The word processor

in a whole language environment

by

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CHAPTER I. INTRODUCTION

Educators have long debated the way reading and writing should be taught. Some claim that this debate, or confusion, dates back some four hundred and fifty years, if not longer (Mathews, 1966). Even within the last century, Dr. Edmund Burke Huey, Professor of Psychology and Education in the Western University of Pennsylvania, wrote, "A survey of the views of some of our foremost and soundest educators reveals the fact that the men of our time who are most competent to judge are profoundly dissatisfied with reading as it is now carried on in the elementary school" (Mathews, 1966, Preface).

As a result of the problems recognized not only by Dr. Huey but by other prominent educators of the past and present, the teaching of reading, and writing as well, has changed many times. In the beginning, children learned to read by first learning the alphabet, followed by the mastery of syllables, and finally the mastery of words. At that time, reading and writing were largely associated with morality and religion, so children used prayer books to learn to read and wrote about topics dealing with moral issues (Baker, 1955; Bartine, 1989; Kantrowitz, 1990; Mathews, 1966).

Around the 1500s, many children began to experience difficulty in learning the letters of the alphabet. It wasn't until the 1600s and 1700s, however, that some teachers began to stray away from the traditional philosophy of teaching reading. It was during this time that the word method of reading instruction came about, although it failed to meet the approval of many of the educational leaders of the time (Bartine, 1989; Mathews, 1966).

In the first part of the 1800s, the word method of reading instruction became more popular and was supported by such educational leaders as Horace Mann and John Dewey. A struggle broke out, however, during the last half of the 1800s between the differing methods of teaching reading that existed at the time. This struggle has been termed by some as the "ancients-versus-moderns controversy" (Bartine, 1989; Mathews, 1966).

In an effort to better the educational system, John Dewey opened his first "Laboratory School," which was both child-centered and activity-based (Baker, 1955; Dewey, 1929, 1966; Kantrowitz, 1990; Mathews, 1966). This type of educational environment, which made use of the word method of teaching reading, prevailed in several parts of the U. S. throughout the early 1900s and was supported by many teachers and parents (Mathews, 1966).

With the advent of World War I, however, people began to question the effectiveness of the educational system. It was discovered that 24.9 percent of the one and one-half million American soldiers were able to read and write well enough to perform the simple tasks assigned to them. In 1936, a survey of children's reading ability revealed that a large percentage of seventh graders were reading at only the third-grade level. Ten years later, in 1946, an article was published that spoke of at least one-third of the entire secondary school population--grades nine to twelve--being incapable of learning to read and write well enough to profit from textbook instruction. What finally caused public alarm regarding reading instruction to spread, however, was the publication of Dr. Rudolf Flesch's book, Why Johnny Can't Read, in 1955 (Kantrowitz, 1990; Mathews, 1966).

As a result of the apparent problems with reading instruction in the early and mid-1900s, much discussion centered around the reinstatement of phonics and word attack skills into the elementary reading programs. Such skills, which included the teaching of letters and sounds at the beginning of the child's instruction in reading, became a part of the elementary reading programs of the 1960s (Kantrowitz, 1990; Mathews, 1966).

In the 1970s and 1980s, teachers and administrators once again began to question the phonics programs. Too much emphasis on decoding seemed to take the joy of reading away from children. As research was conducted which appeared to substantiate the concerns of educators, a gradual paradigm shift occurred away from the phonics-oriented language arts programs toward more holistic programs (Heald-Taylor, 1989; Kantrowitz, 1990).

The first holistic program, which initially appeared in the 1940s (Aukerman, 1971; Gans, 1941; Lee & Allen, 1943/1963) and became very prevalent in the 1960s and 1970s, was known as the language experience approach. This approach placed a strong emphasis on dictation. The child would tell a story, the teacher would write it down, then the child would read his/her own words. The language experience approach served as a precursor to another holistic program known as whole language.

Whole Language

Whole language is an educational philosophy (Hull & Goodman, 1989) based on a set of underlying assumptions regarding language and language acquisition (Altwerger, Edelsky, & Flores, 1987). Evidence has shown support for such assumptions that regard learning as a social process (Altwerger, Edelsky, & Flores, 1987; DeGroff, 1990; Graves, 1985; Heald-Taylor, 1989; Hull & Goodman, 1989; Lamme, 1989; Newman, 1985b; Teale, 1982; Wong-Kam & Au, 1988) that takes place in authentic, meaningful, child-centered, and risk-oriented situations that deal with the subject of learning as the whole that it is and eventually move to the understanding of its parts (Calkins & Graves, 1980; DeGroff, 1990; Goodman, 1986; Hull & Goodman, 1989; Milz,1980; Newman, 1985b; Smith, 1971, 1983; Tyler, 1988; Whole Language Special Interest Group of I.R.A., 1988). Evidence has also provided support for other assumptions of whole language, which maintain that children acquire language as they engage in all of its forms (Heald-Taylor, 1989; Whole Language Special Interest Group of I.R.A.,1988), with their goal being the communication of ideas (Altwerger, Edelsky, & Flores, 1987; Goodman, 1986).

The underlying assumptions of whole language give shape to holistic classrooms. There are no essential component practices that exist for a whole language viewpoint, although there are certain practices that seem to lend themselves well to the whole language

philosophy and are, therefore, typical of whole language classrooms (Altwerger, Edelsky, & Flores, 1987).

Some of the practices common to whole language classrooms include process writing, journal writing, reading aloud to children, silent reading, literature study, publishing books, keeping content logs, and studying thematic units in content areas (Altwerger, Edelsky, & Flores, 1987; Goodman, 1986; Heald-Taylor, 1989; Robbins, 1990). It should be remembered, however, that none of these practices are essential to such a classroom. Emphasizing science projects, excluding literature, or focusing entirely on art, music, and drama, could still constitute characteristics of a whole language classroom. Any classroom which demonstrates the premises upon which whole language is founded could be classified as a whole language classroom (Altwerger, Edelsky, & Flores, 1987).

Whole Language Research

In conjunction with some of the underlying assumptions of the whole language philosophy, advocates place a heavy emphasis on reading and writing instruction. There is some controversy, however, regarding the effectiveness of whole language-based classroom instruction (McGee & Lomax, 1990; Schickedanz, 1990; Stahl, 1990; Stahl & Miller, 1989). Results of some whole language studies may need to be taken with caution since some studies lacked a control group with which to compare the results and could, therefore, not account for any maturation effects that might have occurred (Guilfoyle, 1988; Tyler, 1988). In addition, whole language is a difficult term to define and, therefore, may carry very different meanings in "whole language" studies (McGee & Lomax, 1990; Schickedanz, 1990; Stahl, 1990; Stahl & Miller, 1989). Even so, research provides supporting evidence of children's reading and writing accomplishments in whole language settings.

Researchers have found a significant growth and sophistication in children's writing abilities over the course of a school year in whole language classrooms (Fennacy, 1988;

Gunderson and Shapiro, 1988; Varble, 1989). Similar results provide supporting evidence of children's growth in reading ability and achievement (Azwell, 1989; Holley, 1988), their increased participation in reading (Potchen, 1988), and their positive attitudes toward reading (Holley, 1988) when taught in whole language-based classrooms. In addition, research provides supporting evidence that the quality of student learning is affected by the social context of the classroom, created through the interaction among the teacher, his/her instructional organization, and the social organization of the classroom (Edelsky, Draper, & Smith, 1983; Guilfoyle, 1988).

To date, however, there is little research that deals with the effects of different organizational structures in the whole language classroom. Thus, there is a need for research that addresses the possible outcomes of structuring students into different social organizations in the whole language classroom, especially in the language arts area.

Collaborative Writing Research

Classroom social organization has been a popular topic of educational research to date. Much of the research focuses on three basic ways of structuring learning situations so that students can learn: (a) cooperatively, (b) competitively, and (c) individualistically. Research results provide evidence that cooperative learning experiences tend to promote greater student achievement than competitive or individualistic learning experiences (Johnson, Johnson, Johnson, & Anderson, 1976; Johnson, Johnson, & Scott; 1978; Johnson, Johnson, & Stanne, 1986).

One area in which cooperative learning has been found successful is in writing; cooperative writing activities are often referred to as collaborative writing. The theoretical basis for collaborative writing groups suggests that writing is a cognitive and social process and that writing originates from the interactive communication skills that one acquires as a response to a social group (Bruffee, 1984). Writing, as viewed from a social perspective, is

not an operation that occurs in a vacuum but rather is built upon ideas that are formed in learning communities (Bruffee, 1984; Faigley, 1986; Hansen, 1987).

Research in collaborative writing supports the idea that an environment that encourages conversation and collaboration with a peer group during the writing process improves the final written product (Daiute, 1986a; Dickinson, 1986; Herrmann, 1985, 1987). Daiute (1986a), in her case study examining young writers working collaboratively at the computer, found that the writers' interchanges during collaborative writing activities increased their performance on individual writing activities. This increase in performance was measured using a pretest-posttest-control group design. Posttests, which were written individually and which immediately followed the collaborative writing activities, indicated an improvement over the individually written pretest in the length and complexity of the students' written work.

In addition to improving the length and complexity of the written piece, collaborative computer writing environments have shown positive results in facilitating an environment where talk is conducive to the writing task. In an ethnographic study of 21 children in a combined first-second grade class, Dickinson (1986) observed the development of collaborative writing projects using computers. The researcher concluded that the computer seemed to change the way the children wrote. With paper and pencil, most of the children wrote about their own topics and seldom discussed their writing with others. Collaborative writing sessions at the computer, on the other hand, " . . . included considerable talk conducive to planning, self-monitoring and responding to what was being said" (p. 357). In his conclusions, Dickinson suggested that collaborative computer writing adds a new dimension to the teaching of writing and that its effects should be further studied.

In a year-long study by Herrmann (1985, 1987) involving collaborative writing in a high school English class, it was found that, although collaboration was slow in developing, the students who made noticeable gains in writing ability were those who had a positive attitude toward collaboration. The researcher also observed that these students had become

part of a peer response group that shared the writing and editing of their text during the writing process.

Writing and editing are two of the five stages included in the process approach to writing. Writing as a process is one current theory of writing instruction.

Process Writing

The process approach to writing is the theory advocated by whole language practitioners. This theory emphasizes the process that students go through to arrive at a written product rather than the finished product itself. The process-centered model views writing as a developing and recursive process (Fleury, 1988; Reynolds & Hart, 1990) with multiple stages that overlap (Calkins, 1986; Heald-Taylor, 1989; Murray, 1978; Wheeler, 1985).

The key stages of the writing process include prewriting, drafting, revising, editing, and publishing. The prewriting stage involves the production of ideas through brainstorming, information gathering, reflection, writing, and discussion. After gathering ideas, the writer enters the drafting stage, which focuses on organizing the information to make sense. It is in the drafting stage that the writer creates a first draft of the written piece, taking into account the writer's purpose and audience. The revising stage follows the writing of the first draft. In the revising stage, the writer decides whether or not changes will be made to the content of the piece. Then the writer makes the necessary changes. After revising, the writer makes surface changes to the piece, such as in spelling, usage, or punctuation. This is known as the editing stage. The piece is then ready for publication, which occurs when the writer shares the final piece. Writers often do not desire to share every piece that is started, however. They may choose to stop at any stage and choose another topic, go back to a previous stage, or simply begin again, which illustrates the non-linear and recursive nature of the writing process (Chew, 1985; Emig, 1971; Heald-Taylor, 1989).

Due to its non-linear and recursive nature, process writing lends itself well to the word processor. Children are able to write with the word processor, moving between drafting, conferring, and revising, based on their needs rather than on a step-by-step schedule set by either the teacher or the computer. The word processor, which does not imply a specific theory for fostering the writing process, is an ideal tool for facilitating a process approach to writing (DeGroff, 1990; Heffron, 1986; Miller, 1984).

Computers and the Writing Process

The value of word processors as a writing enhancement tool has been a popular topic of educational research to date. In a recent national survey of 1,416 U.S. schools, Henry Jay Becker (1990) concluded that word processing has clearly emerged as a major focus of computer-based learning in American schools. As early as 1980, theorist Seymour Papert, in his book Mindstorms, envisioned the use of the computer as a writing tool and as a possible aid to children in their mastery of language. Papert stated: "I believe that the computer as [a] writing instrument offers children an opportunity to become more like adults, indeed like advanced professionals, in their relationship to their intellectual products and to themselves" (p. 31).

In accordance with experts such as Papert and Becker, there exists an abundance of research dealing with the use of computers in the writing process. Some of the research provides evidence that the computer, as a writing tool, can facilitate processes and bring about results that are congruent with the underlying assumptions of whole language advocates (Miller, 1984).

One area in which the use of the computer has shown positive results is in creating a social environment where children can collaborate (A. C. Allen, 1988; Daiute, 1986a; Dickinson, 1986; Heap & Moore, 1986; Mickelson & Davies, 1987). According to Heap and Moore (1986), "We must discover, comprehend, and appreciate the new interactional

structures and pedagogic functions that are possible through collaboration [at the computer]" (p. 59). Since the computer fosters a collaborative learning situation, it would appear that the computer might enhance a whole language environment, which is founded on the premise that learning is a social process.

The research of Heap and Moore sought to understand the structures of collaborative computer use for writing at the primary level. In so doing, the researchers showed the value of collaborative writing at the computer in bringing about the involvement in and development of all forms of language (Balajthy, 1988; Heap & Moore, 1986; Henney, 1988; Hennings, 1981). According to Heap and Moore (1986), "While writing is the task, the methods include speaking, listening, and reading. The pleasant irony here is that the most sophisticated technology in our schools furthers learning of the most basic skills" (p. 59). In providing an environment which allows for reading, writing, listening, and speaking, the computer would appear to have value in a whole language setting, which emphasizes the necessity of reading, writing, listening, and speaking for language development (Heald-Taylor, 1989; Whole Language Special Interest Group of I.R.A., 1988).

In addition to fostering a social environment where all forms of language are present, the word processor has been considered a tool which allows students to produce reading materials that are personally meaningful to them (DeGroff, 1990; Wepner, 1990). In aiding students in the production of meaningful reading materials, the computer appears to be in line with the whole language premise that learning must be meaningful for the learners (Calkins & Graves, 1980; DeGroff, 1990; Goodman, 1986; Hull & Goodman, 1989; Milz, 1980; Smith, 1971, 1983; Whole Language Special Interest Group of I.R.A., 1988).

Not only does the computer allow for the production of meaningful reading materials but also for the communication of ideas through the writing process (Daiute, 1985; DeGroff, 1990; Phenix & Hannan, 1984; Weyer, 1983;). Several researchers have suggested that revision, which involves higher-level aspects of the writing process, is necessary for the

successful communication of ideas (Goodman, 1986; Reynolds & Hart, 1990; Sommers, 1980). Evidence has shown that the use of word processing programs for writing and revision motivates students to deal with the higher-level aspects of writing such as idea content and coherence (Balajthy, McKeveny, and Lacitignola, 1986-87). Collier (1983), in evaluating the effects of word processing software when combined with training and teacher direction, found that the number and complexity of operations students used to revise their compositions increased. Students who used the word processor made two-thirds more substitutions and reordered their sentences twice as often as students who did not use the word processor. In fostering an environment that encourages students to focus on the idea content and coherence of their writing, the computer would appear to be a valuable tool in a whole language setting, where the goal of language is communication (Altwerger, Edelsky, & Flores, 1987; Goodman, 1986).

In addition to providing supporting evidence for the computer as a tool for communicating, research also lends support to using the computer as a tool to facilitate risk-taking in the writing process. The word processor allows writers to become more willing to take risks, to experiment with their meaning for a longer period of time, and to consider organization and word choices more freely than ever before (Daiute, 1983a; Heffron, 1986; Henney, 1988; Phenix & Hannan, 1984). In its facilitation of risk-taking, the computer would appear to fit in with the whole language premise that risk-taking is an essential element of learning (DeGroff, 1990; Goodman, 1986; Newman, 1985b).

Added to its facilitation of risk-taking, the word processor has been viewed as a tool that empowers students to take control of their own learning (Dede, 1987). The computer, as a writing tool, enables children to impose standards and limits rather than imposing rules on them (Brisk, 1985). What appears on the computer screen or the hard copy is what the writer wants to say, and the writer has the final say in what gets revised. The student has control of both the machine and the process (DeGroff, 1990; Papert, 1980; Wood, 1985). As a tool that

allows student control, the computer shows promise in a whole language environment, which stresses that learning must be child-centered in order to be successful (DeGroff, 1990; Goodman, 1986).

Successful learning, according to whole language advocates, involves (a) a child-centered curriculum, (b) risk-taking, (c) communication, (d) authentic and meaningful activities, (e) reading, writing, listening, and speaking, and (f) a supportive social environment. Research has provided supporting evidence that the word processor can foster these underlying assumptions of whole language advocates regarding successful learning.

Research has also shown that the word processor, in its facilitation of a supportive social environment, may lead to an improvement in children's final written products during collaborative writing sessions. As a tool for collaborative writing, it would appear that the word processor may benefit learning in the whole language setting, which emphasizes writing and the social nature of learning. To date, however, there is a lack of recognition of the word processor as a powerful tool in a whole language environment.

Need for the Study

Educators are beginning to realize the value of computers as a tool for writing in elementary classrooms. As the focus of reading and writing instruction shifts away from phonics- and skills-oriented programs toward more holistic, process-, and social-oriented programs such as whole language, there is learning and writing theory, as well as empirical research, that provides supporting evidence for teaching collaborative writing. In order for educators to fully realize the value of computers as a writing tool in a whole language setting, which emphasizes the social nature of learning, there is a need for research in a whole language classroom to determine the effectiveness of grouping students in all stages of the writing process at the computer.

Statement of the Problem

The literature has provided supporting evidence that learning is a social process and that the use of the word processor as a writing tool fosters an environment where students naturally work and write together to create ideas. The literature has further shown that the use of the word processor as a tool for writing facilitates processes and brings about results that are congruent with the philosophy of whole language. Although the capabilities of the word processor appear to fit into a whole language framework, there has been little empirical evidence that addresses the uses of the word processor as a collaborative writing tool in a whole language environment. Specifically, an exploratory study is needed that investigates the use of the computer as a collaborative writing tool in a whole language environment to determine if there is an effect on students' attitudes as well as the quality and quantity of revisions and the final product.

Purpose of the Study

The purpose of this study is to collect data regarding students' accomplishments as they collaboratively progress through each stage of the writing process at the computer. The effect of collaborative writing at the computer on the quantity of ideas produced during the prewriting stage, on the percentage of changes made during the revising and editing stages, and on the quality of the final written product, will be measured. The students' attitudes toward writing at the computer during each stage of the writing process as well as their attitudes toward writing collaboratively at the computer will also be measured. The results of this exploratory study should provide a basis for using the computer as a collaborative writing tool in a whole language environment. The results should also generate hypotheses for later empirical work that will substantiate the findings.

Research Questions

1. Will there be a difference in the average quantity of ideas produced during the prewriting stage when the children write individually or collaboratively at the computer?

2. Will there be a difference in the average percentage of changes made during the revising stage when the children write individually or collaboratively at the computer?

3. Will there be a difference in the average percentage of changes made during the editing stage when the children write individually or collaboratively at the computer?

4. Will there be a difference in the quality of the final written product when the children write individually or collaboratively at the computer?

5. Will there be a change in students' attitudes toward writing at the computer during each stage of the writing process (prewriting, writing, revising, editing, and publishing)?

6. Will there be an overall change in students' attitudes toward writing collaboratively at the computer?

Limitations

This study was conducted in view of the following limitations:

1. The sample size was small ($N = 20$).

2. Lack of a control group with which to compare students' writing scores made it impossible to control for any maturation effects that may have occurred over the eight-week period.

3. The researcher could not control the amount of additional practice that some students may have received with the word processor during the eight-week period of the study when the researcher was not present.

