypothesize and construct their own understandings of the language system. They learn how to create their own power of meaning through language use. Electronic letter writing can provide
children a non-threatening arena in which they can test and explore the language system. Teachers can also exhibit to their students a mature modeling behavior of a person who uses the computer for functional use. Teachers creating school related writing such as classroom newsletters on a word processing program would allow students to view the teacher at the keyboard creating text. The teacher’s ease of locating keys and dexterity of hand movements would be readily observed by the students. Revising and editing of the text would naturally occur, providing the students an opportunity to witness their teacher’s writing behavior and process.

4. New and challenging experiences in the classroom context enable children to stretch their understandings and look for relationships and differences from knowledge and new encounters. Teachers can encourage their students to compare, contrast, predict and reframe prior knowledge into new and deeper understandings which often broaden the student’s original conceptual base. Electronic communication provides an intellectual challenge and opens new windows to students for viewing and thinking of their world. A computer videotext
networked system can create a bridge from the classroom context to services, resources and individuals in the outside world.

5. An openness to students sharing ideas and collaborating with one another should be encouraged. Young writers who want to be heard and understood by others need to feel secure, and open to an exchange of ideas and suggestions from fellow peers and their teacher. The tone established within the classroom can provide a supportive framework for growth as children seek to reach out and communicate with others within their world. Electronic communication can become a natural component for extending this process as students extend beyond their own classroom to relate with others.

6. Language can be tailored to its audience in electronic communication. A teacher students a variety of audiences for whom to write, can expand students' awareness and understanding of changes in register as language is varied to the appropriateness of the context. Electronic communication created by a student to a pen pal, a computer teacher, a science specialist and a state chamber of commerce would each call for register of language determined by the circumstances of each
discussion. The culture and context in which a message is conveyed determines the register of language that is appropriate. Differences between oral and written language become clearer to students as their experiences in each medium grows and expands.

7. Narrative in both oral and written forms allows students to think through events or stories, and encourage rehearsal by projecting into the future. Electronic letter writing furnishes an acceptable ingredient within the existing curriculum for students to reconstruct events in writing as they seek to share them with others.

8. Electronic letter writing or journal writing which exists as a purpose for communicating meanings can enable the young writer to see his thoughts on paper. Collaboration, open discussion, and self reflection of writing can assist children in developing an identity as a competent learner.

9. Time for computer use within the classroom setting needs to be flexible. Students who are becoming competent computer users need periods of time each school day where they are allowed to use the computer whenever it is appropriate. Flexibility in time and freedom of movement would allow students to
approach and use the computer much like they presently are free to use the pencil sharpener: when the situation deems it necessary to do so. A classroom setting shaped in this manner would create a supportive environment for students to experience computers as a useful tool.

10. Recent research (Flower and Hayes, 1984; Daiute, 1985; Graves, 1985) showing the complexity of the writing process for both the experienced as well as novice writer can only emphasize the importance of the classroom teacher’s role in assisting students in the development of their own writing. Word processing offers children the same benefits that appeal so strongly to adults: 1) ease in revision; 2) simple storage; 3) easy retrieval; and 4) a high quality hard copy in final form. Realizing that writing is a highly complex process, teachers can guide students into word processing programs at an early age, allowing them to use more sophisticated functions of the program as the need or purpose of writing requires. Skills and knowledge that the students gain from the word processing experience can well serve the students in their future.
Implications of the Proposed Framework for Future Research:

1. Exploring the use of electronic communication into classroom settings which support a holistic approach to the writing process is needed. Such an approach focuses strongly on process. The computer writer is encouraged to transfer thoughts to text, followed by a number of revisions which may extend, clarify and refine the text while keeping the communication of meaning clear. Research conducted in this context could explore a wide range of possibilities rather than being fixed into a pre-test and post-test study.

2. This proposed framework is applicable in other classroom contexts where frequent access to microcomputers may be available. Many small-scale studies are needed to help determine the benefits, issues and potential problems encountered as teachers seek to integrate microcomputer use into the existing curriculum. Integration of computer utilization in the classroom will be accelerated by extensive field research.

3. Electronic communication experiences should continue to be explored and documented at a range of grade levels across cultures and socioeconomic variables. Investigations of this nature could provide
information on the purposes for which the microcomputer, word processing, graphics and videotext transmission system serves for each group. Themes identified could be considered as potential directions for expanding present programs within the practicing field. Identified uses should also be addressed in teacher education programs, at both the pre-service and in-service levels.

4. Identified computer uses should also be addressed in pre-service teacher education programs and teacher training. The teacher education component of the WACA project contributes a desirable model and direction for future education programs.

5. An in-depth longitudinal study of the purposes electronic communication serves elementary children over a period of time needs to be conducted. Such a study would provide a great deal of information about developmental phases of learning, using and perceiving the microcomputer and electronic communication as tools for use. Student skills and expanded uses of the microcomputer carefully followed and recorded would provide data of developmental peaks and plateaus of student's growth.
6. The classroom contexts were very important elements within the research study. Classroom environments structured differently from the one in the study could yield additional information and understanding. Classroom environments with an intensified focus on given areas, such as science could expose microcomputer and electronic communication emerging for purposes pertinent to that given context.

7. The role and influence of the classroom teacher upon the in-class microcomputer and electronic communication use must also be further studied. Information gained from such studies could be helpful to assist teachers in re-thinking their roles, values, attitudes, perceptions, classroom plans, time schedules and priorities.

Writer’s Thoughts

The study is innovative in a new area of academic interest and seeks to promote a futuristic commitment to the field. Evidence from the study helps build a framework from which classroom practices and future research may be guided. Consistent evidence throughout the study indicated a recurring pattern showing students eventually perceived and used the computer as a writing
and communication tool. Although the computer may be considered a relatively new tool for elementary students' writing, it serves the same purposes as common writing tools of paper and pencil, to a competent user. From this perspective a framework was constructed, and implications for practice and future research were shaped.