4. For all four writing activities, the subjects were assigned broad topics about which to write, even though whole language emphasizes the importance of allowing the students to choose the writing topics. The students did, however, make the final decision regarding the specific topics about which they would write within the range of broad topics. This allowed the students more freedom and is more in line with the assumptions of whole language.

5. Students were not allowed to conference with a peer during the individual writing activities, even though peer conferencing during the writing process is highly recommended by whole language advocates.

6. The generalizability of the study is limited due to the fact that the study was performed in one classroom.

7. Replication of this study may be limited due to the high ability level of the students in the district from which the subjects were drawn.

8. Due to the exploratory nature of the study, the alpha level was set high (.10).

Definition of Terms

1. Collaborative writing - coauthorship and group authorship, where two or more people are directly involved in drafting, revising, and producing a piece of writing (Ede & Lunsford, 1984).

2. Cooperative learning - a learning situation in which the goals of separate individuals are linked together so that there is a positive correlation among their goal attainments; all group members succeed or fail as a unit (Johnson & Johnson, 1985, 1987).

3. Process writing - emphasis on what goes on during the production of a written piece rather than on the final written product (Heald-Taylor, 1989).

4. Child-centered - focus is on the child's interests, language, background experiences, and purposes for learning (Taylor, Blum, & Logsdon, 1986).

5. Risk - a situation that involves predicting, hypothesizing, inventing, exploring, testing out, refining, generalizing, and/or confirming (Heald-Taylor, 1989; Newman, 1985c).

6. Authentic - in a real context or situation with which the learner is familiar; for a real purpose.

7. Whole language - in favor of the use of natural and authentic learning situations in which language is dealt with in context (Searfoss, 1989) and meaning making is the central focus of reading and writing (McWhirter, 1990); language fulfills a purpose, just as it does in the real world (Edelsky, Draper, & Smith, 1983).

CHAPTER II. LITERATURE REVIEW

This literature review will cover pertinent areas of theory and research in whole language, writing, and, more specifically, collaborative writing using the computer. The review begins with a discussion of the whole language philosophy and its relationship to the process-centered model of teaching writing. This is followed by an explanation of the current view of writing as a developing, recursive, and cognitive process. Since revision is a large focus of the process approach to writing, the importance of revision to the communication process is discussed, along with the influence of peer groups and feedback on revision. This is followed by a discussion of peer groups as they relate to the writing community of the classroom. Next, the application of computers to the writing process is examined, covering the use of the word processor and its effects on revision, quality of writing, and student attitudes. Cooperative learning, computers and small group learning, and computers and collaborative writing are the final topics reviewed for their potential role in writing instruction.

Whole Language Theory

<u>Introduction</u>

The teaching of reading and writing has changed many times in the history of education. These changes have been prompted primarily by the evolution of new theories regarding how children learn to read and write. The traditional philosophy of reading instruction maintained that reading could best be taught through phonics and skills instruction (Kantrowitz, 1990; Mathews, 1966). Likewise, educators believed that skills instruction in grammar and punctuation, along with writing models such as the essay, was the best way to teach writing so that students could produce a completed product (Newman, 1985a; Young, 1978) that the teacher could then correct and grade.

More recently, new theories regarding children's reading and writing have surfaced. Such theories have been the result of numerous research studies (Calkins, 1983; Emig, 1971; Goodman, 1967; Halliday, 1977; Read, 1971; Taylor, Blum, & Logsdon, 1986; Ylisto, 1977) dealing largely with young children and their acquisition of language. One such theory has been termed whole language. Whole language refers to the belief in and use of natural and authentic learning situations in which language is dealt with in context (Searfoss, 1989) and fulfills a purpose (Edelsky, Draper, & Smith, 1983), and meaning making is the central focus of reading and writing (McWhirter, 1990).

Although the philosophy of whole language finds support from all four forms of language, the focus of this research study will be on only one of the language forms--writing. Advocates of whole language, contrary to the beliefs of most educators years ago, maintain that children learn to write by engaging in whole and meaningful writing activities; by writing, reading and perceiving themselves as writers (Smith, 1971). As they engage in these meaningful writing activities, their goal is communication or the expression of an idea (Milz, 1980). This communication can be accomplished through an approach to writing instruction that emphasizes the process that children go through as they write.

Writing as a process

Some of the research that led to the development of the whole language philosophy is also responsible for the current theory of composition teaching, known as the process approach. The process approach to writing, advocated not only by composition teachers but also by whole language practitioners, maintains that writing is a developing and recursive process (Fleury, 1988; Flower & Hayes, 1981; Reynolds & Hart, 1990) composed of multiple stages (Calkins, 1986; Heald-Taylor, 1989; Wheeler, 1985). These stages are seen as a nonlinear sequence, with any stage occurring at any point in the sequence (Britton, 1978; Emig, 1971; Flower & Hayes, 1981; Hayes & Flower, 1980; Murray, 1978). The stages can

be described as prewriting, drafting, revising, editing, and publishing (A. C. Allen, 1988; Calkins, 1986; Graves, 1983; Heald-Taylor, 1989).

Prewriting   During the prewriting stage of the writing process, children produce ideas for their written pieces through brainstorming, information gathering, reflection, writing, and discussion, based on the intent or goal of their writing. Ideas to be communicated may be shaped, in the prewriting stage, by reading and listening to quality literature, as well as by significant experiences the writer may have had.

Drafting   The translation of ideas into the written word is the drafting stage. The focus is on organizing the information to make sense, taking into account the writer's purpose and audience. The writer may produce several rough drafts before deciding to expand upon the ideas or abandon them for another topic and begin again.

In choosing to continue with the same ideas, the writer will often seek input from others. This is generally referred to as conferencing. Conferencing can be viewed as part of the drafting stage in that the writer shares the written draft with a peer or teacher, seeking information about what others liked about the piece as well as questions they have about parts they don't understand or want to know more about. These comments can provide feedback to writers about audience expectations for content and form. This helps writers to develop audience awareness and to acquire both content and formal knowledge, knowledge which is useful for establishing clear intentions and goals for their written pieces (Fitzgerald, 1988).

Revising, editing, and publishing   Peer conferences can aid the writer in making decisions as to whether or not changes should be made to the content of the piece. Changing content, or meaning, is referred to as revision and may include any of the following: (a) the selection of more appropriate vocabulary, (b) the expansion of a section, (c) the reorganization of ideas for impact, and/or (d) the deletion of unimportant ideas (Chew, 1985; Heald-Taylor,

1989). Such changes are generally considered higher-level, or structural, with lower-level, or surface, changes, such as in spelling, grammar, punctuation, and/or capitalization, occurring during editing, followed by publication of the written piece.

These writing stages, with their brainstorming and reflection, organization of ideas, and expansion and reorganization of ideas, suggest a cognitive dimension to the writing process. Some researchers, in fact, have spoken of the process approach to writing as a cognitive process.

Writing as a cognitive process

The process-centered model has been interpreted by Flower and Hayes (1981; Hayes & Flower, 1980) and Bereiter and Scardamalia (1982) as a cognitive process that is shaped by information and experiences stored in long-term memory, by writing processes used in the past, and by the task environment. The task environment includes not only the writer's developing text but also the original description of the writing topic and the intended audience. The writer's long-term memory represents a storehouse of knowledge about this topic and audience, as well as knowledge about writing plans and problem representations. The initial success of a writer depends largely upon the ability to retrieve useful knowledge from long-term memory and to reorganize or adapt that information to fit the demands of the writing assignment (Flower & Hayes, 1981; Hayes & Flower, 1980).

Through the writing assignment, past goals and strategies of the writing process, and information stored in long-term memory, writers attempt to discover meaning and to communicate it to others. Murray (1978) referred to this discovery of meaning when he wrote, "I believe increasingly that the process of discovery, of using language to find out what you are going to say, is a key part of the writing process" (p. 91). In addition, Schwartz (1982) has described writing in the process-centered model as a way to discover, often during the process, just what one is thinking. Rather than serving as a mere vehicle by which to

describe what one already knows, writing is now considered a way to learn, by the act of putting information down on paper, what one wants to know (Schwartz, 1982) or how one wishes to relay what is already known (Flower & Hayes, 1981; Hayes & Flower, 1980).

This view of writing is very much unlike the old model, which stressed thinking out everything beforehand and following an outline to make sure that nothing was left out. Although the current view of writing may involve outlining or semantic mapping, the outline or semantic map serves as more of a mental representation of the relationships of ideas in the written piece rather than as a strict guide that has been set in stone and must be followed from beginning to end. Due to a lack of research years ago, however, writing as a cognitive process of discovery did not find its way into the schools until the 1960s and 1970s (Schwartz, 1982), when the composing process was studied by such researchers as Janet Emig (1971). Along with the view of writing as a method of discovery and exploration came an outlook on revision as an essential part of the composing process (Schwartz, 1982).

Revision and communication

The recursive model of writing places an emphasis on revision as something desirable and necessary for communication, rather than as the mere correction of errors. Sommers (1980) has spoken of revision as the root of the discovery of meaning during writing. As Reynolds and Hart (1990) note, "Revision in the recursive model becomes an essential aspect of rethinking and discovering the meaning that the writer intends to communicate " (p. 273). Murray (1978) described four aspects of discovery that are present during the revision process: content, form and structure, language, and voice. Indeed, revision is seen as an integral aspect of the writing process (Goodman, 1986), " . . . an aspect which may be critical to development of thought and ideas, to creation of newness and uniqueness, and to learning" (Fitzgerald, 1988, p. 128).

In the development of thought and ideas and the creation of newness and uniqueness, the writer strives to communicate. Communicating, first with oneself and second with an audience, is the goal of the writing process (Key Ideas, 1988).

Communication and decentering

The ability to determine if communication has occurred is a skill that requires an understanding of whom the reader or intended audience will be (Ede & Lunsford, 1984). Piaget (1926/1959) refers to this ability to envision an audience outside one's self and to reconcile other points of view with one's own as decentering. According to Piaget, decentering is a key component of cognitive development that occurs only after certain developmental stages have been reached.

Looking at one's writing from the perspective of others requires an objective, uninvolved viewpoint, which is difficult even for older students. That is why the structuring of groups, who provide objective, interactive feedback during the writing process, is extremely helpful to revision of the written piece (Balajthy, 1986). Students who receive feedback and assistance in identifying if their argument has been made seem to make more appropriate revisions (Reynolds & Hart, 1990).

The writing community

Jane Hansen, in her book When Writers Read, and Kenneth Bruffee (1984), have spoken of the group process, suggesting that writing is not learned or produced in a vacuum but is a product that emerges from the ideas and expectations of a particular community. This community, broadly defined, can be any social arrangement in which a person is involved, such as a classroom or business. It is this community, according to Hansen, which shapes the meaning of the final written product and determines if communication has taken place.

This concept of community has provided a basis for teaching writing in small groups (Bruffee, 1973; Elbow, 1973; Moffett, 1968). Writing classrooms now commonly use the

peer writing group to create positive, supportive groups who share their writing with one another. Such a peer influence has shown positive results in helping students to develop a sense of audience (Brisk, 1985; Dyson & Genishi, 1982; Heap & Moore, 1986).

In addition to developing a sense of audience, peer writing groups have also increased students' interest in writing as well as writing scores. Using the data on 13-year-olds collected during the Fourth National Assessment of Educational Progress in Writing, Soltis and Walberg (1989) found that adolescents who had a supportive peer group that shared their writing with one another were significantly more interested in writing and achieved higher scores in writing than those who did not have such a peer group. The authors noted, however, that it has yet to be established whether good writing is an antecedent to involving peers in the writing process or if receiving support from a peer group encourages students to work hard at a difficult task. Findings indicated a need for future research in peer group influence on writing quality and achievement.

Summary

In summary, the whole language philosophy has come about as a result of new theories regarding how children learn to read and write. One such theory is referred to as the process approach to teaching writing and emphasizes teaching writing as a dynamic process of discovering and communicating ideas rather than as the mere production of an end product. The writing process has been explained by Flower and Hayes (1981) as a cognitive operation that uses information and experiences stored in long-term memory. The process approach to writing appears to promote peer influence and feedback in revision, which tends to improve communication (Reynolds & Hart, 1990).

Computers and the Writing Process

Paralleling the change in writing instruction from an emphasis on the final product to an emphasis on the discovery process, the computer has entered the elementary classroom to

be increasingly viewed as a tool for improving both student and teacher productivity and expression of ideas (Becker, 1990). With the convergence of the process-centered model and the word processing capabilities of the microcomputer, the one-draft writing product is now being replaced with a model of how successful writers go about writing (Fleury, 1988). The word processor, when used as a tool, can encourage the writing and rewriting of material (Daiute, 1983b, 1986b; Kochan, 1987; Phenix & Hannan, 1984).

Word processors and revision

The role that computers can play in facilitating revision has been the impetus for the growing interest in using the word processor in the teaching of writing. With the ease of revision that it offers, coupled with the process approach to writing, children might well develop writing strategies congruent with those of more experienced writers (Bean, 1983; Wheeler, 1985).

In a pilot project involving the introduction of the word processing program Story Writer to first graders, Phenix (Phenix & Hannan, 1984) found that, not only did the children come to better understand what was involved in the writing process, but their awareness of the manipulation possibilities of their writing stayed with them. Even when the computer was not available, the children continued to insert, delete, rewrite, and check spelling and punctuation only after the composing was complete. They learned that writing does not have to come out right the first time, that it can be manipulated by the author, that a writer takes risks, and that revision is a normal part of the writing process.

Daiute (1983b) also found that children increased their revisions with pen and paper after using the computer for writing. Daiute's project involved eight 9- to 12-year-old children in a writers' workshop, aimed at exposing the children to the word processor and then to a program called Catch. Catch served as a guide to focus and revise texts. Results showed that

most of the children increased their revisions with pen and paper after using the Catch program for about four weeks.

The results from Daiute (1983b) and Phenix (Phenix & Hannan, 1984) are encouraging considering the fact that most students show limited revision efforts using pencil and paper (Papert, 1980), especially beginning writers (Graves & Murray, 1980). Research evidence has shown that, even when younger and less competent writers do revise, their revisions involve lower-level changes, with the older and more competent writers revising more for meaning and making more sentence and theme changes (Faigley & Witte, 1981; Hayes & Flower, 1986; National Assessment of Educational Progress and Educational Testing Service, 1986).

The word processor, with its ability to minimize the physical and mechanical difficulties of young writers (Bean, 1983; Daiute, 1986b), eases the process of revision. Students can move whole sections of text for large-scale reorganization, and add or delete other sections. Spelling, wording, and punctuation can also be easily changed (DeGroff, 1990; Wheeler, 1985). Students no longer have to fear the recopying or retyping of entire pieces of text (Daiute, 1989; Kochan, 1987).

Even with the ease of revision that the word processor appears to facilitate, research evidence regarding the effectiveness of this writing tool on student revisions is still inconclusive. McAllister and Louth (1987), in their study of the effects of the word processor on the revision quality of one hundred college basic writers, found that the college students who wrote using the word processor demonstrated a significantly higher quality of revisions than those who wrote without the word processor. Hawisher (1986), on the other hand, found no difference between the quality of revisions made by college students using the computer and the quality of revisions made by college students using a pen and typewriter. Furthermore, Hawisher found, in her analysis of eighty essays, that writing on the computer did not lead to increased revision for the college writers in her study. Even so, Morton (1988)

and Sommers (1980) maintain that the word processor allows for a greater focus on content and revision by eliminating the tedium associated with lower-level corrections in spelling, mechanics, and text modification.

Some evidence suggests that revision would seem to be a natural outcome of writing on the computer, but several caution that this is not necessarily so. Donald Graves (1983) warns that students may be even less likely to revise when they see neatly printed drafts, since words typed are more final and official than handwritten words. Such concerns have also been expressed by Schwartz (1982), although neither Graves nor Schwartz have provided research evidence to support their concerns. One study that addressed the concerns of Graves and Schwartz somewhat found that the word processor led to a higher quality of revisions than other media of expression (McAllister & Louth, 1987). Another study found no difference between the quality of revisions made using the computer and the quality of revisions made using a pen and typewriter (Hawisher, 1986). Both of these studies were conducted with college students.

In addition to the concerns of Graves (1983) and Schwartz (1982) regarding the word processor and revision, Schwartz (1988) has suggested that students make use of the word processor's ease of revision only when they are encouraged by a peer or teacher. As with Graves (1983) and Schwartz (1982), however, Schwartz (1988) has not provided research evidence to support her concerns.

Relationship between revision and quality of writing

The word processor has been referred to by some as a writing tool that can help students increase their revisions (Daiute, 1983b; Phenix & Hannan, 1984) and become better writers with writing tools other than the word processor (Daiute, 1983b; Phenix & Hannan, 1984; Wheeler, 1985). Research on the relationship between revision and quality of writing, however, is inconclusive.

No relationship between revision and quality of writing for fourth graders and a negative relationship for eighth graders was found in a study by Bracewell, Scardamalia, and Bereiter (1978). High schoolers or more skilled writers, on the other hand, appeared to improve the quality of their writing when they revised (Bamberg, 1978; Bracewell et al., 1978; Bridwell, 1980). Furthermore, students judged higher in writing achievement tended to say that they made more revisions (National Assessment of Educational Progress and Educational Testing Service, 1986). For older writers, higher quality of writing was associated with a wider variety of kinds of revisions (additions, deletions, and rearrangements) as well as higher-level revisions (Bridwell, 1980).

To enhance the link between revision and quality of writing, it has been suggested that the teacher provide instructional support or feedback. Instruction designed to enhance revision efforts has shown promising results in increasing the quality of writing between sixth grade students' first drafts and second drafts (Cohen & Scardamalia, 1983).

Morton (1988) also found an increase in writing quality after direct instruction in revising and editing tasks for 10- to 13-year-old students in a summer school program. The 14-day program involved students in the writing process, making use of six editing sessions, each of which focused students' attention on a different content and convention to check. Results indicated a significant increase in students' standard scores for vocabulary and thematic maturity between the first and final drafts. Morton noted that this qualitative improvement was contingent upon the increased length of the revised stories as well as the instructional suggestions offered during the editing-revising process. The editing-revising process served as the vehicle for qualitative improvement between first and final drafts.

Although some research supports the idea of a positive link between revision and quality of writing, results are still inconclusive. Some studies have shown that instruction in the revision process can increase the quality of students' written products (Cohen & Scardamalia, 1983; Morton, 1988). Other studies have found a relationship between the kinds

(Bridwell, 1980) and numbers (National Assessment of Educational Progress and Educational Testing Service, 1986) of revisions made and the quality of writing. Most studies that found a positive relationship between revision and quality of writing, however, were carried out with older subjects; studies using younger subjects indicated no relationship or a negative relationship between the two variables (Bracewell, Scardamalia, & Bereiter, 1978).

Word processors and the quality of writing

Just as some researchers have reported a relationship between quality of writing and revision, some have also found a link between quality of writing and the use of the word processor. Several have provided evidence that this link is dependent upon the amount of time students are given to practice and write with the word processor.

Phenix (Phenix & Hannan, 1984) found that first graders included more detail in their written pieces, which increased in length, fluency, and literary quality, following daily use of a word processor over a six-week period. Similarly, first-grade students in a bilingual (Spanish-speaking) class, who could originally not write fully coherent stories, produced sequential stories with more attention to detail in the choice of words, grammar, punctuation, and spelling after using the word processor for fifteen hours over a three-month period (Brisk, 1985).

With older students, Morton (1988) found a significant increase in the writing quality of ten- to thirteen-year-olds after their participation in ten days of word processing instruction involving forty minutes per day. This increase was evidenced by the difference in standard scores for vocabulary and thematic maturity between the students' first and final drafts. Students in Morton's study also received six sessions of instruction in the editing-revising process. Morton concluded that children appear to be able to benefit from the interface between instruction and the editing-revising process on the microcomputer, enhancing the

quality of their writing beyond what that they would achieve if they were revising with paper and pencil.

Contrary to Morton (1988), Brisk (1985), and Phenix (Phenix & Hannan, 1984), Collier (1983) found few advantages of the word processor over normal handwriting in improving the quality of composition for college students. The four subjects received only two sessions of training and practice on the word processor, which Collier concluded was apparently an insufficient time allotment for effective use. Hoffmann and Welk (1986) also found no significant differences between the quality of seventh- and ninth-grade students' handwritten work and word-processed work in more than 50% of the papers when scored holistically. The project coordinators, however, the independent evaluator, and most participants in the program noted dramatic differences in style and content between student handwritten and word-processed documents over the 3-year period.

Although some research has indicated that there may be a positive relationship between the use of the word processor and the quality of writing, other research has shown that the word processor does not automatically improve the quality of writing, at least not for inexperienced writers. These writers tend to be fooled by the longer, neatly-typed documents and added revisions they make when writing with the word processor. What they don't take into account is that the revisions tend to be lower-level or "smokescreen revisions" (Schwartz, 1982) such as in spelling. "Smokescreen revisions" do not necessarily increase the quality of the written piece (Schwartz, 1982; Wheeler, 1985) and may, in fact, camouflage poor content, organization, and mechanics.

Word processors and student attitudes

Content, organization, and other aspects of writing quality are also affected by student attitudes, which some researchers have found to be positively related to the use of the word processor. Two studies reported an improvement in students' attitudes toward writing when

using a word processor (Brisk, 1985; Hennings, 1981). Wetzel (1988) found that, although fourth graders preferred to use a word processor for writing overall, most favored pencil and paper for writing a first draft. Another study found that students who used the word processor to write were more willing to share their writing with other students and the teacher, exhibited more pride in their written accomplishments, and enjoyed the writing process more than when writing by hand (Keyboarding/word processing topics . . . some findings, 1988). Cross and Curey (1984), however, found that attitude and performance vary with the individual writer and the method of instruction more than with the tool that was used to produce the written piece.

In addition to the teacher's chosen method of instruction and instructional tools used, students' attitudes and performance are also influenced by the instructional grouping strategy. One such strategy that has gained recognition in recent years is cooperative learning.

Cooperative Learning

Cooperative learning refers to a learning situation in which the goals of separate individuals are linked together so that there is a positive correlation among their goal attainments, with all group members succeeding or failing as a unit (Johnson & Johnson, 1985, 1987). When students work in cooperative learning groups, members may work collaboratively on a task or may divide the task up into individual parts, with each member working individually on a part. These cooperative learning groups generally range in size from two to six. Johnson and Johnson (1986) have found that group sizes of two or three are most advantageous in situations when students are inexperienced in working cooperatively, when time is short, or when materials are scarce.

The idea of learning in cooperative groups developed as a result of educators' concerns, based on research, regarding the overwhelming amount of student learning time spent passively absorbing information or filling in blanks. "Perhaps more than any other idea

in education today, cooperative learning empowers students and provides instructional strategies that enable people to become actively involved and socially responsible participants in their own learning" ("' . . . cooperative learning empowers . . . ,'" 1988, p. 83).

The ways in which classroom learning is structured can affect student achievement as well as their attitudes toward learning. A 1981 meta-analysis by Johnson, Maruyama, Johnson, Nelson, and Skon (1981), involving 122 studies, indicated that cooperative learning experiences resulted in higher achievement and greater retention of learning than did competitive or individualistic learning. These findings held true for all age groups, ability levels, subject areas, and learning tasks. Cooperative learning experiences have also resulted in more positive attitudes toward the subject area and toward the instructor than have competitive and individualistic learning experiences (Johnson & Johnson, 1983).

In a study by Johnson, Johnson, and Scott (1978), cooperative learning during math assignments promoted more positive attitudes toward heterogeneity among peers as well as more positive attitudes toward the teacher, fellow cooperators, and conflict. Results also indicated that students were significantly more accurate in their daily work and worked faster when learning was structured cooperatively rather than individualistically. Similar results were found in a study by Johnson, Johnson, Johnson, and Anderson (1976). Findings indicated that cooperative, compared to individualized, learning resulted in significantly more positive attitudes toward classroom life as well as higher achievement in language arts. Cooperative groups made significantly less errors on daily assignments, used more words in subject and predicate phrases, and made significantly fewer errors on the second posttest (when taken with their cooperative group) than did subjects in the individualized group.

Individual and cooperative learning structures have also been compared for their effects on a more structured language arts program. Stevens, Madden, Slavin, & Farnish (1987) conducted two studies to evaluate a comprehensive cooperative learning approach to elementary reading and writing instruction: Cooperative Integrated Reading and Composition

(CIRC). CIRC was composed of three primary elements: basal-related activities, direct instruction in reading comprehension, and integrated language arts and writing. Third- and fourth-grade students worked in heterogeneous learning teams for all three components. In the writing and language arts component, students used a process approach to writing and participated in peer conferences during planning, revising, and editing stages of the process. Significant results indicated that the CIRC students scored better than the control students on standardized measures of reading comprehension, reading vocabulary, language mechanics, language expression, and spelling. The CIRC students also performed better on a sample measure of their writing, which was scored on a three-point scale, including the two content variables of ideas and organization, as well as mechanics such as punctuation, capitalization, spelling, usage, word choice, and syntax. The researchers concluded that " . . . if state-of-the-art principles of classroom organization, motivation, and instruction are used in the context of a cooperative learning program, student achievement in reading and writing can be increased" (Stevens et al., 1987, p. 452).

One method of furthering student achievement through cooperative learning groups in the classroom is by incorporating the use of state-of-the-art technologies. One such technology that has gained popularity as a learning tool in schools is the personal computer. Research in the area of small-group, computer-based learning shows the potential power of the computer to facilitate a positive group learning environment that leads to enhanced student learning.

Computers and small group learning

Computers are becoming more and more popular as learning tools in schools today. A recent national survey by Henry Jay Becker (1990) reported a consistent annual increase of computers in schools, ranging from 300,000 to 400,000 per year over the last six years. For

elementary schools, this increase represented a significant change in the number of computers per school--from six in 1985 to nearly twenty (projected) in 1990.

Even with the significant increase in the number of computers per school, only a small percentage of students in any one school can simultaneously use the computers. That is because the majority of computers at the elementary level is widely dispersed in the schools. Only about 25% of all elementary schools have 15 or more computers in any one room (enough for pairs of students to work together), with a slim majority having a computer lab (Becker, 1990).

To compensate for the lack of computers in the schools, students have had to work in small groups around the computer. Even though the lack of hardware may have been the initial reason for structuring small groups at the computer, interesting research results have surfaced regarding small group computer learning. The computer has shown potential as a focus for group interaction through group problem-solving and programming, through cooperative game-playing, and through aids for writing (Weyer, 1983). Research in the area of small-group, computer-based learning shows the potential power of the computer to facilitate a positive group learning environment that leads to enhanced student achievement, more positive attitudes, and higher-level problem-solving.

Several researchers support the idea that cooperative, small group work at the computer enhances achievement (A. C. Allen, 1988; Cox & Berger, 1985; Johnson, Johnson, & Stanne, 1986; Mevarech, Stern, & Levita, 1987; Webb, 1984). In a study by A. C. Allen (1988), the effects of working cooperatively at the computer on student writing were measured. Allen concluded that students not only improved their written product when working collaboratively but also found more success when writing individually later. Cooperative computer work also improved students' attitudes toward writing as well as toward themselves.

Johnson et al. (1986) found results similar to Allen's (1988) when measuring the impact of cooperative, competitive, and individualistic learning structures on eighth-grade students' achievement and attitudes while working on a computer simulation task. Findings indicated that the cooperative-oriented group scored significantly higher on test items than students in the other two groups and that the cooperative group had more positive attitudes toward computers than the individualistic group. Johnson et al. (1986) also found that cooperative learning promoted the ability to apply facts in test questions requiring higher-level reasoning and problem solving as well as more success in a complex problem-solving task involving mapping and navigation.

Problem solving has been another area of interest in studies of cooperative learning structures at the computer. In a study involving children's writing, Riel (1983) came to the conclusion that the presence of someone else during the writing process facilitated problem solving in generating ideas and immediate responses to the written word. Several other studies examined the effects of a cooperative grouping strategy on students' problem-solving skills using the Logo programming language developed by Seymour Papert (1980). Cox and Berger (1985), in their examination of the effects of group size on problem-solving skills, concluded that students were more successful at solving problems when they worked in groups rather than alone. Furthermore, Cox and Berger found that the groups composed of three or four students were quicker at solving problems than those composed of one, two, or five students. Guntermann and Tovar (1987), on the other hand, found no significant differences among individuals, groups of two, and groups of three when measuring problem-solving skills.

In addition to problem-solving skills, Logo programming has been the vehicle by which researchers have measured the effects of cooperation on social interactions. Genishi's (1988) observations of pairs of kindergarten children learning the Logo programming language led to the conclusion that the children's talk was both cooperative and task-oriented,

a finding that corroborated earlier work by Genishi, McCollum, and Strand (1985). C. A. Allen (1988) also found the talk and laughter of fourth, fifth, and sixth graders working with Logo to be cooperative and task-oriented. Allen's most frequently observed social interaction surrounding the use of microcomputers was collaboration, which increased with grade level. During interviews, students verified the collaboration that took place and its importance in solving problems.

Although microcomputers have shown promising results in their facilitation of a cooperative environment, Johnson et al. (1986) have cautioned that students may need to see the value and support of a cooperative learning environment in order for the natural tendency of interacting around the computer to be promoted. Learning may need a clear cooperative goal structure before students will work cooperatively at the computer. If students understand the goal structure of cooperative learning and see the value of cooperative learning at the computer, research provides evidence that the results may be beneficial.

- Studies of individuals versus small groups working at the computer indicated that small group work on a familiar task may be an effective use of classroom computers (Johnson et al., 1986). The studies on social interaction, problem solving, and grouping indicated that cooperative grouping structures may lead to increased success on problem-solving tasks and achievement tests, as well as more positive attitudes and social interactions (A. C. Allen, 1988; C. A. Allen, 1988; Cox & Berger, 1985; Johnson et al., 1986; Mevarech et al., 1987).

Collaborative writing

In addition to its facilitation of computer-based learning, the cooperative group structure has shown positive results in the area of writing. Students writing cooperatively often work together throughout the entire writing task instead of dividing the assignment up into individual parts. Thus, writing cooperatively is often referred to as collaborative writing. Writing collaboratively involves two or more children creating one text together, writing and

revising the story from both the writer's point of view as well as the reader's. In collaborative writing, the teacher provides the general framework for the writing task to establish a common starting point, but the children are free to develop the task on their own (Daiute, 1989).

Dyson and Genishi (1982) looked at the interactive process of writing in primary school children who used paper and pencil as the medium of expression. In their study of two students, Dyson and Genishi noted the attempt to spell in both solo and collaborative writing by sounding words out. The authors also noted that the interaction with others may have fostered the development of a sense of audience. They concluded that the interaction children experience in collaborative writing has positive effects on their ability to write.

Computers and collaborative writing

The structure of the collaborative, small group environment seems to lend itself to the classroom computer. Riel (1983) maintains that the computer facilitates cooperative work between children that is difficult with paper and pencil. In a study by Hawkins, Sheingold, Gearhart, and Berger (1982), the researchers concluded that children working around the computer were more likely to collaborate with each other than when they were not working around the computer. This conclusion was later corroborated by the work of David Dickinson (1986).

Research involving computers and collaboration offers support for collaborative student writing using the word processor (A. C. Allen, 1988; Daiute, 1986a, 1989; Dickinson, 1986; Heap & Moore, 1986; Herrmann, 1985, 1987; Levin & Boruta, 1983). This collaboration usually took place as two or more children worked together to create one written piece, either (a) from beginning to end, or (b) after one student had already begun the written piece and then called upon a peer to help revise and edit the piece.

Several skills that appear to benefit from collaborative computer writing are the development of a sense of audience and the acquisition of self-monitoring and self-regulation

habits. Heap and Moore (1986) carried out a study to investigate collaborative computer use for writing at the primary level. Methods included videotaping and observation over a three-week period in a first grade classroom at a Catholic school in Toronto. When writing at the computer, each student could choose a helper, who interacted with the writer during the entire writing process, helping with such things as program instructions, story titling, sentence development, inputting, arranging the text, using student dictionaries, closing and printing the story, and editing and revising. Conclusions indicated that having a helper may help the writer to acquire habits of self-monitoring, self-regulation, and developing a sense of audience (Heap & Moore, 1986).

Dickinson (1986) also found self-monitoring to be a common occurrence between children writing collaboratively at the computer, as well as interactions that focused on talk relating to the writing task. In his ethnographic study, Dickinson examined both solo and collaborative writing with the computer as well as with paper and pencil in a combined first/second grade class of twenty-one. Data consisted of writing samples, field notes, audio tapes, and teacher interviews. Analysis of the audio tapes and field notes indicated considerably more interactions among the children when writing collaboratively at the computer than when writing with paper and pencil. The majority of these interactions focused on talk relating to the planning, editing, and revising of the written piece. Such talk was a result of the different communicative demands placed on the children writing collaboratively. When they wrote collaboratively at the computer, the children gained experience in articulating their plans and their reactions to what their partner was writing, which increased their own awareness of what they knew implicitly. Dickinson concluded that the word processor can be integrated into a process-centered writing program as early as the first grade. The researcher added that collaborative computer writing, with its ability to encourage children to articulate plans and reactions to the writing of a peer, may add an important dimension to the writing program.

Levin and Boruta (1983) also observed the potential value of the computer in a writing program. The researchers witnessed students sharing the mechanical task of writing by alternating typing turns as well as dividing up the task of capitalization, with one child pushing the 'shift' key and the other typing the letter. According to Levin and Boruta (1983), "Once the mechanics of collaborative writing are overcome, we have found that children working in pairs on the computer create social/communicative environments that enhance the benefit of the writing assignment" (p. 293).

Daiute (1989) has observed an additional benefit of collaborative computer writing. According to Daiute, collaborative writing experiences positively influence children's individual writing, as evidenced in the increased elaboration of ideas in children's written pieces, such as more words, more adjectives, and more plot twists, than before having collaborated. In her case study observations, Daiute (1986a) observed young writers working collaboratively at the computer and found that the writers' interchanges during collaborative writing activities increased their performance on individual writing activities. Students showed an improvement in the length and complexity of individually written pieces after having collaborated with peers on other writing assignments. Daiute concluded that collaborative learning activities showed promise for the future.

Another area in which collaborative learning activities have shown promising results is in reducing students' anxieties toward writing and computers (Herrmann, 1985, 1987). Herrmann found, in addition, that collaboration was important in establishing the trusting relationships that are necessary to expose oneself as both a learner and a writer. Students who learned to collaborate as writers and those who cultivated one or more sympathetic readers were the students whom Herrmann found made the most noticeable gains as writers during the year.

Review of the literature on collaborative writing using computers provided supporting evidence of the potential power of the word processor to enhance students' written texts. So

few studies have been conducted, however, which investigated the effects of collaborative computer groups on the written piece that an assumption of this relationship may be premature. Further research is needed to investigate the possible outcomes that will result from grouping students at the computer for writing.

Summary

Elementary schools are increasingly recognizing the potential power of the word processor in facilitating children's writing development (Becker, 1990). Several researchers have reported that, when given enough time to practice and write with the word processor, students can improve the quality of their written pieces (Brisk, 1985; Morton, 1988; Phenix & Hannan, 1984). Others have failed to show that the word processor produces better writers (Collier, 1983; Hoffmann & Welk, 1986). It appears that, as new theories regarding children's writing surface, the word processor warrants some attention for its potential effects on elementary students' writing.

One theory that places a strong emphasis on children's writing development is whole language. Whole language advocates maintain that children learn to write by engaging in whole and meaningful writing activities (Smith, 1971), with their goal being the communication of an idea (Milz, 1980). This communication, according to whole language advocates and writing teachers, can be accomplished through the process approach to writing, a theory that has emerged in recent years.

The process approach to writing views writing as a recursive (Fleury, 1988; Flower & Hayes, 1981; Reynolds & Hart, 1990) and cognitive (Bereiter & Scardamalia, 1982; Flower & Hayes, 1981) process composed of multiple (Calkins, 1986; Heald-Taylor, 1989; Wheeler, 1985) and nonlinear (Britton, 1978; Emig, 1971; Flower & Hayes, 1981; Hayes & Flower, 1980; Murray, 1978) stages. These stages include prewriting, drafting, revising, editing, and publishing (A. C. Allen, 1988; Calkins, 1986; Graves, 1983; Heald-Taylor, 1989).

The process-centered model of writing instruction has converged in recent years with the word processing capabilities of the microcomputer (Fleury, 1988). Some researchers have found that the word processor aids students in improving the quality of their written pieces (Brisk, 1985; Morton, 1988; Phenix & Hannan, 1984) as well as their attitudes toward writing (Brisk, 1985; Hennings, 1981). Others have found the word processor to be a tool that can encourage revision of the written piece (Daiute, 1983b; Morton, 1988; Phenix & Hannan, 1984), which some agree is necessary for successful communication of ideas (Goodman, 1986; Reynolds & Hart, 1990).

If the successful communication of ideas necessitates revision, then students must not only be able to revise but also to determine if successful communication has taken place once they have revised. In order to determine the success of communication, students must have an understanding of who their intended audience will be (Ede & Lunsford, 1984) and must be able to view the writing from that audience's perspective. Piaget (1926/1959) refers to this skill as decentering--a skill that is difficult even for older students.

To ease the process of viewing writing from the audience's perspective, students are increasingly working in groups. Groups provide objective feedback and assistance in identifying if the argument has been made during the writing process (Balajthy, 1986). Some researchers have found that peer groups help students to develop a sense of audience (Brisk, 1985; Dyson & Genishi, 1982; Heap & Moore, 1986), to make more appropriate revisions (Reynolds & Hart, 1990), and to achieve higher scores in writing (Soltis & Walberg, 1989). Caution should be exercised in interpreting these results, however, since it is still unknown whether good writing is an antecedent to involving peers in the writing process or whether peer group support encourages hard work at a difficult task (Soltis & Walberg, 1989).

Evidence from studies involving cooperative learning situations has shown that peer group support does encourage hard work at a difficult task as well as positive attitudes. Researchers have reported that students who worked cooperatively at a task experienced

higher achievement (Johnson et al., 1976; Johnson et al., 1978; Johnson et al., 1981; Stevens et al., 1987); greater retention of information (Johnson et al., 1981); and more positive attitudes toward the subject area (Johnson & Johnson, 1983), toward the instructor (Johnson & Johnson, 1983; Johnson et al., 1978), toward classroom life (Johnson et al., 1976), toward heterogeneity among peers (Johnson et al., 1978), and toward fellow cooperators (Johnson et al., 1978), than those who worked individualistically.

To further enhance student achievement through the use of cooperative learning groups, some have made use of the personal computer. Several researchers support the idea that cooperative, small group work at the computer enhances student achievement (A. C. Allen, 1988; Cox & Berger, 1985; Johnson et al., 1986; Mevarech et al., 1987; Webb, 1984) and focuses their talk on the learning task at hand (C. A. Allen; Genishi, 1988; Genishi et al., 1985).

One area in which student achievement and talk have been enhanced through cooperative, small group work at the computer is writing. Writing cooperatively, often referred to as collaborative writing, finds support in the use of the word processor. Researchers have reported that writing collaboratively at the computer helps students develop a sense of audience (Heap & Moore, 1986), positively influences their individual writing (Daiute, 1986a, 1989), improves the length and complexity of their written pieces (Daiute, 1986a), and focuses their talk on the writing process (Dickinson, 1986).