A critique of the study by an outside evaluator indicated the value and need for research that documents the emergence of creative and purposeful student use of computers in the school setting. Dr. Stephen Marcus, Assistant Director, South Coast Writing Project, University of California had read the original project proposal for Writing Across the Content Areas with Computers (WACA) in 1984. This research study is an offspring of the WACA project and serves to document only one portion of the many faceted components of the full project. Marcus has followed the project and served as a discussant and critiquer at the American Educational Research Association Annual Meeting Symposium held in San Francisco, April 1986. The researcher presented a condensed report of the research study described in this document at the symposium. First, Marcus emphasized the complexity of the WACA project and its broad base with multiple events occurring at the same time. Second, he
commented upon the personal communication of electronic mail and postulated its creative writing potential for students. Third, Marcus addressed the research method which allowed data to be gathered in the natural classroom setting, and the analysis which looked at the whole, and sought the emergence of recurring themes. Fourth, he recognized positive benefits from encouraging students to combine graphics and text as a medium of self-expression and communication to others. Finally, Marcus affirmed the potential learning experiences of problem-solving and trouble-shooting that naturally evolve in microcomputer environments. He emphasized the need for problem-solving situations to be capitalized upon by teachers by involving students in developing their thinking skills. His critique highlighted the researcher’s study and the WACA project as beneficial ways to investigate and document computer and electronic communication experiences in the classroom setting.

The researcher has reflected on her own growth in the research field and as an educator. A very strong component of the WACA project was the preparation of classroom teachers and student teachers. The researcher was trained by the project’s co-directors and later assisted in training sessions for both classroom and student teachers. The project encouraged the development
of communication skills in students based on microcomputer experiences in the classrooms. These experiences were implemented by trained teachers prepared to take on the challenge. A support group created by a cluster of trained WACA educators served as a catalyst in the project. Over a period of twenty months the researcher gained competence as a computer user. She was willing to take risks and collaborate with others to solve problems. She saw the influence, impact and transition of the microcomputer in her life as her skills developed. First, she was able to observe an increase of text manipulation, revision and editing skills in her own writing. If a computer and word processing program was not available for writing, the researcher found sections of her hand written drafts cut and pasted with inserts and revised passages. Essentially, the researcher was experiencing a carry-over from the microcomputer's ease to manipulate text to pencil and paper tasks. Second, the researcher was originally an "Apple only" user, but learned to relax and see the commonalities among different computers. Finally, as the researcher's skills and needs increased so did potential uses for the computer. The researcher asserts that the microcomputer can provide ethnographic researchers with access to research data base files that can be easily retrieved and
drawn from as needed. This would be especially helpful in ethnographic research which usually constitutes lengthy descriptions of environments and life within the given setting. A hard disc drive provided this researcher with a flexibility similar to a data base file, which proved to save time and provide convenience when compiling her dissertation document.

Both the formal research review and the personal reflection of the research study provided the researcher with reinforcement that the efforts applied to this study resulted in a meaningful contribution to the field, the classroom practitioner and to teacher educators. But the researcher had other sources of feedback before the symposium and self-reflection. The continual enthusiasm displayed by the students yielded both motivation and reward to the researcher.
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APPENDIX A

BACKGROUND SURVEY INTERVIEW GUIDE
BACKGROUND SURVEY INTERVIEW

DATE: _______________________
NAME: _________________________ AGE: ________

SAMPLE QUESTIONS

1. When and where do you use a microcomputer?

   a. Do you have a microcomputer that you can use outside of school?

2. For what reasons do you use the microcomputer?

   a. If responses word processing—

      1. Who did you write to or for?

      2. Was it helpful in any way to use a word processor for this
         (these) tasks?

         If so, how?

3. Presently, has the word processor helped you learn to write?

   a. If so, how?

4. Using word processing on a microcomputer is . . . . . .

   a. What makes it _______ for (student's name) ?
APPENDIX B
THE PILOT STUDY
Sample Pilot Case Study Summary Report

My observations of K, a second grader at T, were limited to his time spent in the tutor room with Miss McC. However, this time I spent in the tutor room allowed me to learn several things about K concerning his reading and writing skills and how these skills were approached and handled by Miss McC. Each day, K is usually involved in both a reading and writing task in the tutor room. K is very enthusiastic about reading. He really loves to have books read to him. I noticed that as time went on, K and Miss McC started sharing the reading duties. Miss McC would start out reading and when she got to a certain word, she would stop, point to a word, and K would then say that word. After doing this several times, K would begin to read an entire page and Miss McC would read a page. K I feel, is an excellent reader and he is very fluent. When he comes to a word he does not know, he does not just stop, but he tries to sound it out.

K's enthusiasm for writing is not the same as it is for reading. Furthermore, K's enthusiasm differs between writing with pencil and paper and with using the computer as a writing tool. To begin with, K's enthusiasm for writing in the tutor room (pencil and paper) is practically non-existent. Miss McC usually has to write a story along side of K to get him started with writing. At the idea of having to write a story or anything else, K rolls his eyes or makes a face. He then procrastinates by dropping his pencil several times on the floor or will start talking about something. Once he gets started, he often hesitates to write down ideas. He also becomes a little frustrated at having to erase his mistakes. While doing the writing tasks for me, K has demonstrated some of these behaviors. The thing that seemed to
bother and discourage K most was having to erase his paper.

K performance in writing with the computer is quite different than his writing with pencil and paper. First of all, K enthusiasm for writing with the computer is overwhelming, especially when you compare it with his enthusiasm for writing with pencil and paper. K is always excited when I tell him we are going to use the computer. He still has a difficult time generating ideas, but he does not try to avoid doing the writing. The first time K used the computer, he was a bit frustrated about locating the keys. But the times after that, he seemed quite fast at locating the keys, which cut down the frustration.

K preferences in writing tools is, obviously, the computer. When he makes a mistake or wants to change something, he can just delete what he wrote instead of having to erase his paper with a pencil. K also likes the fact that he can have a print out of what he wrote. Every time he uses the computer, he can't wait for me to print out his work. The computer seems to motivate K to write, whereas pencil and paper does not provide motivation for K. This motivation is also related to how K feels about his writing. Whenever he has to write using paper and pencil, he feels he is doing it for the teacher. However, when K gets the opportunity to write using the computer, he feels he is writing for himself because he always gets to keep the print out copy.

K writing is basically in story form. K usually has a difficult time coming up with ideas of what to write. Both Miss McC and myself provide K with some beginning sentence to introduce a subject matter for his story. K strategy is somewhat simple by using mainly examples. The use of the computer allows K to write more freely, while pencil and paper cause K to be somewhat frustrated with his writing. However, the quantity and length of both the computer writing and the pencil and paper writing are fairly equal. Even though the length of both types of writing are equal, K puts more thought into his computer writing and tends to be more concerned with what he is saying.
Pilot Study

BACKGROUND EXPERIENCE SURVEY

1. NAME
   AGE
   GRADE LEVEL

2. Previous writing experience

3. Previous computer experience

4. Previous keyboard (typing) experience
   a) typing skills: underline one---above average, average, below average, strictly hunt and peck, non-existent

5. Would you like to learn more about using a computer and word processing program?
   Why?
   Is there a special area of word processing you desire help and or addition information?
   How might word processing skills and text-editing experience be helpful to you?

USING THE WORD PROCESSOR

1. For what purpose did you use the word processor?

2. Who was the intended audience for your written work?

3. Were there any advantages to using a word processor for this (these) tasks?
   List and or describe advantages:

4. Does the word processor affect your writing process?
   How?

SAMPLE QUESTIONS FOR WRITING CONFERENCE WITH CASE STUDY STUDENTS

1. Do you remember when you did this?
2. How did you do this?
3. Is this good writing?
4. What makes it good writing?
5. Who did you do this writing for?
6. For what purpose did this writing function?
7. Which of these papers you’ve done is the best? Why?
APPENDIX C

LETTERS TO PARENTS
CONSENT FOR PARTICIPATION IN SOCIAL AND BEHAVIORAL RESEARCH

I consent to participating in (or my child's participation in) research entitled: MICROCOMPUTER WORD PROCESSING AND GRAPHICS IN ELECTRONIC COMMUNICATION EXPERIENCES OF THIRD AND FOURTH GRADE STUDENTS. Dr. Marlin Languis (principal investigator) or Gretta Kumpf (an authorized representative) has explained the purpose of the study, the procedures to be followed, and the expected duration of my (my child's) participation. Possible benefits of the study have been described as have alternative procedures, if such procedures are applicable and available.

I acknowledge that I have had the opportunity to obtain additional information regarding the study and that any questions I have raised have been answered to my full satisfaction. Further, I understand I am (my child is) free to withdraw consent at any time and to discontinue participation in the study without prejudice to me (my child). I, as parent or guardian of the child, give permission for the release of school records to provide the researcher with student background information. The information obtained from me (my child) will remain confidential and at no time will my (my child’s) name be used in the study.

Finally, I acknowledge that I have read and fully understand the consent form. I sign it free and voluntarily. A copy has been given to me.

Date: _______________ Signed: _______________

Signed: _______________ Signed: _______________
(Principal Investigator) (Person Authorized to Consent For Participant: Parent/Guardian)

Signed: _______________
(Authorized Representative)

Witness: ____________

HS-027 (Rev. 12-81)—To be used only in connection with social and behavioral research.

Modified (1-85)
Written Summary of What is to be Said to the Subject:

My name is Gretta Kumpf and I am a student at Ohio State University. Much like you, I too have special projects and assignments to do for school. For a special project that I'm working on right now I would like to visit your classroom and watch students each week for several hours as they do their school work. I would really enjoy watching the students write and use the Apple IIe microcomputer that is in your classroom. Every other month I will sit down for approximately 30 minutes and talk with each student about his/her writing and word processing experiences on the Apple IIe. Do you have any questions about my project?

On a voluntary basis would you like to participate in the study? Or in other words, would you like to volunteer as one of the three students that I will watch in your classroom and talk with every month about your classroom work and computer writing experiences? It is important that you understand if you want to stop at any time being part of my project that you just tell me, your parents or your teacher. I will not be upset with you in any way if you decide that you do not want to be in the study. The decision is your free choice.

If you decide that you want to volunteer, I will be talking with your parents to make sure that it is also alright with them. Your parents will need to sign a consent or permission form. I would also want to fully explain my research project to them and answer any questions that they might have. Do you have any questions right now that I could answer for you?
Dear Parents,

Presently a unique situation exists where The Ohio State University and your School District are working in a joint research project grant from Apple Education Foundation and CompuServe, a national information videotext utility. We would like to invite you to have your child participate in a research project jointly planned and conducted by Dr. David Heigle, with administration and staff; and Dr. Marlin Languis, OSU Professor; and, university students (Gretta Kumpf, WACA University Students-Writing Across the Content Areas With Computers). The purpose is to actively involve elementary students using the microcomputer and CompuServe for writing, learning and communicating with others.

There will be an Apple microcomputer available in the school for your child to use on a regular basis. During that time your child will have opportunities to try out ideas, word process, create graphic designs and use electronic communication. On occasion, we will be taking photographs, videotapes and audiotapes of the students actively participating in these activities. We will also talk with the children to become aware of their ideas and feelings about learning with a microcomputer. None of these activities will be used to evaluate the child's regular school performance in any way nor will any data be placed in the child's permanent school records. This project endeavors to document the nature of children using microcomputers and electronic communication capabilities.

If you prefer that your child not participate in this activity please contact the school by Monday morning, January 21, 1985. Either you or your child have the right to withdraw from the project at any time. If you have any questions please contact any of the following persons:

Dr. A______ Y_______, Principal 333-1234
Dr. David Heigle, ______ Schools 333-1234
Dr. Marlin Languis, D.S.U. 422-1257
Ms. Gretta Kumpf, D.S.U. 422-1257
March 15, 1985

Dear Parents,

On Monday, March 18th, Dr. David Heigle, Microcomputer Specialist, and O.S.U. students will be video taping students from our classroom to document the nature of children using microcomputers.

If you prefer that your child not participate in this activity please contact the school by Monday morning.

Sincerely,

Mrs. B
APPENDIX D

SAMPLE OF CLASSROOM NOTES TAKEN BY THE RESEARCHER
Feb 28, 1985

Contact: W. Elm дл

Schedule written on the chalkboard:

1. Opening
2. Writing
3. Work time
   1. Spelling sentences
   2. Math
   3. Reading
4. Reading
5. Food
6. Reading
7. Math

Opening - pledge
   reding time
   introduction to math

9:20 Prepare computers in the classroom
9:25 Students begin working with computers
I. Finished Monday's letter.
Mr. X. Account in hopes of Apple White.
Mr. X. Q. Now, what do you do?
I. A freeuw
I. proceeded to remove A's check and insert his check to lend the letter to Mr. X. that was not yet completed.
11. I when looking up how quickly
responded: "Drop in, "

7. appear very unsure of what to do
asked toward his friend. He asked for
guidance.

I look in peace for levy moments
so he thinks about his next venture.

9:55 He finishes his letter and
writes it on his desk at the classroom.

11:06. Still has met to finish
and ask to stay in order to
finish.

D. He takes a place at the
computer.

10:00 He finishes reading letter from
X. Looks at photos referred to in letter.

10:10 He goes to children (other classmates
outside) a sunny clear day.
    Still cold temp. 36°.
2/8

7: Continue working with WP w/little distraction from children who are taking off their coats from recess.