It would appear that collaborative writing using the word processor shows potential for enhancing students' written products, especially in school districts operating under the whole language philosophy, which places a large emphasis on children's writing processes. This study sought to examine the writing processes of whole language sixth-grade students using the word processor both alone and collaboratively.

CHAPTER III. METHODOLOGY

This chapter describes the methodology used to examine the research problems. Sections included in this summary of the research methodology pertain to subjects, development of the instrument, research design, research procedures, limitations, and data analysis.

Subjects

Subjects for this study included one sixth-grade class of twenty-one students from a suburban, upper-middle class school district in central Iowa. The school district's students averaged near the 93rd percentile (grades three through eight) on the Iowa Tests of Basic Skills for the 1989-90 school year. The class was selected on the basis of its school district's support of the whole language philosophy, its access to and experience with computers, and the grade level of its students. The class was composed of seven boys and fourteen girls. Due to the odd number of students, however, one boy was selected by the classroom teacher to write alone during collaborative writing exercises. Analysis of results, therefore, will represent the information obtained from the data of twenty subjects--six boys and fourteen girls.

Since the district from which the subjects for this study were drawn had operated under the whole language philosophy for several years, the subjects were very experienced with the writing process. Subjects did not have much experience, however, in collaborative writing. Rather, the students in this study were accustomed to producing their own written pieces and drawing upon the help of a peer (peer conferencing) during the revising and editing stages of the writing process. Subjects had worked with computers in a lab setting throughout the entire 1990-91 school year, although this work did not involve the use of a word processing software package. These students had also received a brief introduction to the Bank Street Writer III word processing program several weeks prior to the start of the study.

In this introduction, students received instruction on how to access the Bank Street Writer III software program. Students did not, however, begin writing with the Bank Street Writer III program or receive instruction on how to use it until the start of the study.

Development of the Instrument

A demographic and attitudinal questionnaire was designed to measure subjects' attitudes toward the following: (a) working with a partner, (b) writing with a partner, (c) writing with a computer, (d) writing with a computer during each stage of the writing process, and (e) writing with a partner on the computer. The questionnaire also obtained information about subjects' computer use and experience. Procedures for constructing the questionnaire were based on information presented in How to Measure Attitudes (Henerson, Morris, & Fitz-Gibbon, 1978).

The first step in the development of this instrument was to collect statements which clearly distinguished between favorable and unfavorable opinions regarding the following: (a) working with a partner, (b) writing with a partner, (c) writing with a computer, (d) writing with a computer during each stage of the writing process, and (e) writing with a partner on the computer. Statements that favored working with a partner or using the computer were considered to represent favorable opinions. The majority of statements used were obtained from studies of student attitudes toward the computer (Abou-Dagaa, 1991; Allen, 1990; Sullivan, 1989) and toward collaborative writing (Allen, 1990). Several statements measuring variables for which no instruments from previous studies could be located were constructed by the researcher. These statements were those relating to students' attitudes toward using the computer during each stage of the writing process.

Content validity, the degree to which an instrument measures the content it purports to measure, was a primary concern of the researcher. Content validity is most often determined by an appraisal of experts or professionals in the content area. One university professor, four

graduate students, and three sixth-grade teachers were each given the questionnaire and asked to write comments. It was requested that comments be geared toward the appropriateness of the questionnaire for measuring attitudes toward using the computer, working with a partner, writing with a partner, and writing with the computer. Comments were also requested for the appropriateness of the questionnaire for sixth-grade students who were familiar with the writing process and the computer. The cover form that was included with the questionnaires given to the sixth-grade teachers can be found in Appendix A. The majority of comments from these people related to concerns about the wording of statements or the appropriateness of the vocabulary used for sixth graders, as well as questions about the appropriateness of the content of some statements for measuring the attitudes they were intended to measure. Comments and suggestions from these people were used to modify the instrument.

After writing and modifying the initial sixty-six statements, a pilot test of the questionnaire was conducted with twenty-three sixth-grade students at an Ames elementary school. The twenty-three sixth graders were familiar with computers. Each student answered up to fifteen questions measuring background information and fifty-one attitude questions. The attitude questions involved a Likert-type agreement scale with the following values:

1 = strongly disagree

2 = disagree

3 = not sure

4 = agree

5 = strongly agree

Based on the sixth graders' comments, questions, and concerns while answering the questionnaire, the instrument was once again modified. Two background questions were expanded, and twenty-two attitude items were reworded. The resulting questionnaire contained fifteen items that measured background information and fifty-one items that

measured attitudes toward computers, toward cooperative learning, and toward collaborative writing.

Reliability of the Instrument

A Cronbach alpha reliability coefficient was obtained for each of the nine attitude factors measured in order to test the internal consistency of the instrument's attitude items. Items were omitted if they reflected a weak or negative correlation with other items that were intended to measure the same attitude. This resulted in the retention of forty-three attitude questions, the deletion of eight, and the addition of five. The reliability coefficients for the nine attitude factors, based on the second administration of the questionnaire to the twenty students in the study, were as follows:

(a) working with a partner, .95

(b) writing with a partner, .90

(c) writing with a computer, .95

(d) writing with a computer during each stage of the writing process:

- brainstorming, .76

- writing, .89

- revising, .85

- editing, .83

- publishing, .82

(e) writing with a partner on the computer, .85

The overall reliability coefficient for all forty-eight attitude statements was .76.

The final instrument contained fifteen items measuring background information and forty-eight attitude items measuring nine attitude factors. These nine attitude factors consisted of the following items on the attitude questionnaire:

(a)   working with a partner - items 18, 22, 23, 39, 41, 44, 45, 46, 47, 49, 51, 53, 55, 56, 59, and 62

(b)   writing with a partner - items 18, 22, 23, 39, 41, 44, 46, 51, and 55

(c)   writing with a computer - items 16, 17, 19, 20, 21, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 40, 42, 48, 50, 52, 54, 57, 58, 60, 61, and 63

(d)   writing with a computer during each stage of the writing process:

   - prewriting - items 16, 19, 31, 42, and 48

   - writing - items 20, 25, 35, 50, and 60

   - revising - items 24, 27, 38, 40, 52, and 58

   - editing - items 26, 29, 33, 57, and 61

   - publishing - items 17, 30, 32, 36, and 63

(e)   writing with a partner on the computer - items 22, 23, 44, 51, and 55

These attitude items were randomly distributed throughout the attitude section of the survey questionnaire. The questionnaire was administered to the twenty subjects the day before the first practice writing session and again the day after the last writing session. This instrument can be found in Appendix B.

Research Design

This study is exploratory in nature. It uses a quasi-experimental design, with one group being measured at two different times. This one-group time-series design includes measurement of both individual and collaborative writing of sixth-grade students over an eight-week period.

Research Procedures

Beginning activities

The proposal for this research study was reviewed and approved by the Iowa State University Human Subjects Committee. Permission was obtained from the West Des Moines School District to study a classroom of sixth-grade students at Rex Mathes Elementary School. The sixth-grade teacher and the researcher discussed the procedures and writing assignments prior to the start of the study.

The study was carried out in the networked IBM computer lab at Rex Mathes Elementary School. The lab contained seventeen networked computers and four computers not on the network. Each student was assigned his/her own computer. Also present in the lab were three printers, which accepted printing instructions from the networked computers. Students working on the non-networked computers saved their documents on disk and then printed them on the printer in the sixth-grade classroom. First and final drafts were collected for four writing activities over an eight-week period, spanning from March 25 through May 17, 1991.

Students participated in four writing activities. The first and last were individual writing activities, and the second and third were collaborative. All writing assignments were comparable in length of time required to complete and in level of difficulty.

On the first day of the study, the researcher explained to the students that they would be participating in a research study to investigate how they write at the computer, both by themselves and with a partner. All students then received the necessary instructions and completed the questionnaire.

During the next three meeting days, the researcher introduced the students to some of the menu commands of the Bank Street Writer III word processing program. The classroom teacher served as the keyboarder. Using the local area network, the researcher instructed the

classroom teacher to do such things as the following: (a) move a block of text, (b) copy a block of text, (c) erase a block of text, (d) calculate the number of words in the text, (e) check the spelling of the text, (f) and change the spacing and columns of the text. Students viewed what the teacher was doing to the text and how she was doing it on their own computer monitors. Following each ten- to fifteen-minute introduction to the menu commands, students practiced using the menu command of the Bank Street Writer III program on their own. The researcher circulated, observing and offering assistance when necessary.

Writing assignments

The fifth and remaining nineteen meeting days were devoted to the four writing assignments. No time restrictions or length requirements accompanied any of these assignments. Students were encouraged to write as much as they needed to communicate their ideas. Three printouts emerged from each of the writing assignments: (a) a brainstormed ideas list, (b) a first draft, and (c) a final draft.

Prior to the start of each of the writing assignments, the researcher read an example to the students and then briefly discussed it. All four example pieces can be found in Appendix C.

For the first assignment, students worked alone to write a piece describing how to do something. After completing a first draft, students were encouraged to read their documents to make sure that they had included all the necessary steps/directions for carrying out the task they were describing. Each student wrote at his/her own computer and printed a first draft and a final draft.

For the second and third writing assignments, each student worked with a partner to produce a written piece. Students were paired by the classroom teacher, and each pair wrote the assignment together using one computer. The following collaborative rules were posted on a banner in the computer lab and discussed with the students:

1. Suggestions should be for the improvement of ideas, not people.

2. Listen to your partner's ideas, even if you disagree with them.

3. When a disagreement occurs, talk things over until an agreement has been reached.

The first collaborative writing assignment was to produce a character description of a real person or someone who could be real. During this assignment, pairs of students were encouraged to read their documents to make sure they had included descriptive language that characterized both the outside and the inside of a person. Students were also encouraged in their descriptions to make use of all five of their senses, which were discussed prior to the start of the writing activity. Each student pair produced one paper, with both students receiving the same grade. Student pairs printed a first draft and a final draft.

The second collaborative writing assignment was to describe a setting. Students worked with the same partner as in the first collaborative assignment. During the second collaborative assignment, students were encouraged to either choose a setting that was familiar to both students in the pair or to describe a make-believe setting. Students were also urged to make use of all five senses in their descriptions and to read their documents to make sure that they had described the setting well. As in the first collaborative writing assignment, both students in each pair received the same grade as a result of the one paper they produced together. Student pairs printed one first draft and one final draft.

The final writing assignment had the students working alone again to create a narrative of an ordered event--an event whose parts had to have happened in a certain order. Each student worked at his/her own computer to produce a written piece. Students were encouraged to read their first drafts to make sure they had not left any important details out or placed any parts out of order. Each student printed a first draft and a final draft.

<u>Analysis of the written assignments</u>

The first and final drafts of all four writing assignments were analyzed and compared by the researcher, using the taxonomy described in the Revision Analysis section, to determine the number of revisions and edits made. The final drafts from all four writing assignments were holistically graded by a team of three Iowa State University professors in the English Department. The writing assignments' description that was given to the English professors can be found in Appendix E.

<u>Holistic evaluation</u>   Holistic evaluation is a guided procedure for sorting or ranking written pieces. In holistic evaluation, the rater takes a piece of writing and either (a) matches it with another piece in a graded series of pieces, (b) scores the written piece for the prominence of certain features important to that kind of writing, or (c) assigns a letter or number grade. This grading, scoring, or placing occurs very quickly (usually within two minutes) as the rater reads the written piece as a whole and judges it by his/her impression of the whole. Holistic evaluation is usually guided by a holistic scoring guide, often a rubric or a checklist, which specifically distinguishes the contents of a high-quality paper, a medium-quality paper, and a low-quality paper (Cooper, 1977).

Two rubrics, each containing a set of criteria used by the graders for this study, were used to rate the students' written pieces on content, length, organization, and mechanics. Due to the nature of the writing assignments, one rubric was used for the individual writing activities and a slightly different one for the collaborative writing activities. The individual writing assignments involved a sequence of steps or an ordering of events, so organization of sentences and paragraphs was included in the rubric for grading these. The individual writing assignments were also expected to be longer than the collaborative writing assignments, although both types of assignments required the same amount of time to complete.

The collaborative writing assignments involved descriptions of people and places, so the use of descriptive language, including all five of the senses, was an important criterion by which to grade these. Other than the few items mentioned, the rubrics were identical.

The rubrics were created by the researcher after discussing the evaluation of the written pieces with the subjects' classroom teacher and two of the three English professors who would be grading the written pieces. Grades were based on a scale of one to five, with one being the highest possible score attainable and five being the lowest. These rubrics can be found in Appendix D.

Revision analysis   Many authors refer to revision in terms of the extent to which the changes affect the meaning or emphasis of the written piece. Global changes, which are viewed as higher-level revisions, are those that give new meaning or emphasis to the content of the piece. Changes that preserve the meaning and emphasis of the written text are often referred to as lower-level revisions, as are surface-level changes such as in spelling or punctuation (Faigley & Witte, 1981). For purposes of this study, higher-level changes, or those that altered the meaning or emphasis of the written piece, were noted as revisions. Changes that preserved the meaning and emphasis of the text, as well as surface-level changes, were considered edits.

Analysis of students' written pieces for revisions and edits was conducted according to a classification system adapted from Faigley and Witte (1981) and other pieces of literature (DeGroff, 1990; Heald-Taylor, 1989; Humes, 1983; Hunter & Begoray, 1990; Robbins, 1990). This taxonomy helped determine the number of revisions and edits students made in both their individual and collaborative written pieces.

The taxonomy classified revisions as those changes that gave new meaning or emphasis to the content of the piece. Such changes included the following:

(a) additions (DeGroff, 1990; Faigley & Witte, 1981; Heald-Taylor, 1989; Humes, 1983; Hunter & Begoray, 1990)

(b) deletions (DeGroff, 1990; Faigley & Witte, 1981; Heald-Taylor, 1989; Hunter & Begoray, 1990)

(c) substitutions (Faigley & Witte, 1981; Hunter & Begoray, 1990)

(d) rearrangements (DeGroff, 1990; Faigley & Witte, 1981; Heald-Taylor, 1989; Humes, 1983; Hunter & Begoray, 1990)

(e) distributions (Faigley & Witte, 1981)

(f) consolidations (Faigley & Witte, 1981).

For example, in the second writing activity, one pair of students wrote in their first draft, "He won Mr. Olympia in 1984." In the final draft, the sentence became, "Arnold lifts a lot of weights which helped him win Mr. Olympia." Since the addition of the phrase, "Arnold lifts a lot of weights . . . " changed the emphasis of the sentence from the winning of Mr. Olympia to the lifting of weights, or one of the reasons for winning, the researcher coded the change as a revision.

On the other hand, the above six areas of change represented edits if the changes preserved the meaning and emphasis of the text. For example, one child in the study wrote this sentence in her first draft for the first writing activity: "Building a snow man isn't that difficult." In her final draft, the child broke the same sentence up (distributed) into the following two sentences: "How do you build a snow man? It really isn't very difficult." The researcher coded the change of breaking the sentence into two as an edit since the meaning and emphasis of the sentence(s) remained virtually the same.

Edits also included surface-level changes in the following areas:

(a) spelling (DeGroff, 1990; Faigley & Witte, 1981; Heald-Taylor, 1989; Humes, 1983; Robbins, 1990)

(b) capitalization (Robbins, 1990)

(c)   punctuation (DeGroff, 1990; Faigley & Witte, 1981; Humes, 1983)

(d)   tense (Faigley & Witte, 1981)

(e)   number (Faigley & Witte, 1981)

(f)   format (Faigley & Witte, 1981).

For example, in writing activity 3, one pair of boys wrote the following in their first draft: "If you come at the right time of year, you could run into a religis festivle!" In their final draft, the sentence looked like this: "If you come at the right time of year, you could run into a religious festival!" Since the correction of the two spelling errors did not change the meaning or emphasis of the sentence, the researcher coded each change as an edit. Similarly, when one of the students, during the fourth writing activity, changed a sentence in her first draft from, "Then after that they took me back to the chair that i was going to get my perm in," to, "Then after that she took me back to the chair that I was going to get my perm in," in her final draft, the researcher recorded two edits--"they" to "she" (number) and "i" to "I" (capitalization). Neither change altered the meaning or emphasis of the sentence. Each change in the students' texts from the first draft to the final draft was coded as either a revision or an edit.

Audio taped conversations

During the collaborative writing assignments, student conversations were audio tape recorded. Student interactions were examined for possible trends that might have emerged during collaboration. Students were supervised by the researcher, classroom teacher, and student teacher during these writing activities. Assistance was provided for technical problems, spelling errors, and review of earlier classroom instruction relating to the writing process.

Posttest questionnaire

In the final meeting, students completed the attitude questionnaire once again (Appendix B). The purpose for administering the questionnaire a second time was to measure

any changes in attitude toward writing at the computer during each stage of the writing process as well as toward writing collaboratively using the computer.

Limitations

One limitation of this study was that there were several variables for which the researcher was unable to control. First, the lack of a control group with which to compare students' writing scores made it impossible to control for any maturation effects that may have occurred over the eight-week period. Also, the researcher could not control the amount of additional practice that some students may have received with the word processor during the eight-week period of the study when the researcher was not present.

A second limitation of the study was that the researcher departed from the whole language philosophy in two ways. First, whole language emphasizes the importance of allowing the students to choose the writing topics. Since it was necessary, for measurement purposes of this study, to have all subjects write about the same topics, the researcher supplied the students with a broad topic with which to begin. Students were then free to choose a more narrowed topic within the broad topic. For instance, the first assignment involved all subjects in writing a "How to . . . " piece, and students then brainstormed different topics that they wished to explain how to do. Students, therefore, were not able to exercise as much freedom as they might have liked, although they were the final decision-makers in the specific topics about which they chose to write.

The second way the researcher departed from the whole language philosophy was in prohibiting students from participating in peer conferences during the individual writing activities. Peer conferencing during the writing process is highly recommended by whole language advocates, especially for revision of the written piece. The researcher could not allow students working individually to conference with a peer, however, if the written

products were to truly be individually written pieces. It is uncertain whether this absence of peer conferencing affected the results of this study in any way.

Some final limitations of this study that need to be noted include the small sample size (N = 20) and the high alpha level (.10). The fact that the study was performed in one classroom limits the generalizability of its results. Also, replication of this study may be limited due to the high ability level of the students in the district from which the subjects for this study were drawn.

Analysis of the Data

Data from the writing samples were analyzed using the SPSS$_X$ procedure for analysis of variance, 2x2 (group structure and time) within-subjects design, to determine any statistically significant differences between individual and collaborative writing. Data from the survey questionnaire were analyzed using the SPSS$_X$ procedure for repeated measures ANOVA to determine any changes in attitude that might have occurred on the nine attitude factors. Before analyzing the data using the repeated measures ANOVA tests, the attitude items that were negatively worded (did not favor the computer or did not favor working with a partner) on the questionnaire were reverse scored (i.e. 1=5, 2=4, 4=2, and 5=1). These item numbers included the following: 16, 17, 18, 19, 20, 22, 23, 25, 26, 29, 31, 32, 34, 38, 43, 49, 50, 52, 54, 55, 58, 59, 61, and 63. Additional tests for auxiliary findings included the SPSS$_X$ procedure for one-way analysis of variance, with time as the factor. Since this is an exploratory study, the alpha level was set at .10.

CHAPTER IV. RESULTS AND FINDINGS

In this chapter, results and findings are presented and discussed in relationship to the research questions explained in Chapter 1. Auxiliary findings are also reported.

Research Question 1

The first research question was stated as follows: Will there be a difference in the average quantity of ideas produced during the prewriting stage when the children write individually or collaboratively at the computer?