7: I want to get a question mark up there (she writes it & leaves alone now)

Me & assist her with now key.

7:Ralston & inserted 2 lines & begins signing her letter.  Your friend.

10:37 Quit copies.

10:40 Plotted. Messed 2 letters

1) MK

2) PP

10:49 Plotted, fed the letter

1) MK

10:52 Plotted. Letter to letter

1) MK

10:55 Letter began with computer.

He read his letter from MK & looked at photos.

11:00 Letter begins WP

Fed the letter with computer.

He read his letter from MK

Paused for a minute, & said —
11:14 'Well, you have a lot to tell me!'

11:16 

11:18 She seems to think a great deal to say,

11:20 Finished next time

11:30 Lunch

[Late] "How do you spell gymnastics?"

[Late] "How do you spellChina?"

11:40 Looked at Peter's screen and

(every time) [which needed a pause]

He begins to print the rest of Peter's

Meeting called for.

[Note] 'regress in doing more

Meeting time at work on

the computer'
March 11th, 1985

9:30 Ente bld. 3rd floor classroom
9:30 Packed computers into room.
9:35 Began explaining Kaha Pad to C.
9:45 Bed to Apple. Write for C.
10:00 Free from reading group
10:15 Sent reading letter from C. A.
10:30 C. returned Kaha Pad.

10:15 Complete Kaha Pad
10:30 Finish letter: "C. seja"
10:30 Records back in folder

10:45 RECESS INSIDE

10:40 Mrs. X. calls Kaha Pad Computer lab.
10:45 A. calls Kaha Pad Computer lab
10:45 A. calls in A.U.
10:45 A. go to the lab w/ Kaha Pad
10:45 A. goes to the map & pulls it down in front of the classroom to check
something that she wants to include in her letter. (Map? & location)
10:50 3 1/2 in the lab (Kaha pad)
11:00 Still experimenting. Very excited about what we're doing. Thinking
writing some more.
11:05  Saw Andy picture on date
11:30  Called 2 Computer back to lab
       (1 broken w/ large pad)
11:35  Situated computer w/ parts in
       new room.
April 22, 1985 Monday

Dallie on first chalkboard.

1. Grammar
2. Spelling (pre-test)
3. Handwriting
   1. ABC order
   2. Language
   3. P. T. or P. T. - Who did it?
4. Math

5. Reading

6. Reading

7. Note: Fear ended car accident on way to the school.
   Shocked up a little headache, tummy felt nervous.

8. Rate, chalkboard behind reading table

9. Reading story
10. Mystery Treasure
    Skill pp. 113-114
    115
11. Ten Frames found
    Read pp. 30-33

12. Carefoot School

13. Fielding activity

14. Fielding free time

15. 9:00 Began letter to Dad.

16. Worked on Y. Folse letter

17. Began work on Y. Folse letter.
9:57 253
some of print 7 false letters
10:00 253
continue to work on the computer
10:13 253
continue to work on the computer
10:15 253
finish complete letters, print letters, and
good letters
10:43 253
read letter in file (1)
10:45 253
work on false 2 letter
11:10 253
work on false 2 letter
status of letters: worked on & completed today:
letter to false + print 7 false, added
letter to false + read, printed
letter to false + read, printed
APPENDIX E

CASE STUDY 1: SAMPLES OF DEAN'S WORK
YOU ARE IN YOUR CABIN AND YOU HEAR A KNOCK AT THE DOOR. YOU WENT TO LOOK BUT NO ONE WAS THERE, BUT THERE WAS A MAP IN THE MAIL BOX. IT SAID, 'TO FIND THE MAGIC AX GO TO THE RED ROCK.' THAT IS ALL IT SAID.

The choices are:

HUNT THE MAGIC AX: PAGE 2.
STAY IN YOUR CABIN: PAGE 3.
BURN THE MAP: PAGE 4.
YOU Go To The oNly REd RokK youK noW oF. you see a funny paTern oN the REd RokK (boTTom oF PaGe). you are gettinG tIreD so you LeaN agaINSt thE Rock. reallY it iS a secret enTrance to a cave. you stumble and fall down thE Endless tunnel. Bam! you hit thE moist rocky eArth. your jouRney beGins here.

The ChOiceS are:

Take thE Tunnel to your RigHt: page 5.
Take thE Tunnel to your LeFt: page 6.
A THANK YOU NOTE

June 21, 1985

Dear [Name],

Thank you for the "Happ Summer" card that you made for me on the computer. It really brightened my day!

I hope that you are enjoying your experience working with the Apple IIe microcomputer in our home. I only wish we could have installed the modem so that you would have also had the opportunity to work more with a dedicated network system and the ability to transmit and receive electronic mail. However, I could tell on the day I delivered the computer that you were going to make the most of the equipment that you do have access to use. I'll be looking forward to seeing what you create and explore on the days that I'm not with you.

Happ computer ng!

Love,
Mrs. Jumpil

DEAR MRS. K.,

TODAY I WENT TO THE SWIMMING POOL,
 I RODE MY BIKE,
 AND I PLAYED OUTSIDE.
 I ALSO WORKED ON THE COMPUTER.

Dear,

DEAR MRS. K.,

6/27-85

TODAY I USED PRINT SHOP AND MADE 2 CARDS AND 3 LETTER HEADS.
ALSO BRIAN AND I MADE A GET WELL CARD FOR JON (HE BROKE HIS LEG).
WE ALSO MADE A CARD FOR JASON (ITS HIS BIRTHDAY).
DEAR AUNT GEORGIE

MY COMPUTER TEACHER LENDED ME AN APPLE COMPUTER WITH A KOALA PAD, A PRINTER, TWO DISK DRIVES AND COMPUSERVE! I MADE THE PAPER THAT I WROTE THIS LETTER ON WITH PRINT SHOP. HOW ARE YOU DOING? I WOULD LIKE TO HEAR FROM YOU.

LOVE,

LEAN
HI
HAPPY
HEROIC
HIM
ME
HONEST
Student Generated Card Given To The Researcher

* Note how the student illustrates the computers being linked together by a telephone wire.

See you next year!

Bye Mrs. Kumpf

Have a Happy SUMMER!
I hope you have a "Great" summer!
I'll write to you on the computer!

Do this maze and find Freddy the Computer!