The number of ideas produced during the prewriting stage of each of the four writing assignments were counted by the researcher. On the first individual writing assignment, the number of ideas produced during the prewriting stage ranged from 8.00 to 45.00, and the mean number of ideas was 21.55, SD = 10.46. On the second individual writing assignment, the number of ideas produced during the prewriting stage ranged between 8.00 and 37.00. The mean number of ideas for this writing assignment was 20.25, SD = 8.07. In analyzing the two individual writing assignments together, the average number of ideas produced during the prewriting stage ranged from 8.50 to 41.00, with a mean of 20.90, SD = 8.40.

The number of ideas produced during the prewriting stage of the first collaborative writing assignment ranged from 27.00 to 68.00, and the mean number of ideas was 43.40, SD = 11.69. During the prewriting stage of the second collaborative writing assignment, the number of ideas produced ranged from 22.00 to 105.00, and the mean number of ideas was 39.00, SD = 23.88. In analyzing the two collaborative writing assignments together, the average number of ideas produced during the prewriting stage ranged from 25.00 to 86.50, and the mean number of ideas was 41.20, SD = 16.39.

A comparison was made of the mean number of ideas produced on the combined collaborative assignments with the mean on the combined individual assignments (see Figure 1). The comparison showed that the students averaged 20.30 ideas more during the

prewriting stage of the collaborative writing assignments than they did during the prewriting stage of the individual writing assignments.

Comparison of Number of Ideas Produced Individually and Collaboratively
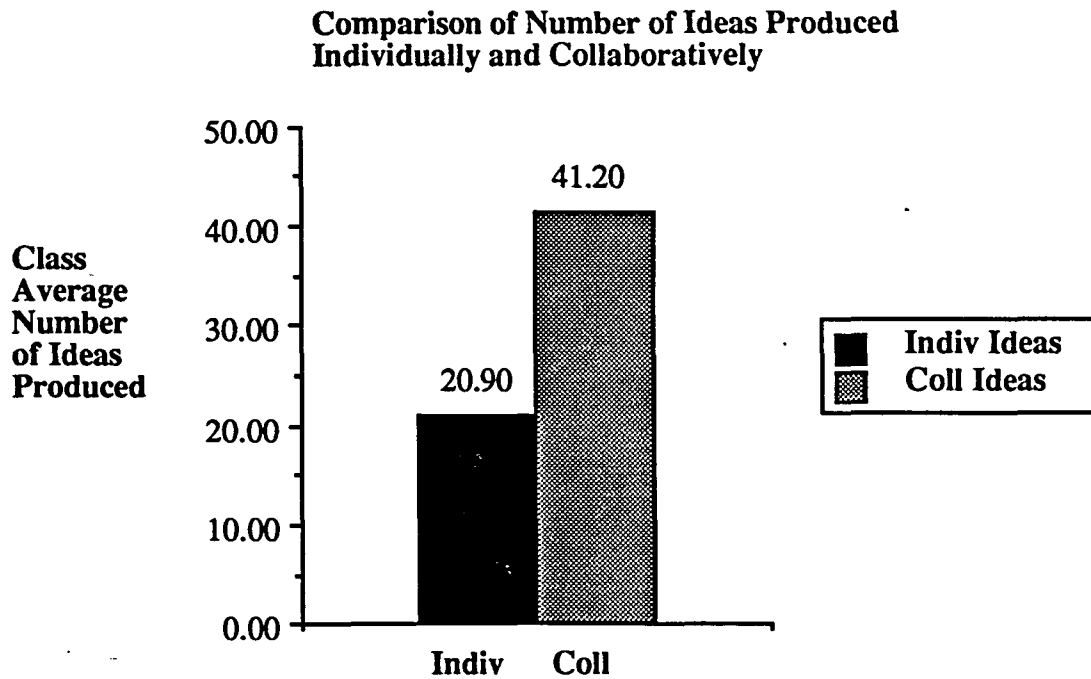
Figure 1.   Comparison of average number of ideas produced during the prewriting stage between individual and collaborative writing assignments

Since the mean number of ideas produced during the prewriting stages of the individual and collaborative writing assignments was not normally distributed, a square root transformation was conducted in order to stabilize the variances. Then a two-way analysis of variance test was carried out to test the significance of the difference in the mean number of ideas produced during the individual and collaborative writing assignments. Results of the analysis showed a significant difference in the average number of ideas produced during the prewriting stage between the individual and collaborative writing assignments, $p < .001$.

Table 1 shows the results of the two-way ANOVA for the average number of ideas produced during prewriting.

Table 1.   Two-way ANOVA for the average number of ideas produced during the prewriting stage of the writing process

Source of Variation	Sum of Squares	Degrees of Freedom	Mean Square	F	Sig. of F
Main Effects	68.282	2	34.141	25.817	.000**
Size of Group	66.563	1	66.563	50.335	.000**
Time of Activities	1.719	1	1.719	1.300	.258
2-Way Interactions	.717	1	.717	.542	.464
Size of Group by Time of Activities	.717	1	.717	.542	.464
Residual	100.502	76	1.322		

** $p < .001$.

Research Question 2

The second research question was stated as follows: Will there be a difference in the average percentage of changes made during the revising stage when the children write individually or collaboratively at the computer?

An analysis was conducted of the number of revisions made during both individual writing assignments and both collaborative writing assignments. This number was then divided by the number of words in the first draft and multiplied by one hundred in order to calculate the percentage of revisions made for each writing assignment. For example, one student made four revisions in writing activity one and produced one hundred and seventy-four words on the first draft. This student's percentage of revisions was calculated as (4/174)*100, which resulted in 2.30% revisions.

The percentage of revisions made during the first individual writing assignment ranged from 0.00% to 3.13%, with a mean of 0.68%, *SD* = .96%. For the second individual writing assignment, the percentage of revisions made ranged from 0.00% to 2.60%, with a mean of 0.52%, *SD* = .83%. Overall, average revisions made on the individual writing assignments ranged from 0.00% to 2.86%, with a mean of 0.60%, *SD* = .76%.

For the first collaborative writing assignment, the percentage of revisions made ranged from 0.00% to 9.33%, with a mean of 1.56%, *SD* = 2.90%. The second collaborative writing assignment saw the percentage of revisions range from 0.00% to 1.25%, with a mean of 0.38%, *SD* = .54%. Overall, average revisions made during the collaborative writing assignments ranged from 0.00% to 5.29%, with a mean of 0.97%, *SD* = 1.61%.

A comparison was made of the percentage of revisions on the combined collaborative assignments with the percentage on the combined individual assignments (see Figure 2). This comparison showed that the students averaged 0.37% more revisions during the collaborative writing assignments than they did during the individual writing assignments.

Since the mean percentage of revisions made on the individual and collaborative writing assignments was not normally distributed, a square root transformation was conducted in order to stabilize the variances. To test the significance of the difference in the mean percentage of revisions made between the individual and collaborative writing assignments, a two-way analysis of variance test was then carried out. Results of the analysis failed to show a significant difference in the average percentage of revisions made between the individual and collaborative writing assignments. Table 2 shows the results of the two-way ANOVA for the average percentage of revisions made.

Comparison of Individual and Collaborative Revisions
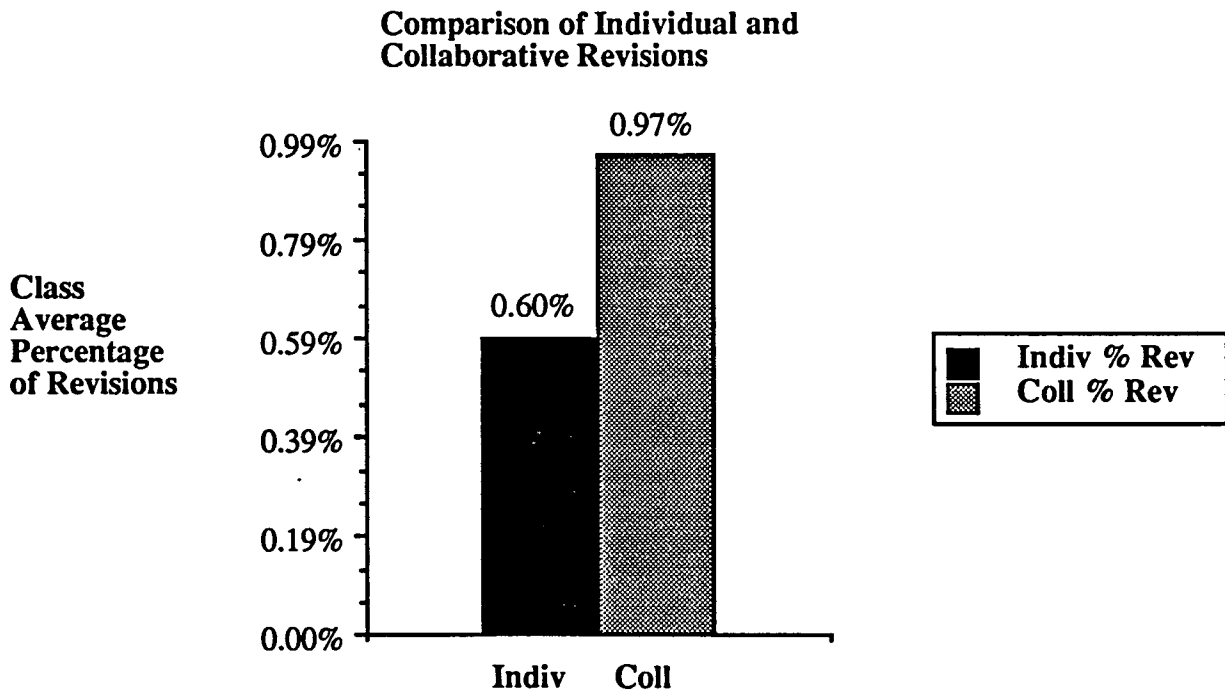
Figure 2.   Comparison of average percentage of revisions made between individual and collaborative writing activities

Table 2.   Two-way ANOVA for the average percentage of revisions made

Source of Variation	Sum of Squares	Degrees of Freedom	Mean Square	F	Sig. of F
Main Effects	.985	2	.492	.938	.396
Size of Group	.074	1	.074	.140	.709
Time of Activities	.911	1	.911	1.735	.192
2-Way Interactions	.313	1	.313	.595	.443
Size of Group by Time of Activities	.313	1	.313	.595	.443
Residual	39.917	76	.525		

Research Question 3

The third research question was stated as follows: Will there be a difference in the average percentage of changes made during the editing stage when the children write individually or collaboratively at the computer?

An analysis was conducted of the number of edits made during both individual writing assignments and both collaborative writing assignments. This number was then divided by the number of words in the first draft and multiplied by one hundred in order to calculate the percentage of edits made for each writing assignment, as illustrated with revisions previously.

The percentage of edits made during the first individual writing assignment ranged from 0.61% to 17.93%, with a mean of 5.55%, $SD = 4.45\%$. For the second individual writing assignment, the percentage of edits made ranged from 0.58% to 14.46%, with a mean of 5.73%, $SD = 4.39\%$. Overall, average edits made on the individual writing assignments ranged from 1.04% to 12.65%, with a mean of 5.64%, $SD = 3.25\%$.

For the first collaborative writing assignment, the percentage of edits made ranged from 0.61% to 12.50%, with a mean of 5.80%, $SD = 4.46\%$. The second collaborative writing assignment saw the percentage of edits range from 0.00% to 13.58%, with a mean of 4.11%, $SD = 4.32\%$. Overall, edits made during the collaborative writing assignments averaged between 0.61% and 11.48%, with a mean of 4.96%, $SD = 3.83\%$.

A comparison was made of the average percentage of edits on the combined collaborative assignments with the average on the combined individual assignments (see Figure 3). This comparison showed that the students averaged 0.68% more edits during the individual writing assignments than they did during the collaborative writing assignments.

**Comparison of Individual and
Collaborative Edits**
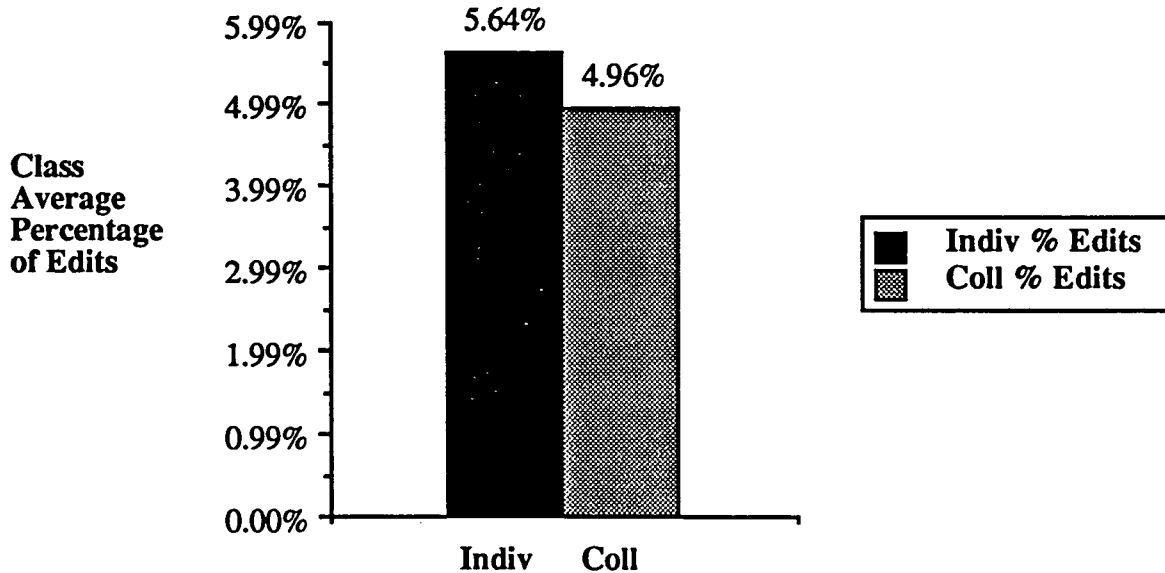
Figure 3.   Comparison of average percentage of edits made between individual and
collaborative writing activities

Table 3.   Two-way ANOVA for the average percentage of edits made

Source of Variation	Sum of Squares	Degrees of Freedom	Mean Square	F	Sig. of F
Main Effects	2.170	2	1.085	1.082	.344
Size of Group	1.084	1	1.084	1.081	.302
Time of Activities	1.086	1	1.086	1.083	.301
2-Way Interactions	1.180	1	1.180	1.177	.281
Size of Group by Time of Activities	1.180	1	1.180	1.177	.281
Residual	76.210	76	1.003		

Since the mean percentage of edits made on the individual and collaborative writing assignments was not normally distributed, a square root transformation was conducted in order to stabilize the variances. A two-way analysis of variance test was then carried out to test the significance of the difference in the average percentage of edits made between the individual and collaborative writing assignments. Results of the analysis failed to show a significant difference in the average percentage of edits made between the individual and collaborative writing assignments. Table 3 shows the results of the two-way ANOVA for the average percentage of edits made.

Research Question 4

The fourth research question was stated as follows: Will there be a difference in the quality of the final written product when the children write individually or collaboratively at the computer?

Scores on the writing assignments ranged from 1.00 to 5.00, with 1.00 representing the highest quality paper and 5.00 representing the lowest. Average scores on the first individual writing assignment ranged from 1.00 to 5.00, with a mean of 3.35, $SD = 1.01$. For the second individual writing assignment, average scores ranged from 1.00 to 5.00, with a mean of 3.18, $SD = 1.22$. Overall, the average score on the individual writing assignments ranged from 1.33 to 5.00, with a mean of 3.27, $SD = .97$.

Average scores on the first collaborative writing assignment ranged from 1.67 to 4.33, with a mean of 3.37, $SD = .96$. For the second collaborative writing assignment, average scores ranged from 1.33 to 4.00, with a mean of 3.07, $SD = .97$. Overall, the average score on the collaborative writing assignments ranged from 1.50 to 4.17, with a mean of 3.22, $SD = .93$.

**Comparison of Individual and
Collaborative Writing Scores**
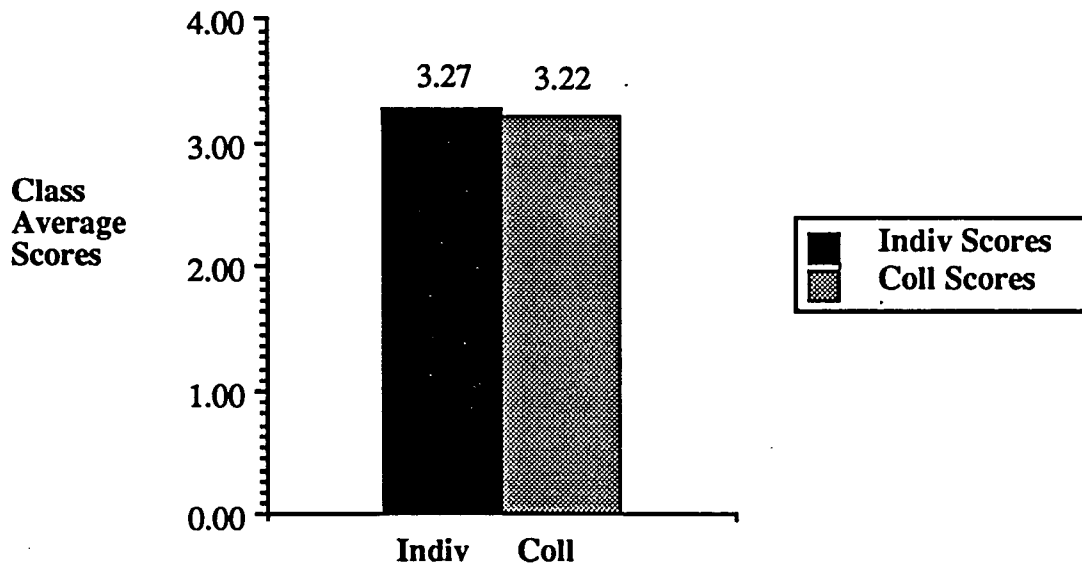
Figure 4.   Comparison of average writing scores between individual and collaborative
            writing activities

Table 4.   Two-way ANOVA for the average writing scores

Source of Variation	Sum of Squares	Degrees of Freedom	Mean Square	F	Sig. of F
Main Effects	1.139	2	.569	.523	.595
Size of Group	.050	1	.050	.046	.831
Time of Activities	1.089	1	1.089	1.000	.321
2-Way Interactions	.089	1	.089	.082	.776
Size of Group by Time of Activities	.089	1	.089	.082	.776
Residual	82.767	76	1.089		

A comparison was made of the average scores on the combined collaborative assignments with the average scores on the combined individual assignments (see Figure 4). This comparison showed that the students averaged .05 points better on the collaborative writing assignments than they did on the individual writing assignments.

To test the significance of this difference, the researcher used a two-way analysis of variance test. Results of the analysis failed to show a significant difference in the average scores between the individual and collaborative writing assignments. Table 4 shows the results of the two-way ANOVA for the average writing scores.

Research Question 5

The fifth research question was stated as follows: Will there be a change in students' attitudes toward writing at the computer during each stage of the writing process (prewriting, writing, revising, editing, and publishing)?

Students' attitude scores were measured using scales that were composed of certain attitude items on the questionnaire designed by the researcher. Students' answers on each attitude item that contributed to an attitude scale were summed and then divided by the number of items contributing to the scale to yield an average item score for the attitude scale. On the questionnaire, a "5" answer on an attitude item was coded as the highest positive score, with a "1" answer representing the lowest positive score. Each student completed the questionnaire before the writing assignments began and again after finishing the writing assignments. Scores on the questionnaire for these attitude scales will be discussed in relationship to the writing stage to which they referred.

Prewriting

Average item scores on the scale for attitude toward prewriting at the computer (attitude items 16, 19, 31, 42 and 48) ranged from 1.60 to 4.20. The mean item score for this scale on the pretest questionnaire was 2.63, $SD = .58$, with the posttest items averaging a

3.35 score on the same attitude scale, $SD = .59$. Item scores on the posttest averaged 0.72 higher than the pretest item scores for this attitude scale, indicating an increase in positive attitude toward prewriting at the computer. To test the significance of this difference, the researcher used a one-way analysis of variance test, with time as the factor.