FROM: Dean
APPENDIX F

CASE STUDY 2: SAMPLES OF LISL'S WORK
Bogey and The big hill

One very cold day, a whisling deep, cold, crisp, snow came to the town Mugamuga. I think you could guess it's on planet Pluto. Well it was very cold so the tockees, who are the marshans, put on snow pants, and sweaters and stuff like that. Everyone except Bogey. He was a differit tockee on planet Pluto. He puts on his swim-suit in winter and he put on his snow pants in summer. Boy, he was nicked up. Yesterday he route umenia, but He did not mind. Today it was so below zero. Well, he still went swimming. The lake was frozen with ice. It was a thick sparkling blue ice. Well, Bogey still tried to dive in. Bogey was retty. His hands were in a triangle above his p ump head. He was almost touching the end of his antenas. He took a big breath, and then he conted to three, one, two, three... BOOM! He dived on.
to the thick, sparkling blue ice. Wa- 
Wa-Wa, Bogey cryed with a small 
voice. The lovely snow blow across 
Bogey's face. Then he saw a old cabin. 
It was duzered, He looket both ways very 
quickly. Then he Tip-toed up to the 
cabin, the door creaked open. It was 
a dark, shadowy, grey cabin. Well when 
Bogey bumped his plump little head on 
the ice, so it even got plumper, he 
stated to get disy and disyer and thump. 
Bogey fainted right next to a big brunt 
chair in the cabin, then the wind 
blowed faster, and the snow came down 
faster, till the sky and the land 
was foll of just white. A very 
thike blanket of snow was on 
the ground. It was 11 feet high. 
Once Bogey wake up, he was getting 
cold. He fond a red, soft, furry blanket 
on a old chair with a hole on 
the boxen. He took the blanket 
off and put it around his shoulders. 
Outside in front of the tocar 
buding was a big meshegan that 
plowed snow. It had a big long tub.
that sticks out of the front and then there's a big fat red retangle in the middle. The big fat red retangle has a yellow little button which is shaped like a circle. It has 3 big tires. It has a lever seat. The seat on the left hand side, when someone puts their hand on the lever, it goes 'ch-ch-ch-ch-ch-ch'. Bogey kept saying 'ch-ch-ch-ch-ch-ch'. Then Bogey heard a ch-ch-ch-ch-ch-ch. Bogey turned the wheel. It's horn is next to the wheel. It has a yellow little button which is shaped like a circle. The horn is shaped like a circle. It has a yellow little button which sticks out of the top. Bogey looked over to the right hand side. The snow was only to his neck. He opened the door and ran home. He asked his mother if he could go home, or if she wished that he stay in the cabin. Every time Bogey looks at his mother, she says, 'Bogey looks at his mother'. Also they ask his mother if they should go to the store.
mother if Bogey is hers. She always said, Oh, you've got mine. Well the next day was a school day. So Bogey got ready for school. At school Bogey got a prize. It was for being the worst tokee. On the way home from school Bogey and his best friend, who thought Bogey was neat but wild, went to the cabin. When they got there they decided to turn the old cabin into a club house. There was a big big hill in front of the cabin. So they decided to go sliding and then tomorrow we will go sliding. Boy Bogey that's a steep hill, said Makeroany, Bogey's best friend. They walked home and got their slides. Then on the way back they started to slide down the hill. It really was a steep hill, and they really went speeding down that hill. Most of the tokees saw Makeroany and Bogey so they ran over to see if they could go sliding too. Bogey and Makeroany stepped into the old cabin. They started to talk in over Bogey, mabye we can
5.

have a club, a sliding club, said Makeroany. Ok, and if these in the club they only half to pay 50¢, said Bogey. Also if there hot, neber they have to pay $1.50, said Makeroany. Also Bogey do you ever get cold, said Makeroany. Yes, how did you know, said Bogey. Well Bogey umm, um. Well you're aposto ware snow paints and stuff like that in witer and in summer you're aposto ware swim-suits and stuff like that, said Makeroany and also mabby more tockees would come to the club if yo dress right. Ok I'll be back, said Bogey. Bogey ran home and put on a brown and red sweeter, some snow paints, 2 pairs of socks, black boots, a blue hat and yellow mittens. Bogey ran back to the cabin. Most tockees stooded the old cabin. All of the tockees turn around and lookeet at Bogey. They all cheered, Hip Hip Hero-o. After 40 tockees came to the sled. They clouseed the sliding hill. Bogey was the leater and Makeroany was the co. leater.
They both decided to make a esklaeter so once someone was at the end of the hill they just had to walk over to the left and walk on it and it will take them to the top. Senys they only have $40.00 they had to make one. They took a paper toule roll, well one of those things when you are done with the paper towel's you have left cardboard that is roll up, well they put that on the top of the hill in front of some stairs that they made out of wood. Then they both took a large red blaket. They sowed each end of the blaket together. Also they coneted the red blaket to the paper toule roll. Then they put half of the blaket under the stairs and half of the blaket over the stairs so it was a loop around it. Then Marcy only took his old moater from his mother's car because she was going to get a new moater tomaro anyways. So they put
the old moater next to the esklater. Then they got a couple of wires and ataght that to the moater. then they ataght the wires to a no and off button and then they ataght that to the papper towle roll, so when they push on it makes the papper towle roll spin so it makes the blanket spin so it carries up tockeees. Well how almost every tockee comes to the big hill now. Boy, now even almost every tockee was coming to the big hill. Ensted of calling it the big hill they made up a name for it. It was called EEPBL, witch meams electric eskater. Boy, they really got tockees, they would make more then 420000 a day. Well, now by a month they were millions. Well, also everyone wanted to be Bogey's friend and he tride to to be a good one.