Results of the analysis showed that, between the pretest and posttest administrations of the questionnaire, the difference in the average item scores on the scale for attitude toward prewriting at the computer was significant, $p < .001$. Table 5 shows the results of the one-way ANOVA for the attitude toward prewriting at the computer.

Table 5. One-way ANOVA for the differences in attitude toward prewriting at the computer

Source	Degrees of Freedom	Sum of Squares	Mean Squares	F Ratio	F Prob.
Between Questionnaires	1	5.2201	5.2201	15.2529	.0004 **
Within Questionnaire	38	13.0049	.3422		

** $p < .001$.

Writing

Average item scores on the scale for attitude toward writing at the computer (attitude items 20, 25, 35, 50, and 60) ranged from 1.20 to 4.80. The mean item score for this scale on the pretest questionnaire was 2.87, $SD = .86$, with the posttest items averaging a 3.49 score on the same attitude scale, $SD = .79$. Item scores on the posttest averaged 0.62 higher than the pretest item scores for this attitude scale, indicating an increase in positive attitude toward writing at the computer. To test the significance of this difference, the researcher used a one-way analysis of variance test, with time as the factor.

Results of the analysis showed a significant difference between the pretest and posttest administrations of the questionnaire on the scale for attitude toward writing at the computer, p < .05. Table 6 shows the results of the one-way ANOVA for the attitude toward writing at the computer.

Table 6.   One-way ANOVA for the differences in attitude toward writing at the computer

Source	Degrees of Freedom	Sum of Squares	Mean Squares	F Ratio	F Prob.
Between Questionnaires	1	3.7822	3.7822	5.5573	.0237 *
Within Questionnaire	38	25.8625	.6806		

* $p < .05$.

Revising

Average item scores on the scale for attitude toward revising at the computer (attitude items 24, 27, 38, 40, 52, and 58) ranged from 2.33 to 5.00. The mean item score for this scale on the pretest questionnaire was 3.71, SD = .79, with the posttest items averaging a 3.97 score on the same attitude scale, SD = .63. Item scores on the posttest averaged 0.26 higher than the pretest item scores for this attitude scale, indicating a slight increase in positive attitude toward revising at the computer. To test the significance of this difference, the researcher used a one-way analysis of variance test, with time as the factor.

Results of the analysis failed to show a significant difference between the pretest and posttest administrations of the questionnaire on the scale for attitude toward revising at the computer. Table 7 shows the results of the one-way ANOVA for the attitude toward revising at the computer.

Table 7.   One-way ANOVA for the differences in attitude toward revising at the computer

Source	Degrees of Freedom	Sum of Squares	Mean Squares	F Ratio	F Prob.
Between Questionnaires	1	.6717	.6717	1.3161	.2585
Within Questionnaire	38	19.3939	.5104		

Editing

Average item scores on the scale for attitude toward editing at the computer (attitude items 26, 29, 33, 57, and 61) ranged from 2.40 to 5.00. The mean item score for this scale on the pretest questionnaire was 3.64, SD = .84, with the posttest items averaging a 3.88 score on the same attitude scale, SD = .66. Item scores on the posttest averaged 0.24 higher than the pretest item scores for this attitude scale, indicating a slight increase in positive attitude toward editing at the computer. To test the significance of this difference, the researcher used a one-way analysis of variance test, with time as the factor.

Results of the analysis failed to show a significant difference between the pretest and posttest administrations of the questionnaire on the scale for attitude toward editing at the computer. Table 8 shows the results of the one-way ANOVA for the attitude toward editing at the computer.

Table 8.   One-way ANOVA for the differences in attitude toward editing at the computer

Source	Degrees of Freedom	Sum of Squares	Mean Squares	F Ratio	F Prob.
Between Questionnaires	1	.5562	.5562	.9747	.3298
Within Questionnaire	38	21.6833	.5706		

Publishing

Average item scores on the scale for attitude toward publishing using the computer (attitude items 17, 30, 32, 36, and 63) ranged from 2.20 to 4.60. The mean item score for this scale on the pretest questionnaire was 3.18, $SD = .59$, with the posttest items averaging a 3.39 score on the same attitude scale, $SD = .63$. Item scores on the posttest averaged 0.21 higher than the pretest item scores for this attitude scale, indicating a slight increase in positive attitude toward publishing using the computer. To test the significance of this difference, the researcher used a one-way analysis of variance test, with time as the factor.

Results of the analysis failed to show a significant difference between the pretest and posttest administrations of the questionnaire on the scale for attitude toward publishing using the computer. Table 9 shows the results of the one-way ANOVA for the attitude toward publishing using the computer.

Table 9. One-way ANOVA for the differences in attitude toward publishing using the computer

Source	Degrees of Freedom	Sum of Squares	Mean Squares	F Ratio	F Prob.
Between Questionnaires	1	.4731	.4731	1.2864	.2638
Within Questionnaire	38	13.9744	.3677		

Research Question 6

The sixth research question was stated as follows: Will there be an overall change in students' attitudes toward writing collaboratively at the computer?

Students' attitude scores toward writing collaboratively at the computer were measured

using a scale that was composed of attitude items 22, 23, 44, 51, and 55 on the questionnaire

designed by the researcher. As with the previous research question dealing with student

attitudes, students' answers on each attitude item that contributed to the attitude scale were

summed and then divided by the number of items contributing to the scale to yield an average

item score for the attitude scale. An answer of "5" on an attitude item was coded as the

highest positive score, with a "1" answer representing the lowest positive score, as in the

previous research question also.

Average item scores on the scale for overall attitude toward writing collaboratively at

the computer ranged from 1.20 to 5.00. The mean item score for this scale on the pretest

questionnaire was 3.00, SD = .82, with the posttest items averaging a 2.73 score on the same

attitude scale, SD = .84. Item scores on the posttest averaged 0.27 lower than the pretest item

scores for this attitude scale, indicating a slight decrease in positive attitude toward writing

collaboratively at the computer. To test the significance of this difference, the researcher used

a one-way analysis of variance test, with time as the factor.

Table 10. One-way ANOVA for the differences in attitude toward writing collaboratively at the computer

Source	Degrees of Freedom	Sum of Squares	Mean Squares	F Ratio	F Prob.
Between Questionnaires	1	.7111	.7111	1.0305	.3165
Within Questionnaire	38	26.2222	.6901		

Results of the analysis failed to show a significant difference between the pretest and

posttest administrations of the questionnaire on the scale for attitude toward writing

collaboratively at the computer. Table 10 shows the results of the one-way ANOVA for the attitude toward writing collaboratively at the computer.

Auxiliary Findings

In addition to findings that provided answers for the six research questions, some interesting auxiliary findings also emerged. The following two sections on quantitative and qualitative findings discuss these additional results.

Quantitative findings

Although students' attitudes toward writing collaboratively at the computer did not change significantly between the first and second administrations of the questionnaire, one finding that was significant between the pretest and posttest was the change in students' attitudes toward writing at the computer in general, $p < .05$. Average item scores on the scale for attitude toward writing at the computer in general (attitude items 16, 17, 19, 20, 21, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 40, 42, 48, 50, 52, 54, 57, 58, 60, 61, and 63) ranged from 2.12 to 4.77. The mean item score for this scale on the pretest questionnaire was 3.25, $SD = .60$, with the posttest items averaging a 3.67 score on the same attitude scale, $SD = .49$. Item scores on the posttest averaged 0.42 higher than the pretest item scores for this attitude scale, indicating an increase in positive attitude toward writing at the computer. To test the significance of this difference, the researcher used a one-way analysis of variance test, with time as the factor.

Results of the analysis showed a significant difference between the pretest and posttest administrations of the questionnaire on the scale for attitude toward writing at the computer, $p < .05$. Table 11 shows the results of the one-way ANOVA for the attitude toward writing at the computer.

Table 11.   One-way ANOVA for the overall differences in attitude toward writing at the
            computer

Source	Degrees of Freedom	Sum of Squares	Mean Squares	F Ratio	F Prob.
Between Questionnaires	1	1.7465	1.7465	5.8118	.0209 *
Within Questionnaire	38	11.4196	.3005		

* $p < .05$.

In addition to further analyzing the attitude questionnaire, the researcher also conducted further analyses of the writing assignments. To measure any differences that may have occurred between the first writing assignments, one individual and one collaborative, and the second writing assignments, one individual and one collaborative, as well as any interaction effects between the size of group and the time of writing activities, the researcher further analyzed the two-way ANOVA tables (repeated measures design) that were produced for research questions one through four (see Tables 1 through 4). No significant differences were found in the number of ideas produced during prewriting, the percentage of revisions and edits made, or the writing scores based on the time of the writing activities. Furthermore, no interaction effects occurred between size of group and time of writing activities for any of these measures.

One finding that was significant was the difference in the percentage of edits between the two collaborative writing assignments. For the first collaborative writing assignment, subjects edited an average of 5.80% of their written text, $SD = 4.46\%$. In the second collaborative writing assignment an average of 4.11% of the written text was edited (see Figure 5), $SD = 4.32\%$. The difference between these two shows a decrease of 1.69% in the average percentage of edits made on the collaborative writing assignments. This decrease in percentage of edits made between the two collaborative writing assignments was represented

by four writing pairs, with six pairs of students showing an increase in percentage of edits made.

Comparison of Edits Between First and Second Collaborative Writing Assignments
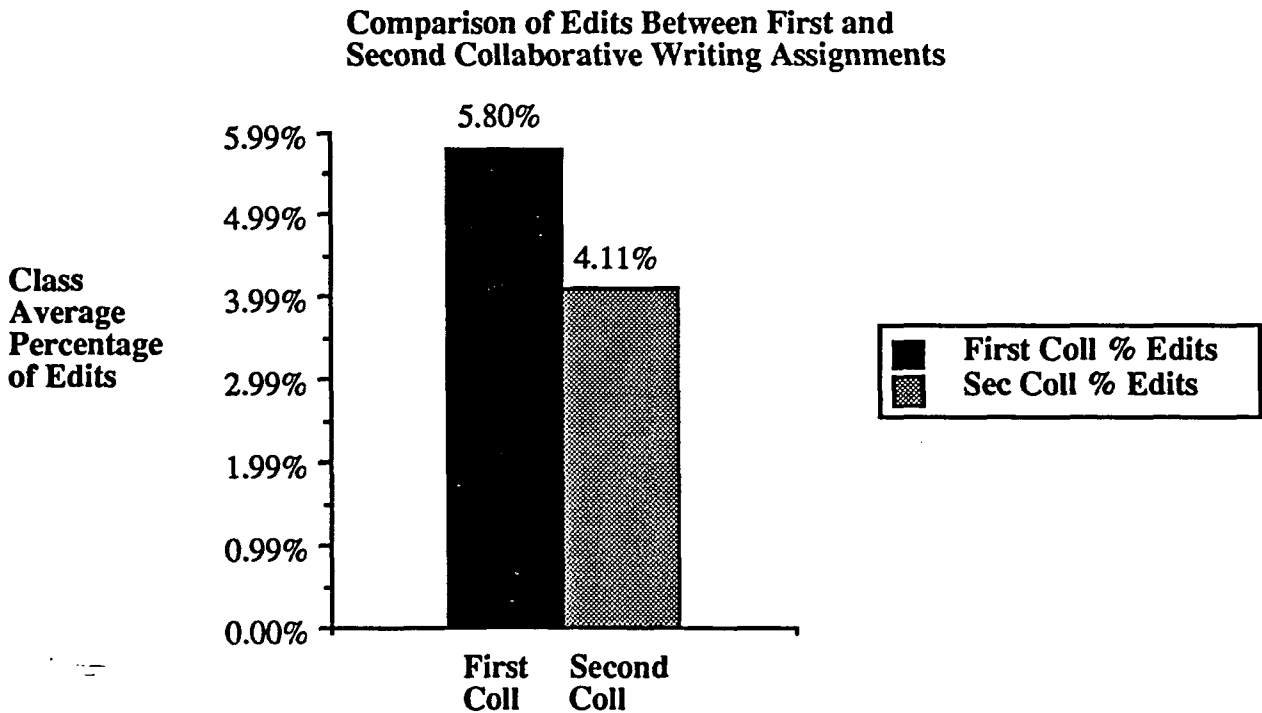
Figure 5.   Comparison of average percentage of edits made between first and second collaborative writing assignments

Since the average percentage of edits made on the collaborative writing assignments was not normally distributed, a square root transformation was conducted in order to stabilize the variances. To test the significance of the difference in the average percentage of edits made between the first and second collaborative writing assignments, an analysis of variance test for repeated measures was then carried out. As shown in Table 12, the results of the repeated measures ANOVA for edit percentages showed a significant difference between the first and second collaborative writing assignments, $p < .10$.

Table 12.   Repeated measures ANOVA for the percentage of edits made on the two
collaborative writing assignments

Source of Variation	Sum of Squares	Degrees of Freedom	Mean Square	F	Prob.
Between People	31.9773	19	1.6830		
Within People	12.9201	20	.6460		
Between First and Second Collaborative Assignments	2.2651	1	2.2651	4.0391	.0589 *
Residual	10.6550	19	.5608		

$* \ p < .10.$

**Comparison of Edits Between First and
Second Individual Writing Assignments**
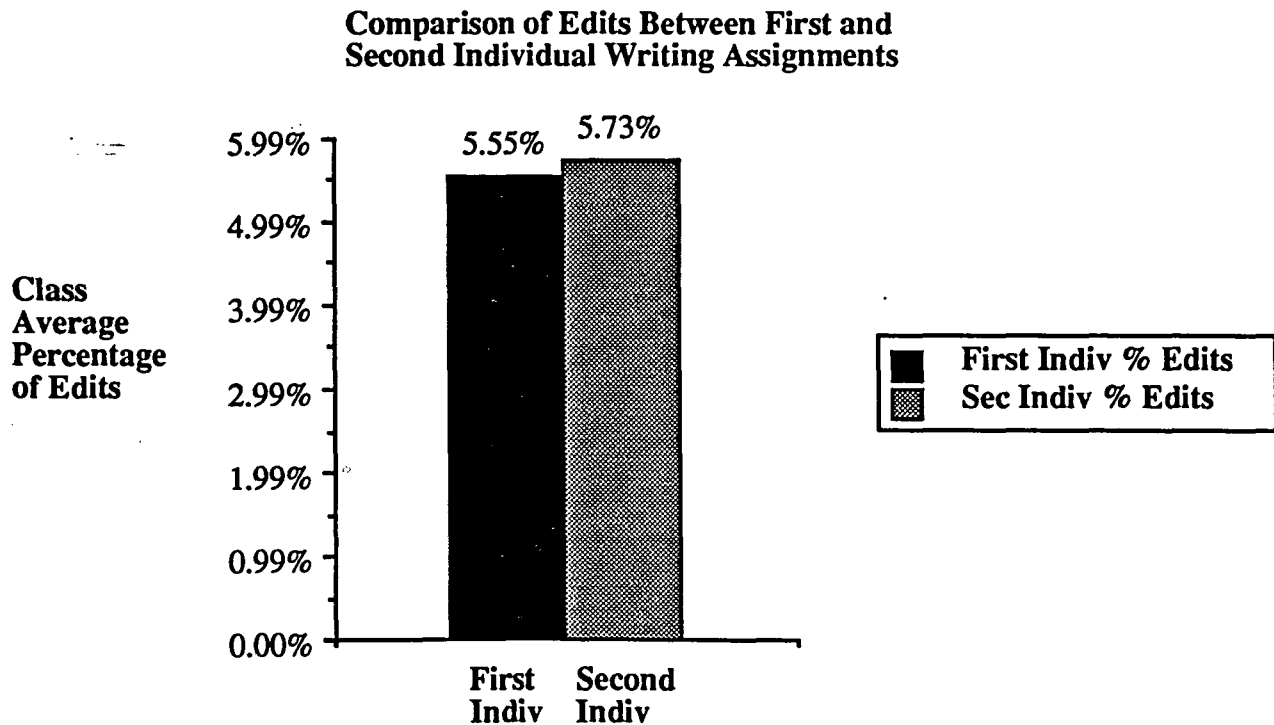
Figure 6.   Comparison of average percentage of edits made between first and second
individual writing assignments

For the individual writing activities, the percentage of edits made increased slightly, from an average of 5.55%, SD = 4.45%, on the first assignment, to an average of 5.73%, SD = 4.39%, on the second assignment (see Figure 6). This increase was represented by eight students, with twelve students decreasing the percentage of edits from the first to the second individual writing activities.

Table 13.   Repeated measures ANOVA for the percentage of edits made on the two individual writing assignments

Source of Variation	Sum of Squares	Degrees of Freedom	Mean Square	F	Prob.
Between People	17.8212	19	.9380		
Within People Between First and Second Individual Assignments	15.7577	20	.7879		
	.0010	1	.0010	.0012	.9730
Residual	15.7567	19	.8293		

Since the average percentage of edits made on the individual writing assignments was not normally distributed, a square root transformation was conducted in order to stabilize the variances. An analysis of variance test for repeated measures was then carried out to test the significance of the difference in the average percentage of edits made between the first and second individual writing assignments. As shown in Table 13, the results of the repeated measures ANOVA for edit percentages failed to show any significant differences between the first and second individual writing assignments.

One other factor that differed significantly between the collaborative writing assignments but not between the individual writing assignments was children's writing

scores. As stated earlier, scores on the writing assignments ranged from 1.00 to 5.00, with

1.00 representing the highest possible score attainable and 5.00 representing the lowest.

Comparison of Scores Between First and Second Collaborative Writing Assignments
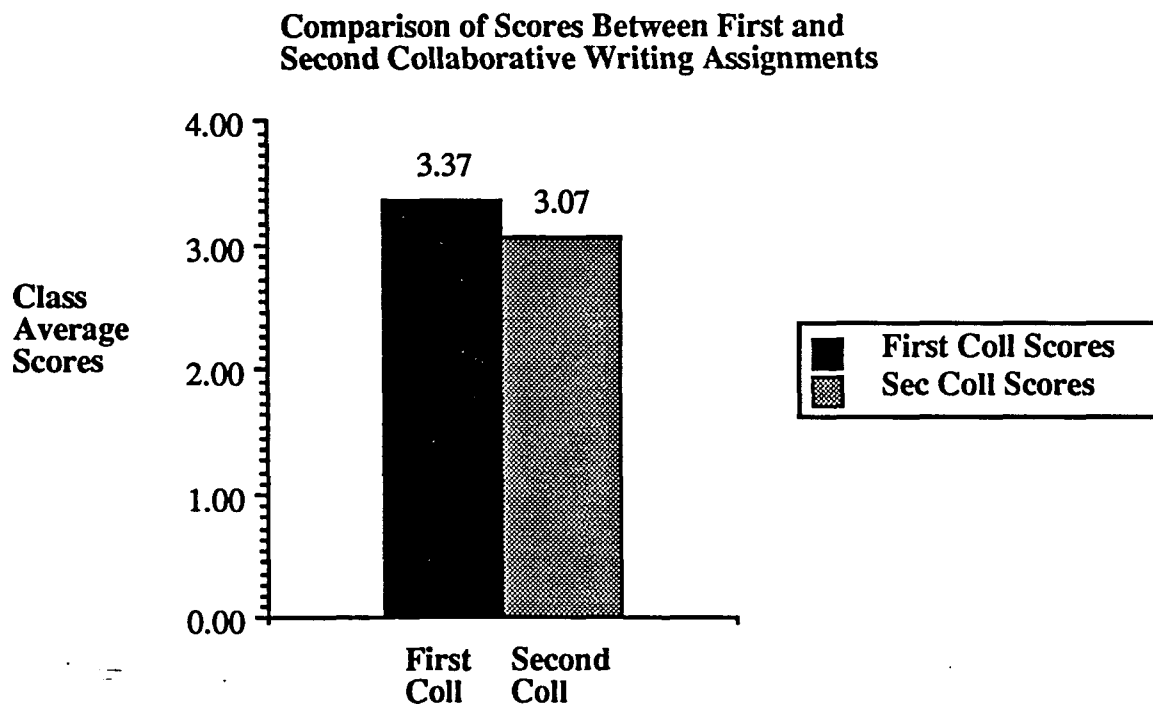
Figure 7.   Comparison of average writing scores between first and second collaborative writing assignments

On the first collaborative writing assignment, subjects' scores averaged 3.37, SD =

.96. The average score on the second collaborative writing assignment was 3.07, SD = .97,

indicating an improvement in quality (see Figure 7). This improvement in the average writing

score between the two collaborative writing assignments was evidenced by six pairs of

students, with one pair averaging a lower quality writing score on the second collaborative

assignment and three pairs remaining the same.