THE END
One very cold day, a whistling deep, cold, crystal, snow came to the town Mugamuga. It's on the planet Pluto. Well it was very cold so the tockees, who are the martians, put on snowpants and sweaters, everyone except Bogey. He was a different tockee on planet Pluto. Bogey puts on his swimsuit in the winter and in the summer he wears his snowpants. Boy, he was mixed up. Yesterday he caught pneumonia, but he did not mind. Today it was 80 below zero. Well, he still went swimming. The lake was frozen with ice. It was a thick, sparkling, blue ice. Well, Bogey still tried to dive in. Bogey was ready! His hands were in a triangle above his plump head. He was almost touching the end of his antennas. He took a big breath, and then he counted to three. One, two, three. BOOM! He dove onto the thick, sparkling blue ice. "Wa-Wa-Wa," Bogey cried with a small voice. The lovely snow blew across Bogey's face. Then he saw an old cabin. It was deserted. He looked both ways very suspiciously. Then he tiptoed up to the cabin. The door creaked open. It was a dark, shadowy gloomy cabin. Well, when Bogey bumped his plump little head on the ice, so it got even plumper, he started to get dizzy and dizzier. Thump, Bogey fainted right next to a big brown chair in the cabin. Then the wind blew faster and the snow came down faster, until the sky and the land was full of just white. A very thick blanket of snow was on the ground. It was 11 feet high! When Bogey woke up, he was getting cold. He found a red, soft, furry blanket on an old chair with a hole on the bottom. He took the blanket off and put it around his shoulders. Outside in front of the tocam building was a big machine that plowed snow. It had a big long tube that stuck out of the front and a big fat red rectangle in the middle. The big fat red rectangle had a yellow little button which was shaped like a circle. The machine had 3 big tires, a lever seat with a long stick with a circle on top of it. That was the steering wheel. It's horn was next to the seat on the left hand side. When someone honks it go's din, diny. Well, it started to dig most of the snow up. Then Bogey heard a ch-ch-ch-ch-ch-ch-ch. Bogey bounced up and ran to the window in a leap. The snow was only 6 inches high now. Bogey looked over to the right and saw the machine. "Wow, what a machine," said Bogey. He opened the door and ran home. When Bogey got home his mother was not worried, or something like that. Matter of fact she wished Bogey was still in the cabin. Every
time Bogey and his mother go to the store everyone looks at Bogey. Also they ask his mother if Bogey is her's. She always says, "Oh, no not mine." Well, the next day was a school day, so Bogey got ready for school. At school Bogey got a prize. It was for being the weirdest tockee. On the way home from school Bogey and his best friend, who thought Bogey was neat not weird, went to the cabin. When they got there they decided to turn the old cabin into a club house. There was a big, big hill in front of the cabin. So they decided to go sliding and then tomorrow they planned to go skiing. "Boy, Bogey that's a steep hill," said Macaroni, Bogey's best friend! They walked home and got their sleds. Then on the way back they really, really went speeding down that hill! Most of the tockees saw Macaroni and Bogey so they ran over to see if they could go sliding too. Bogey and Macaroni stepped into the old cabin. They started to talk it ovr. Bogey, Maybe we can have a club, a sliding club, said Macaroni. OK, and if they're in the club they only have to pay 50 cents, said Bogey. Also if they're not a member, they have to pay $1.50, said Macaroni. Also Bogey do you ever get cold, said Macaroni. Yes, how did you know, said Bogey. Well Bogey ummm, well your supposed to wear snow pants and stuff like that in winter and in summer you're supposed to wear swim suits and stuff like that, said Macaroni and also maybe more tockees would come to the club if you dress right. OK, I'll be back, said Bogey. Bogey ran home and put on a brown and red sweater, some snow pants, 2 pairs of socks, black boots, a blue hat and yellow mittens. Bogey ran back to the cabin. All tockees surrounded the old cabin. All of the tockies turned around and looked at Bogey. They all cheered, Hip, hip, Hooray. After 40 tockees came to sled, they closed the sledding hill. Bogey was the leader and Macaroni was the co-leader. They both decided to make an escalator so once someone was at the end of the hill they just had to walk over to the left and walk on it ant it will take them to the top. Since they only have $40.00 they had to make one. They took a paper towel roll, well one of those things when you are done with the paper towels you have left cardboard that is rolled up, well they put that on the top of the hill in front of some stairs that they made out of wood. Then they both took a large, large red blanket. They sewed each end of the blanket. They sewed each end of the blanket together. Also they connected the red blanket to the paper towel roll. Then they put half of the blanket under the stairs and half of the blanket over the stairs so it was hooked around it. Then Macaroni took his old motor from his mother's car because she was going to get
a new motor tomorrow anyway. So they put the motor next to the escalator. Then they got a couple of wires and attached to the motor. Then they attached the wires to a on and off button and then they attached that to the paper towel roll, so when they pushed it on it makes the paper towel roll spin so it makes the blanket spin so it carries up tockees. Well now almost every tockee comes to the big hill. Boy, now even almost every tockee was coming to the big hill. Instead of calling it the big hill they made up a name for it. It was called E.E.P.B.R, which means electric escalator push button ride. Boy they really got famous and would make more than $200.00 a day. Well, now by a month they were millionairs. Well, also everyone wanted to be Bogey's friend and he tried to be a good one.

THE END
Graphics Greeting Card

YOU'RE THE BEST
I EVER HAD!!!

I
YOU
THANKS
GRANDPA
FOR EVERYTHING YOU DID,
FROM ABC TO XYZ,
THANKS AGAIN!
SMILE,

IT MAKES THE WHOLE WORLD BRIGHTER!!!
APPENDIX G

CASE STUDY 3: SAMPLES OF JOE'S WORK
Joe's Mazes: Created With The Graphic Illustration Pad
YOU ARE FLYING IN YOUR PLANE WHEN YOU HEAR YOUR FUEL BEEPER BEEPING. YOU FORGOT YOUR FUEL GAUGE WAS LOW. THEN YOU SEE SOME ALIEN SHIPS!

The choices are:

ATTACK: PAGE 2.
SLOW TO THE NEAREST PLANET: PAGE 3.
YOU FIRE YOUR LASERS BUT THEY DO
NOTHING. YOU TRY EVERYTHING BUT AT LAST
YOU GO DOWN IN FLAMES.

THE END

Roll one die. If your roll is

1 - 5: go to PAGE 1.
6: go to PAGE 1.
YOU DECIDE TO GLIDE TO THE NEAREST
PLANET. AFTER YOUR SCANNER DETECTS A
PLANET, YOU REMEMBER ABOUT THE ALIENS!
YOU DECIDE THAT YOU BETTER GO DOWN
QUICKLY BECAUSE THEY ARE BEGINNING TO
SHOOT! THEY JUST MISS YOU AS YOU GLIDE
DOWN TO THE PLANET.

The choices are:

TAKE A LAST SHOT AT THE ALIEN: PAGE 4.
KEEP ON GLIDING: PAGE 5.
YOU FIRE YOUR LASERS AGAIN. YOU KEEP ON FIRING, THEN THEY SHOOT YOU AND YOU LOSE CONTROL AND CRASH ON THE PLANET.

THE END

Roll one die. If your roll is

1 - 3: go to PAGE 1.
4 - 6: go to PAGE 1.
YOU KEEP ON GLIDING AND MAKE A GOOD
LANDING ON THE PLANET.

The choices are:

EXPLORE PAGE 6.
TRY TO CONTACT EARTH: PAGE 7.
YOU START EXPLORING. IN THE DISTANCE YOU SEE A OBJECT COMING CLOSER TO YOU.