To test the significance of this difference in writing scores between the first and second

collaborative writing assignments, the researcher used an analysis of variance test for repeated

measures. As shown in Table 14, the results of the repeated measures ANOVA for writing

scores showed a significant difference between the first and second collaborative writing

assignments, $p < .05$.

Table 14.   Repeated measures ANOVA for the writing scores on the two collaborative
            writing assignments

Source of Variation	Sum of Squares	Degrees of Freedom	Mean Squares	F	Prob.
Between People	32.6778	19	1.7199		
Within People Between First and Second Collaborative Assignments	3.4444	20	.1722		
	.9000	1	.9000	6.7205	.0179 *
Residual	2.5444	19	.1339		

*. $p < .05$.

Like the collaborative writing assignments, average scores on the individual

assignments also improved. Scores on the first individual writing assignment averaged 3.35,

$SD = 1.01$, while those on the second individual assignment averaged 3.18 (see Figure 8), SD

$= 1.22$. This improvement was represented by nine students, with eight students averaging a

lower quality score on the second individual writing assignment and three students averaging

the same score on both individual writing assignments.

To test the significance of this difference in average writing scores between the first

and second individual writing assignments, the researcher used an analysis of variance test for

repeated measures. As shown in Table 15, the results of the repeated measures ANOVA for

writing scores failed to show any significant differences between the first and second

individual writing assignments.

**Comparison of Scores Between First and
Second Individual Writing Assignments**
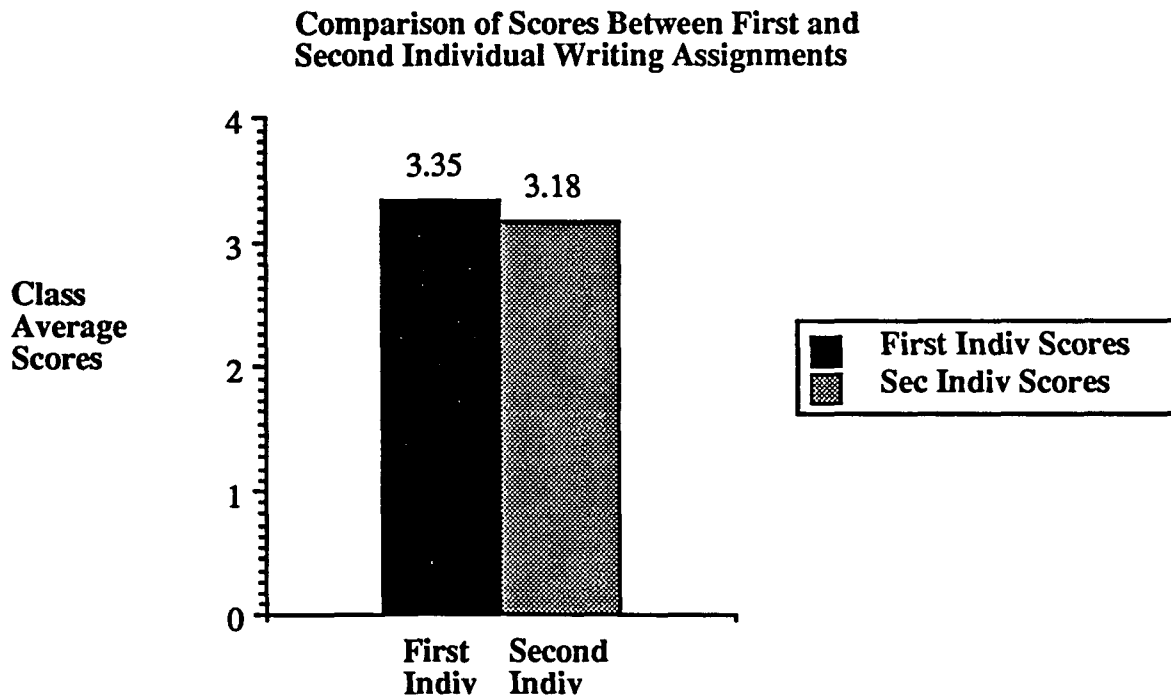
Figure 8. Comparison of average writing scores between first and second individual
writing assignments

Table 15. Repeated measures ANOVA for the writing scores on the two individual writing
assignments

Source of Variation	Sum of Squares	Degrees of Freedom	Mean Squares	F	Prob.
Between People	35.8222	19	1.8854		
Within People Between First and Second Individual Assignments	12.0000 .2778	20 1	.6000 .2778	.4502	.5103
Residual	11.7222	19	.6170		

Qualitative Findings

One interesting qualitative finding relates to a comment made by the English

Department's three professors when holistically grading the subjects' written pieces. The

procedures the English professors followed for grading the papers were outlined in Chapter 3.

In grading the writing pieces, all three professors agreed that the papers that resulted from the

second collaborative writing activity consistently illustrated stronger mechanics than papers

from the other three writing activities.

Another qualitative finding surfaced when analyzing students' audio taped

conversations during the collaborative writing activities. Analysis of these audio tapes

indicated that partners were generally cooperative and accepting of each other's suggestions.

This finding can be evidenced in the following excerpts of dialogue:

1.	Student 1:	"Hey, you never did write down Roseanne Barr."
	Student 2:	"Oh yeah." (followed by Student 2 typing 'Roseanne Barr')
	Student 2:	"There."
2.	Student 1:	"Who else should we put in?"
	Student 2:	"How about John Wayne?"
	Student 1:	"Umm, well, okay."
3.	Student 1:	"Really tan or just slightly tan?"
	Student 2:	"Just slightly."
	Student 1:	"Okay."

Analysis of the audio tapes also indicated that one partner sometimes dominated the

conversation, as in the following excerpts of dialogue:

1.	Student 1:	"Okay, we're going to use Erkle."
	Student 2:	"No, we're not."
	Student 1:	"Yes, we are. Now let's start out . . . "
2.	Student 1:	"Okay, hair color . . . black. Eyes . . . brown. Face . . . pretty. Clothing . . . colorful. Shoes . . . Nike hightops. How do you spell hightops? . . . I think it's all one word. What else?"
	Student 2:	"Umm." (followed by silence)
	Student 1:	"Okay, how about weight . . . 150 pounds . . . ."

Summary

Students completed an attitude questionnaire both before and after four writing activities, which lasted a total of eight weeks. Attitudes measured included the following: (a) working with a partner, (b) writing with a partner, (c) writing with a computer, (d) writing with a computer during each stage of the writing process, and (e) writing with a partner on the computer. Results of the attitude questionnaire were analyzed using several one-way ANOVA tests. Findings indicated a significant increase in students' attitudes toward prewriting at the computer and a significant increase in attitudes toward writing at the computer. Although students' attitudes toward revising, editing, and publishing using the computer increased, this increase was not significant. Also insignificant was the slight decrease in students' attitudes toward writing collaboratively at the computer.

In addition to completing the attitude questionnaire, students participated in four writing activities--two individual and two collaborative. The research questions examined the differences between individual and collaborative writing in the average number of ideas produced during the prewriting stage, the average percentage of revisions and edits made during the revising and editing stages, respectively, and the quality of the final written products. Results were analyzed using two-way ANOVA tests. Findings indicated that significantly more ideas were produced during the prewriting stage of the collaborative writing assignments than during the prewriting stage of the individual writing assignments. Although students averaged a greater percentage of revisions during the collaborative writing assignments, as well as better writing scores, these differences were not significant. Also insignificant was the smaller percentage of edits that students averaged during the collaborative writing assignments.

Auxiliary findings indicated a significant positive increase between the pretest questionnaire and the posttest questionnaire in students' attitudes toward writing at the computer in general. Findings also showed a significant decrease in the average percentage of

edits made as well as an improvement in the quality of written pieces from the first collaborative writing activity to the second collaborative writing activity. Comments from the English professors who graded the students' papers indicated that papers from the second collaborative writing activity consistently illustrated stronger mechanics than papers from the other three writing activities.

The audio taped interactions of students during the collaborative writing sessions indicated that student partners generally cooperated with one another and were accepting of each other's comments, although some partners tended to dominate the conversations.

Thus, students in this whole language classroom were able to successfully write with a partner using the computer. While collaboratively writing at the computer, students brainstormed significantly more ideas during prewriting activities. Students also developed significantly more positive attitudes toward prewriting at the computer; toward writing at the computer; and toward writing at the computer in general, no matter what stage of the writing process, during the eight-week period of the study. Furthermore, students writing collaboratively revised a higher percentage of their documents and achieved higher quality writing scores than when they wrote individually, although these two findings were not significant.

CHAPTER V. SUMMARY, DISCUSSION, AND RECOMMENDATIONS

Summary

Whole language is an educational philosophy that emphasizes the social nature of learning, maintaining that children use the different forms of language to engage with others around them in order to communicate and to determine if communication has taken place. One important language process through which children attempt to communicate is writing. Research in the area of writing has shown that writing in groups facilitates the discovery of knowledge and helps to determine if communication has taken place.

One medium that appears to foster a "group writing environment" where children naturally work and write together to create ideas is the computer. Through their observations of children writing collaboratively at the computer, as well as their analyses of group written pieces, researchers have determined that the computer can be a powerful tool in helping students create a social/communicative environment that enhances the quality of the written piece. A teaching philosophy such as whole language, with its emphasis on writing, communication, and the social nature of learning, may well lend itself to collaborative computer writing. Investigation into the relationship among the computer, collaborative writing, and whole language will lead to a further understanding of the effective uses of collaborative computer writing within a philosophy that is increasingly gaining recognition as an effective philosophy of teaching.

The purpose of this study was to compare the effects of grouping students individually and collaboratively on their accomplishments as they progressed through each stage of the writing process at the computer. Data were collected regarding the quantity of ideas students produced during the prewriting stage, the average percentage of changes made during the revising and editing stages, and the quality of the final written product. Also measured were students' attitudes toward writing at the computer during each stage of the writing process as well as their attitudes toward writing collaboratively at the computer.

A classroom of twenty sixth-grade students from the West Des Moines School District, a district that operates under the whole language philosophy, participated in this study. The study lasted eight weeks and encompassed a pre- and posttest attitude questionnaire as well as four writing assignments. All writing assignments were completed using seventeen networked IBM computers and four non-networked IBM computers in a computer lab. Two of the assignments were written individually, and two were written collaboratively with a partner. Printouts were collected of students' first and final drafts for each writing assignment in order to tally revisions and edits. The final written pieces were holistically scored on a scale from one to five by independent graders. Attitude items that were negatively worded on the questionnaire were reverse scored (items 16, 17, 18, 19, 20, 22, 23, 25, 26, 29, 31, 32, 34, 38, 43, 49, 50, 52, 54, 55, 58, 59, 61, and 63). Results were analyzed using the $SPSS_X$ procedures for a 2x2 (group structure and time) within-subjects analysis of variance, a repeated measures ANOVA, and a one-way (time) analysis of variance test. The alpha level was set at .10 because of the exploratory nature of the study.

This study was designed to measure how a specific type of writing environment affected the changes students made in their written pieces as well as the quality of their written pieces. Using subjects who were accustomed to working with the computer and who had already been exposed to the specific word processing package used in the study (Bank Street Writer III) was important in order to eliminate variables such as computer anxiety and lack of familiarity with the computer keyboard and word processing.

Discussion of the Results

Researchers studying the effects of collaborative writing at the computer have found that the presence of someone else during the writing process facilitates the generation of ideas (Daiute, 1989; Riel, 1983). Similarly, findings from this exploratory study indicated a

significant increase in the average number of ideas produced by students during prewriting activities when the students wrote collaboratively with a partner rather than individually.

For the individual writing activities, the average number of ideas produced during the prewriting stage was 20.90, while the average number of ideas produced during prewriting activities on the collaborative writing assignments was 41.20. The difference between these two averages indicated an increase of 20.30 ideas from the prewriting activities of the individual writing assignments to the prewriting activities of the collaborative writing assignments. This increase was significant.

In addition to prewriting, the editing and revising stages of the writing process have also been a focus of research in recent years. This research, however, has concentrated largely on older and more experienced writers. Consequently, results are inconclusive as to the effects of the word processor on younger students' revisions and edits. Some researchers have suggested that students will make use of the word processor's ease of revision only when they are encouraged by a peer or teacher (Graves, 1983; Schwartz, 1988).

Results from this study with young writers found that even the help of a peer or teacher is not enough to focus students' attention on the revising and editing capabilities of the word processor. Percentages of revisions and edits were calculated by dividing the number of revisions and edits, respectively, by the total number of words in the first draft of the written piece and then multiplying by one hundred. Average revisions for the collaborative groups, who had the opportunity for support not only within themselves but also from the researcher and the classroom teacher, were less than 1% (0.97%) of the entire text, and edits represented only 4.96% of the text.

During the individual writing activities, when the only support that students received was from the researcher and the classroom teacher, revisions averaged only 0.60% of the text, an even smaller percentage than the collaborative writing activities. The average percentage of edits students made on the individual writing assignments, 5.64%, was somewhat higher than

the average percentage made on the collaborative writing assignments. Even so, the revisions and edits made during the individual and the collaborative writing activities represented a small percentage of the entire text. It would appear that students need more than a writing partner and support from the teacher in order to use the revising and editing capabilities of the word processor.

It would also appear, at least in this study, that the presence, or absence, of a writing partner does not make a difference in the percentage of text that students revise or edit. The difference in the average percentage of text that students revised individually and the average percentage they revised collaboratively was 0.37%. For the average percentage of edits, the difference between the individual and collaborative pieces was 0.68%. Neither of these differences proved to be significant.

Like revision and editing, writing quality represents another increasingly popular topic of educational research. The literature has shown that students who have a supportive peer group that shares their writing with one another are more interested in writing and achieve higher scores in writing than those who do not have a supportive peer group (Soltis & Walberg, 1989). Although this study found that students achieved slightly better writing scores when writing collaboratively with a partner rather than alone, this improvement in writing score was not significant. Students averaged a score of 3.22 on their collaborative writing assignments, $SD = .93$, with 1.00 representing the highest possible score and 5.00 the lowest, while 3.27 was the average score on the individual writing assignments, $SD = .97$. The difference in average scores of .05 between the collaborative and individual writing assignments was not significant.

The lack of significant difference in the writing scores between the collaborative and individual writing assignments might be the effect of a narrow grading scale. As mentioned earlier, students' assignments were graded on a five-point scale. Based on the average scores and standard deviations of both the individual and collaborative writing assignments, it would

appear that a broader scale might have allowed for finer distinctions among students' written pieces, which might, in turn, have allowed more room for a significant difference between the scores of the individual and collaborative writing assignments.

In addition to measuring concrete items such as revisions and edits, some researchers are dealing with more abstract items such as students' attitudes toward writing. Research evidence has shown that students enjoy the writing process more (Keyboarding/word processing topics . . . some findings, 1988) and develop more positive attitudes toward writing when using the word processor (Brisk, 1985; Hennings, 1981). Findings from this study support the research on student attitudes for some stages of the writing process but not for others.

Students in this study showed significantly more positive attitudes on the questionnaire posttest toward using the computer for the prewriting and writing stages of the writing process. Mean item scores on the scale for attitude toward prewriting at the computer were 2.63 on the pretest, SD = .58, and 3.35 on the posttest, SD = .59, representing a significant increase in positive attitude toward prewriting at the computer. Similarly, mean item scores on the scale for attitude toward writing at the computer were 2.87 on the pretest, SD = .86, and 3.49 on the posttest, SD = .79, also representing a significant increase in positive attitude toward writing at the computer. On the questionnaire, an answer of 2 represented "disagree," and an answer of 3 represented "not sure," indicating that students either disagreed or were not sure about their feelings toward what the attitude statement was implying. One might note that students' average responses on the pretest for both of these attitude scales were on the negative side of the scale (in the 2s), whereas the average responses on the posttest were on the positive side of the scale (in the 3s). One possible explanation for the increase in both of these attitudes, then, might be that students' attitudes, which started out more negative than positive, had room for improvement.

For the factors of revising, editing, and publishing using the computer, average item scores on the posttest also represented more positive student attitudes than average item scores on the pretest, although the increase in positive attitude was not significant for these three attitude scales. An explanation similar to the previous one might account for this insignificance. Students' average responses on the pretest for all three of these attitude scales were in the 3s, indicating a lean toward the positive end of the scale. Thus, students' responses for these attitude scales did not have as much room for improvement as the prewriting and writing attitude scales. Pretest average responses already indicated a lean toward the positive end of the scale for the attitudes toward using the computer for revising, editing, and publishing.

Another possible explanation for the lack of significant difference between the pretest and posttest questionnaires on the scales for attitude toward revising, editing, and publishing using the computer might be the effect of a narrow scale. The items that contributed to these attitude scales were responded to on a five-point Likert-type agreement scale. The average item response on the pretest questionnaire's scale for attitude toward revising using the computer was 3.71, $SD = .79$, while the average item response on the posttest questionnaire's scale was 3.97, $SD = .63$. On the scale for attitude toward editing using the computer, the average pretest item response was 3.64, $SD = .84$, while the average posttest item response was 3.88, $SD = .66$. The average item response on the pretest scale for attitude toward publishing using the computer was 3.18, $SD = .59$, while the average posttest item response was 3.39, $SD = .63$. Based on these average item responses and standard deviations, it would appear that students' responses on the questionnaire's attitude items might have been better distinguished among if a broader scale had been used. This, in turn, might have allowed more room for a significant difference between the pretest and posttest questionnaires on the scales for attitudes toward revising, editing, and publishing using the computer.

Another attitude factor that did not change significantly over the eight-week course of the study was the attitude toward writing collaboratively at the computer. Differences between the pretest and posttest indicated a slight decrease in positive attitude toward writing collaboratively at the computer, although this decrease was not significant.

One possible explanation for the lack of significant increase in positive attitude toward collaborative writing at the computer might be that four weeks--the amount of time students wrote collaboratively with a partner--was an insufficient amount of time for students to grasp the opportunities abound in collaborative writing. Students in this study were not accustomed to writing entire pieces of text with a partner but rather were accustomed to conferencing with a partner when feedback was needed. It might be that sixth-grade students require longer than four weeks to develop a trusting, professional relationship with a writing partner. Since the collaborative writing sessions of this study only lasted four weeks, that could possibly explain the lack of significant increase in positive attitude toward collaborative writing at the computer.