Go to PAGE 8.
TO CONTACT EARTH AND YOU HEAR
THIS:
THIS IS ALPHA BASE
IN WASHINGTON.
WAIT JUST A MINUTE.
THIS IS A RECORDING.

Go to PAGE 9.
YOU SHOOT YOUR LASER AND THE OBJECT DISSAPEARS. THEN YOU KEEP ON EXPLORING. AFTER A WHILE YOU START TO FEEL HUNGRY. YOU GO BACK TO THE SHIP AND GET SOMETHING TO EAT. AFTER YOU EAT, YOU LIE DOWN AND REST FOR ABOUT 30 MINUTES. THEN YOU GET UP.

The choices are:

REST A LITTLE LONGER: PAGE 10.
LOOK FOR SOME KIND OF FUEL: PAGE 11.

---

DEAR MRS. KUMPF,

6-17-83

I'VE HAD A LOT OF FUN ON THE COMPUTER. MY SISTER AND I HAVE BEEN USING PRINT SHOP A LOT. I THINK THINK THE GRAPHICS EDITOR IS FUN TO USE. WE HAVE BEEN USING ELEMENTRY MY DEAR APPLE A LOT ALSO. WE LIKE TO PLAY LEMONADE STAND THE MOST. I AM GOING TO WORK ON STORY TREE NOW. BYE!

YOUR FRIEND,

JOE
Armor Car Tank
APPENDIX H

CASE STUDY 4: SAMPLES OF BETSY'S WORK
Dear Shannon,

I am glad your coming to my house.

Thank you for your letter.

From Betty
TO MRS. PUMPH

I THINK
YOUR NICE

MY CAT
AND I LIKE YOU
Graphics Banner

Written Text And Graphics Show A Relationship

NO DOGS
APPENDIX I

ELECTRONIC MAIL SAMPLES
Welcome to EasyPlex, the new electronic mail system. Features of EasyPlex include:
- An Address Book to enter the names and User I.D.'s of the people you communicate with
- REPLY and FORWARD capabilities
- UPLOAD and DOWNLOAD support
- Switchable modes for using EasyPlex: either menu, prompt or command mode
- Switchable modes for editing.

Do you wish additional information (YES or NO)? YES

EasyPlex

Introduction

EasyPlex, formerly known as Email, borrows several exciting features from CompuServe's industry-leading electronic mail service for business, InfoPlex. At the heart of both names is the term "plex", which means network. "Easy", as you will soon discover accurately describes the user-friendly features of CompuServe's "new" electronic mail service.

For quick access to EasyPlex, type: GO EASY or GO EASYPLEX

Features of EasyPlex include:

ADDRESS BOOK
- Keeps track of the names and User I.D.'s of the people you communicate with regularly. Then, when you send a message you only have to specify the name of the recipient since the User I.D. is already stored in the Address Book.
- You can enter your own name in the Address Book so you will not be prompted for the "From:" information when you send a message.
- You can embed the "To:" and "Subject:" information in your message and then, when you send the message, you will not be prompted for that information.

READING MAIL
- A menu is presented of all pending messages sent to you. It displays the message number, who sent the message and the subject of the message. You may select a range of message numbers to be read (1-5) or a list of message numbers (5,7,10), or both. Or, you may read all messages by selecting choice 0.
- After reading messages, you must choose the ACTION: to be taken. Either DELETE the message, FILE it in your Personal File Area, or FORWARD the message to another subscriber. You may also REREAD the message, REPLY to the original sender, or SAVE the message in your mailbox.
- If you wish to be notified of any pending EasyPlex messages when you enter the CompuServe Information Service, you must first set the appropriate LOGON ACTION. To do this, type: GC DEFAULT.

SENDING MAIL
To send mail to another subscriber, you must first know their User I.D.
The three methods for creating a message are:
- **COMPOSE** a new message. You will be prompted for the text to be entered.
- **USE** a file that contains a message you previously composed and stored in your Personal File Area.
- **UPLOAD** a file containing a message that you composed on your microcomputer.

Whatever method you choose, you will be given the option to edit the message. Then, when you choose the SEND option:
- You will be prompted for "Send to:" information and you may supply the User Id or just the name if you have that information stored in your Address Book.
- You must also specify the "From:" information (unless you stored your own name in the Address Book).
- You must also specify the "Subject:" of your message.

The message will not be sent unless all of this information is supplied. However, your message will remain in the work area if you wish to further edit it and then send it.

**SET OPTIONS**

Set the options for viewing the EasyPlex service. You will be prompted whether the options you choose should be set permanently or for the current session only. The options are:
- The choices for using EasyPlex: **MENU** mode for the novice user, **PROMPT** mode for the intermediate user, and **COMMAND** mode for the expert user. Menu mode is the standard mode.
- Switchable modes for editing and composing messages. The standard is line numbered editing, however, you can switch to non-line numbered editing (FILGE).
- A paging or scrolling option when reading messages. Messages can be paged, according to the type of equipment you are using. This is the standard mode. If you do not want your message to page, set the paging to OFF. Your message will then scroll continuously.

Enter HELP selection or (ENTER) to continue:

**EasyPlex Main Menu**

1 READ mail, 20 messages pending
2 COMPOSE a new message
3 UPLOAD a message
4 USE a file from PER area
5 ADDRESS book
6 SET options

Enter selection, or N for information

**EasyPlex Read Menu**

1 Mrs. class: MUNICH PEN FRIENDS
2 Mrs. class: MUNICH PEN FRIENDS
3 RETURNC: Receiver not found in "us
4 Mrs. Kemp to Mrs. S, Class
5 Mrs. Kemp to Mrs. S, Class
6 RETURN: Not read & expired letter to K
7 MUNICH: MUNICH PEN FRIENDS
8 MUNICH: MUNICH PEN FRIENDS
9 V. M. / Bretta
Date: 07-Mar-85 12:19
From: Mrs. Kumpf [70007,1764]
Subject: to Mrs. S  Class

to Mrs. S  Class
I am writing you a message from your own school to make sure your 
electronic mail system is working. Have a Great Day!
Your Friend,
Mrs. Kumpf

Last page. Key command 
or (ENTER) to continue

EasyFlex Action Menu

** Mrs. Kumpf/to Mrs. S  Class **
1 DELETE this message
2 FILE in PEP area
3 FORWARD
4 RESEND message
5 REPLY
6 SAVE in mailbox

Enter selection or (ENTER) 
to continue

EasyFlex

Date: 07-Mar-85 12:36
From: M . Pen Pal [70007,1764]
Subject: Mrs. S  Class

Dear Pen Pal,
Hi, my name is M .
My favorite color is green what is yours? I have a dog her name is Tiffiny she is very nice.

Your friend,
M 

M
### Student Record Keeping Form: Outgoing Mail

**NAME**  

**ELECTRONIC MAIL**

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Student Record Keeping Form: Incoming Mail

NAME _______________________________________

**ELECTRONIC MAIL**

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APPENDIX J

TEXTUAL CODING OF GRAPHIC BINARY FILE
APPENDIX K

STUDENT BIOGRAPHIES
5/9/85
Dear Mrs. Kumpf,
I did a report on Henry Ford and I would like to share it with you.

I chose this book on Henry Ford because I have an interest in him ever since we went to Greenfield Village. Henry Ford started the Ford Motor Co. He also produced cars in large amounts so everybody could have a car not only rich people. Not only regular cars did Henry Ford make but he also made racing cars. The first car Henry made was called the Quadricycle.

When Henry was little he became very interested with wheels. One time when Henry was ten years old he and his friends made a contraption which dammed up a stream and all the water floated into a potato patch and his parents said he had wheels on his head.

When Henry was grown up he moved eleven times and ended up living at 58 Bagley St. Detroit which was a few blocks away from the Edison Plant where Henry Ford worked before he made his first car. Henry Ford worked before he made his first car. Henry Ford was also a real good skater and he taught his son to skate. Henry was also in some races with his friends and in the cars he built. I think Henry Ford was a brilliant inventor!!

Title: Henry Ford
Author: Regina Z. Kelly
By Carol
Amelia Earhart

Amelia always had to try something new. She was never afraid of dangerous things. After she was finished high school she wanted to be a nurse’s aid. She helped the soldiers in World War One. On the days she was not working with soldiers, she watched a man do some stunt flying. That’s when Amelia wanted to fly.

Then Amelia saved her money. She got an air plane, she named the plane Vega. Ameila was the first woman to fly over the Atlantic Ocean. She was a passenger because she did not known how to fly a plane with instruments.

Amelia had another with and that was to fly around the world. She had to go to school to learn to read the instruments. Amelia made a solo flight across the Atlantic. Everyone around the world was happy and proud of Amelia.

Amelia and George, her husband, where invited to dinner with the President and Mrs. Herbert Hoover at the White House. Amelia was invited again to dinner by Mrs. Franklin D. Roosevelt the President’s wife. Then Amelia asked Mrs. Roosevelt if she wanted to go on a plane ride after dinner, Mrs. roosevelt said she would. It was the first time Mrs. Roosevelt was in a plane.

Amelia wanted to fly all over the world. During the flight Amelia got lost. Some people think Amelia drowned. Some people think the Japanese Navy captured them.

By Angel
MAY 9, 1985
DEAR MRS. KUMPF
THIS IS MY BIOGRAPHY THAT MY DAD AND I DID.
MEAT GEORGE WASHINGTON
BY JOAN HEILBRONER
THIS BOOK IS ABOUT GEORGE WASHINGTON
AND HIS LIFE.

WHEN GEORGE WAS 14 HE BECAME
A LAND SURVEYOR. LATER HE STARTED TO
FIGHT IN THE FRENCH AND INDIAN WAR.

IN 1775, WASHINGTON TOOK OVER HIS ARMY
IN BOSTON AND FOUGHT IN THE WAR
FOR INDEPENDENCE. WASHINGTON
FOUGHT IN THE WAR HARD AND
HE LOST A LOT OF MEN.
HE STILL WON THE WAR THOUGH.

THEN HE BECAME PRESIDENT.
THAT IS WHY GEORGE WASHINGTON IS
CALLED THE FATHER OF HIS
COUNTRY.

BY
LOUISE K.

DEAR MRS. KUMPF
THE NAME OF MR. BRAILLE IS LOUIS.
HE WAS NOT BORN BLIND. BUT HE
GOT BLIND WHEN HE WAS YONG
HE WAS ONLY THREE HE INVENTED
BRAILLE.

FROM
EXIE
APPENDIX L

PATTERNING WRITING BEHAVIOR
April 30, 1985

Dear Pat,

I'm sorry that I haven't written for awhile, but April has been very busy month for me. I went to Chicago to a convention, celebrated Easter with my parents in Indiana, and kept busy with my school work at O.S.U.

Tell me what you have been busy doing during the past few weeks. I saw your display at the Pride Fair but was unable to talk with you about it. Could you tell me about your special interest that was shared during Pride Day? I thought your graphic and poem entitled "Boxy" turned out very nice!!

Since our last letter spring break has passed. I remember that you were going to be seeing your Grandmothers over the break. How did they like the word processed letters that you had written? I bet they would enjoy seeing your graphic and poem too!

Well, it's almost May and that should mean that your swimming pool will be uncovered soon. What do you do to your pool when you are getting it ready for summer swimming?

I'll anxiously be awaiting your reply!

Your Computer Friend,

Mrs. Kumpf
DEAR MRS. KUMPF
I AM SORRY I HAVEN'T
WRITTEN IN A LONG TIME.
I HAVE BEEN PRETTY
BUZZY WRITING TO MY PEN PAL
HOW ARE YOU? I AM JUST
FIN. MY DOG JUST HAD
SUGRY. MY AND AND UNCLE
JUST GOT BACK FROM GREECE.
I AM ON A BASEBALL TEAM.

SINSELY,
PAT
CENTEPIDE SOUP

ONCE THERE WAS A MONSTER. HE WAS BIG
HE HAD A PET CENTAPIDE.
ONCE THE MONSTER RAN OUT OF FOOD SO HE LOOKED FOR SOME. HE FOUND NONE.
NOW THE CENTEPIDE WAS GETTING AN IDEA.
HE THOUGHT HE COULD MAKE SOUP
SO THE CENTEPIDE WENT TO THE KITCHEN
AND MADE IT.
HE TOOK IT TO THE MONSTER.
HE TOOK IT TO THE MONSTER.
THE MONSTER TASTED IT.
BLAH!, SAID THE MONSTER.
THE CENTEPIDE TOOK IT BACK
AND HE SWAM IN IT FOR AWHILE.
THE MONSTER GOT CURIOUS.
HE CAME TO THE KITCHEN.
WHEN HE SAW THE CENTEPIDE SWIMMING,
HE PICKED UP THE BOWL AND DRANK IT.
"YUM, THAT'S MORE LIKE IT."