A similar reason might provide an additional explanation for the lack of significant increase in positive attitude toward revising, editing, and publishing using the computer. Maybe eight weeks--the amount of time the study lasted--was not enough time for students to realize the power of the word processor for revising, editing, and publishing tasks. The Bank Street Writer III word processing program that was used in this study has the capabilities of moving entire blocks of text, deleting entire blocks of text, unmoving and undeleting entire blocks of text, checking spelling, and changing the spacing of print as well as the columns. Students received demonstrations of all of these functions in practice sessions during the second, third, and fourth days of the study. It might be, however, that students were intimidated by the power of the Bank Street Writer III program or that they forgot about some of its functions by the time they needed to use them. Whatever the case is, several researchers have reported that the amount of time students are given to practice and write with the word processor is a factor in the quality of products the students produce (Brisk, 1985; Collier,

1983; Morton, 1988; Phenix & Hannan, 1984). The possibly insufficient practice time with revising, editing, and publishing functions of the word processor in this study might have been a factor in the lack of significant increase in positive attitudes toward revising, editing, and publishing using the computer.

<div align="center">Discussion of the Auxiliary Findings</div>

Although eight weeks might not have been enough time for students to improve their attitudes toward revising, editing, and publishing using the computer, it appears to have been enough time for students to see the value of writing at the computer in general. One significant auxiliary finding showed an increase in students' overall attitudes toward writing at the computer. Mean item scores for this attitude were 3.25 on the pretest, $SD = .60$, and 3.67 on the posttest, $SD = .49$, representing a significant increase in positive attitude toward writing at the computer.

Another auxiliary finding showed that, although children's writing scores did not differ significantly between individual and collaborative writing activities, quality writing scores did improve significantly between the first and second collaborative writing activities. Such a finding corroborates earlier findings from G. Gayle Allen's study with Iowa State University juniors and seniors in the summer of 1990. These findings might be interpreted as suggesting that students grow together and learn to write in a productive partnership over time.

Students' writing scores in the present study averaged 3.37 on the first collaborative writing activity and 3.07 on the second collaborative writing activity. One possible explanation for the improvement in writing scores in the collaborative writing assignments might be that the topic of the second collaborative assignment was perceived by the students as more desirable to write about than the topic of the first collaborative assignment. One other explanation for this improvement in students' collaboratively written products might be

supported by the nature of cooperative work. The possibility exists that, after the initial period of getting to know one another passed, partners both benefited from the experiences that each brought to the learning situation.

The nature of cooperative work might also be partially responsible for one other auxiliary finding. Data collected from the two collaborative writing assignments showed that the percentage of edits students made significantly decreased from the first collaborative writing activity to the second collaborative writing activity. One explanation for these findings might be that, as the writing partners grew accustomed to each other, they began to discuss their ideas more before accepting or rejecting them. Rather than entering into the computer the first thing that came to mind, partners might have tried ideas out with each other, rewording them, and talking about confusing spellings before entering the information into the computer. If this was the case, then the writing pairs actually edited in their heads or out loud before arranging the information into a first draft. This editing in the process of creating a first draft would not have been evident in the printed documents. Thus, what might appear to represent a smaller percentage of edits in the students' second collaborative pieces might not necessarily be representative of what actually took place during the writing process. Another explanation for the decrease in the percentage of edits from the first collaborative writing assignment to the second collaborative writing assignment might be that the topic of the second collaborative writing assignment, description of a setting, was perceived by the students as less desirable to write about than the topic of the first collaborative writing assignment, description of a character.

Qualitative findings provided further support for the use of collaborative writing groups. Analysis of the audio taped conversations of pairs of students indicated that students were generally cooperative and accepting of one another's comments, although some students tended to dominate the conversations. This cooperation might be one possible explanation for the other qualitative finding that the assignments written during the second collaborative

writing activity appeared to be stronger in the area of mechanics than assignments written during the other three writing activities. Students might have learned by the time they participated in the second collaborative writing assignment how to cooperate and combine their talents in looking for mechanical errors.

Recommendations for Further Study

Results of this study indicated that further research is needed in the use of collaborative computer writing groups in the whole language classroom.

The first recommendation is to extend the length of the study. Both this study with sixth-grade students and that of G. Gayle Allen with college juniors and seniors found a significant improvement in students' writing scores from the first collaborative assignment to the second. An extension would allow the researcher to follow students' collaborative writing scores for a longer period of time to measure whether the scores continue to improve significantly. This extension would also give students a longer time to develop a productive working relationship and to mature as partners. The researcher would then have a chance to study the patterns of interaction that may develop between partners over time. Another reason for extending the length of the study would be to measure any changes in students' use of the word processor's revising, editing, and publishing functions over time.

The second recommendation is to study the effects of varying the writing process stages in which collaboration occurs. One possibility would be to have students collaborate during the prewriting stage, then write their own first drafts, followed by collaborating again to help one another revise and edit, and then publish alone, obtaining suggestions and opinions from the partner, if desired. Another possibility would be to let students decide if, when, and with whom they would like to collaborate in writing.

A third recommendation is to replicate the study with younger whole language students to discover possible differences that might occur because of age. Most of the research

regarding collaborative writing deals with older students, so a study of this nature would be very valuable to the field of education.

A fourth recommendation is to carry out a similar study with whole language students in which the students decide beforehand the broad topics with which they will be working. Whole language stresses the importance of student choice in developing ownership of the writing process.

A fifth recommendation is to carry out a study similar to the present one in which the writing assignments are even more closely related. The more closely related the writing assignments are, the more certain one can be that any differences that occur between writing assignments are not due to the topic or nature of the writing assignment itself.

One final recommendation is to study the effects of peer conferencing in individual computer writing. Peer conferencing is a method often used by students in whole language classrooms to obtain feedback from other students about revisions and edits. Peer conferencing, in combination with the computer, might well lead to increases in revisions and edits as well as higher quality writing.

Conclusions

Research results suggest that the word processor, as a tool for collaborative writing, may benefit learning in the whole language setting, which emphasizes writing and the social nature of learning. Very little research, however, has been conducted that deals with the word processor and collaborative writing in a whole language environment.

This exploratory study investigated the effects of collaborative writing using the word processor on whole language students' prewriting, revising, and editing accomplishments as well as on the quality of the written products they produced. Using the computer as a tool to facilitate the recording, revising, and editing of ideas, the students wrote individually and

collaboratively. The focus was on the potential of the computer to facilitate students' writing in the collaborative environment.

Results of this exploratory study indicated that the word processor is perceived by whole language sixth-grade students as a powerful tool during prewriting and writing stages of the writing process. Results also showed promise for the use of collaborative writing groups in increasing the number of ideas students produce in the prewriting stage of the writing process. There was also an indication that collaborative computer writing groups may improve the quality of students' writing over time.

Collaborative computer writing groups appear to facilitate a whole language approach to teaching. More empirical evidence is needed to determine further support for these claims. It is the hope of this researcher that this study will be followed by others that will provide direction for whole language teachers in their efforts to incorporate computers into their writing curriculums.

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APPENDIX A: COVER FORM FOR QUESTIONNAIRE COMMENTS

The target audience for this questionnaire is a sixth grade classroom in a whole language district. The sixth graders will be expected to know how the writing process works at the time they complete the questionnaire. The purposes of the questionnaire are to:

(1) collect background information regarding each child's exposure to computers.

(2) collect information regarding each child's attitude toward writing with the computer vs. paper and pencil at each stage of the writing process.

(3) collect information regarding each child's overall attitude toward writing with the computer vs. paper and pencil.

(4) collect information regarding each child's attitude toward writing individually vs. collaboratively.

(5) collect information regarding each child's attitude toward working individually vs. collaboratively.

(6) collect information regarding each child's attitude toward writing individually vs. collaboratively at the computer.

(7) collect information regarding each child's attitude toward working individually vs. collaboratively at the computer.

Could you please look this questionnaire over and comment on:

(1) the appropriateness of the questions for sixth graders.

(2) the wording of the questions in terms of how difficult they are to understand.

(3) any other suggestions for improving the questionnaire.

Thank you,
Dale Greer

APPENDIX B: ATTITUDE QUESTIONNAIRE

Questionnaire

Please check the appropriate response.

BACKGROUND INFORMATION:

1. _____ Male _____ Female

HOME:

2. Does your family have a computer at home? _____ Yes _____ No (If no, go to question #9)

3. Do you use the computer at home? _____ Yes _____ No (If no, go to question #8)

4. How often do you usually use the computer at home?
   _____ more than once a day
   _____ once a day
   _____ twice a week
   _____ once a week
   _____ every two weeks
   _____ once a month
   _____ less than once a month

5. For what purposes do you use the computer at home? (Check all that apply)
   _____ to write papers, letters or stories
   _____ to program (example: Logo, BASIC)
   _____ to practice keyboarding
   _____ to practice math skills
   _____ to practice science skills
   _____ to practice social studies skills
   _____ to practice reading skills
   _____ to practice spelling
   _____ to communicate with someone in another place
   _____ to play games
   _____ other: (Please describe) _____

6. When you are working on the computer at home, about how long do you usually work?
   _____ less than 15 minutes
   _____ 15 minutes - 1 hour
   _____ more than 1 hour

7. When you have a question or problem about the computer that you can't solve, who helps you at home? (Check all that apply, then go to question #9)
   _____ mother   _____ father
   _____ brother   _____ sister
   _____ friend   _____ no one
   _____ other: (Please describe) _____

8. If you don't use the computer at home, why don't you? (Check all that apply)
   _____ don't like to use it
   _____ don't know how to use it
   _____ don't have time to use it
   _____ am not allowed to use it
   _____ other: (Please describe) _____

SCHOOL:

Questions 9 through 13 refer to times when you are at the computer working.

9. Have you used a computer at school? _____ Yes _____ No (If no, go to question #14)

10. How often do you usually use the computer at school?
    _____ more than once a day
    _____ once a day
    _____ twice a week
    _____ once a week
    _____ every two weeks
    _____ once a month
    _____ less than once a month

11. For what purposes do you use the computer in school? (Check all that apply)
    _____ to write papers, letters or stories
    _____ to program (example: Logo, BASIC)
    _____ to practice keyboarding
    _____ to practice math skills
    _____ to practice science skills
    _____ to practice social studies skills
    _____ to practice reading skills
    _____ to practice spelling
    _____ to communicate with someone in another place
    _____ other: (Please describe) _____

12. When you are working on the computer at school, about how long do you usually work?
    _____ less than 15 minutes
    _____ 15 minutes - 1 hour
    _____ more than 1 hour

13. If you need help while working on the computer at school, what do you do? (Check all that apply)
    _____ ask the teacher
    _____ ask the librarian
    _____ ask the media specialist
    _____ ask another student who knows the subject well
    _____ look in a book
    _____ just keep trying until I figure it out
    _____ other: (Please describe) _____

14. Which of the following can you do? (Check all that apply)
    _____ put a disk into the disk drive
    _____ use the keyboard
    _____ use a word processor to write letters, stories and school papers
    _____ use the computer to draw pictures or graphs
    _____ write computer programs (example: Logo, BASIC)
    _____ other: (Please describe) _____
    _____ none of the above

15.   How did you learn about computers? (Check all that apply)

_____ teachers in school

_____ friends

_____ family members

_____ books

_____ taught myself

_____ other: (Please describe) _____

_____ don't know much about computers

ATTITUDES:

The following statements have to do with how you feel about the computer. Circle 1 if you strongly disagree with the statement, circle 2 if you disagree, circle 3 if you aren't sure how you feel, circle 4 if you agree with the statement, and circle 5 if you strongly agree.

1 = strongly disagree   2 = disagree   3 = not sure   4 = agree   5 = strongly agree

		strongly disagree		not sure		strongly agree
16.	I find it inconvenient to brainstorm at the computer.	1	2	3	4	5
17.	I can easily change the width of my written piece when I am writing with pencil and paper.	1	2	3	4	5
18.	Writing is too difficult to do with a partner.	1	2	3	4	5
19.	Brainstorming is easiest with paper and pencil.	1	2	3	4	5
20.	I prefer to write my final draft using paper and pencil.	1	2	3	4	5
21.	It's more enjoyable to write with a computer.	1	2	3	4	5
22.	I like writing alone at the computer because I can make my own decisions.	1	2	3	4	5
23.	I prefer to work alone when I am writing at the computer.	1	2	3	4	5
24.	I think that using the computer makes it easy to revise my writing.	1	2	3	4	5
25.	I prefer to write my first draft with paper and pencil.	1	2	3	4	5
26.	It is easy to go back and correct the punctuation in my writing when I use paper and pencil.	1	2	3	4	5
27.	When I am writing on the computer, it is easy to go back and delete information.	1	2	3	4	5
28.	I prefer writing using a computer if one is available.	1	2	3	4	5

		strongly disagree		not sure		strongly agree
29.	I have fun editing my writing when I write with pencil and paper.	1	2	3	4	5
30.	I like being able to print my written piece using single, double, or triple spacing.	1	2	3	4	5
31.	I prefer to brainstorm with paper and pencil.	1	2	3	4	5
32.	It is easier to change my page breaks when I write with paper and pencil.	1	2	3	4	5
33.	I find it easy to correct the grammar in my writing when I am using a computer.	1	2	3	4	5
34.	I enjoy writing with paper and pencil the best.	1	2	3	4	5
35.	I have the most fun writing when I write using the computer.	1	2	3	4	5
36.	I can change the location of my page numbers more quickly using a computer.	1	2	3	4	5
37.	I will always choose to write using a computer if it is available.	1	2	3	4	5
38.	I find it difficult to rearrange information in my writing when I am using a computer.	1	2	3	4	5
39.	I like having someone to work with when writing.	1	2	3	4	5
40.	I have more fun revising my writing using a computer.	1	2	3	4	5
41.	I appreciate getting suggestions from a partner when writing.	1	2	3	4	5
42.	I can easily brainstorm at the computer.	1	2	3	4	5
43.	When I work with others, I usually do most of the work.	1	2	3	4	5
44.	I can brainstorm more ideas using a computer if I have someone with whom to brainstorm.	1	2	3	4	5
45.	When I work with a partner, I get more done.	1	2	3	4	5
46.	I would prefer to work on my next writing assignment with a classmate.	1	2	3	4	5
47.	I like to talk to a friend or classmate when I am trying to make a decision.	1	2	3	4	5
48.	It's more fun to brainstorm at the computer.	1	2	3	4	5
49.	I like to do my homework alone.	1	2	3	4	5

		strongly disagree		not sure		strongly agree
50.	I do my best writing using paper and pencil.	1	2	3	4	5
51.	I write best at the computer with a partner.	1	2	3	4	5
52.	I revise best using paper and pencil.	1	2	3	4	5
53.	I accomplish more when I work at the computer with a partner.	1	2	3	4	5
54.	I think that computers make writing more difficult.	1	2	3	4	5
55.	I don't like writing with a partner at the computer.	1	2	3	4	5
56.	I prefer studying with a partner.	1	2	3	4	5
57.	I edit my writing best when I use the computer.	1	2	3	4	5
58.	When I am writing with paper and pencil, it is easy to to go back and add information.	1	2	3	4	5
59.	I like to work alone at the computer as much as possible.	1	2	3	4	5
60.	I prefer to write all of my drafts using the computer.	1	2	3	4	5
61.	It is easier to go back and correct the spelling in my writing when I use paper and pencil.	1	2	3	4	5
62.	Most of the time I would rather work at the computer with a partner.	1	2	3	4	5
63.	When I write with paper and pencil, it is easy to change the margins in my writing.	1	2	3	4	5

APPENDIX C: WRITING PROMPTS

How to Make a Peanut Butter and Jelly Sandwich

by Dale Greer

Making a peanut butter and jelly sandwich is not as easy as it may seem at first. It is an activity that involves several steps and requires skill and practice. Of course, as is the case with many activities, there is no one right way to make a peanut butter and jelly sandwich, although there are some common steps involved.

The first step involved in making a peanut butter and jelly sandwich is to check to ensure that you have all of the necessary ingredients: bread, peanut butter, and jelly. You might also want to check to ensure that you have the necessary utensils: a butter knife, a small spoon, and a plate. Then you are ready to begin making your sandwich.

To make your sandwich in the simplest and least time-consuming manner, place all of the necessary ingredients - bread, peanut butter, and jelly - on the table. Also, place the butter knife, small spoon, and plate on the table. Pull out a chair and sit down.

Next, open the bread bag and take out two pieces of bread. Place them side by side on the plate. Close the bread bag and set it aside.

Then take hold of the peanut butter jar with one hand and screw its lid off with the other hand. Lay the lid on the table. Still holding onto the peanut butter jar with one hand, pick up the butter knife with the other hand and dip it into the jar, scooping the desired amount of peanut butter onto the knife. Set the jar of peanut butter aside, with its lid on the table beside it.

Next you are ready to spread the peanut butter onto the bread. Using one hand to hold one of the slices of bread still on the plate, gently spread the peanut butter that is on the knife evenly onto the slice of bread.

If more peanut butter is desired, let go of the bread, hold onto the jar of peanut butter with one hand, and dip the butter knife back into the peanut butter jar with the other hand, scooping the desired amount of peanut butter onto the knife. Let go of the peanut butter jar and hold onto the bread that already has some peanut butter. Gently and evenly spread the additional peanut butter onto the bread. Repeat again, if necessary, until you have the desired amount of peanut butter on the bread. Then set the knife down and put the lid back on the peanut butter jar. Set the jar aside.

Then take hold of the jelly jar with one hand and screw its lid off with the other hand. Lay the lid on the table. Still holding onto the jelly jar with one hand, pick up the small spoon with the other hand and dip it into the jar, scooping the desired amount of jelly onto the spoon. Plop the jelly that is on the spoon onto the center of the piece of bread that has the peanut butter on it. Make sure that you plop the jelly onto the same side of bread as the peanut butter. Put the spoon down on the table.

To spread the jelly, pick up the knife that you used to spread the peanut butter. Gently spread the jelly evenly across the peanut butter on the bread. If more jelly is desired, repeat the process of scooping the jelly onto the spoon and plopping it onto the bread. Then set the knife down on the table. Put the lid back on the jelly jar and set the jelly aside.

Now pick up the other slice of bread that has nothing on it and lay the bread on the slice that has the peanut butter and jelly. Press down on the sandwich gently. Then pick it up and ENJOY!!!

(Of course, put all of the ingredients and utensils away when you are finished.)

Example for Writing Activity #2:

If you were looking at the outside of my grandpa, you wouldn't see very much. He was just about as big around the middle as he was tall. He didn't have much hair either, just a little around the edges; and it was as grey and stiff as a wild hog's whiskers. He wore glasses, chewed Star tobacco, and needed a shave about three hundred and sixty days a year. It was the inside of my grandpa that really counted. He had a heart as big as a number four washtub; and inside that wrinkled old hide of his was enough boy-understanding for all the boys in the world.

**Excerpted from <u>Summer of the Monkeys</u>
by Wilson Rawls**

Example for Writing Activity #3:

The great troopship sneaks past the city and the tugs leave her, a dark thing steaming into the dark. On the decks and in the passages and in the bunks the thousands of men are collapsed in sleep. Only their faces show under the dim blue blackout lights--faces and an impression of tangled hands and feet and legs and equipment. Officers and military police stand guard over this great sleep, a sleep multiplied, the sleep of thousands. An odor rises from the men, the characteristic odor of an army. It is the smell of wool and the bitter smell of fatigue and the smell of gun oil and leather. Troops always have this odor. The men lie sprawled, some with their mouths open, but they do not snore. Perhaps they are too tired to snore but their breathing is a pulsing, audible thing.

Excerpted from _Once There Was a War_
by John Steinbeck

A Day to Remember

by
Dale Greer

I really don't remember much about that day, and yet I remember everything. It had been a good day, but suddenly I found myself looking at Ann and asking if she was okay. I remember her raising her hand as she screamed, "My head!" and then flinging herself out of the car and onto the ground.

That was four years ago, almost to the day. Ann and I were college roommates, preparing for our upcoming graduation. The day had started off as any other day. We both got ready for school, and then Ann dropped me off. "See you at 3:30," she said, as she waved good-bye. "See ya'," I replied.

****

As 3:30 rolled around, Ann was waiting for me at the circle turn-around. Life had been a little cruel to Ann recently, so we were going to go shopping at the mall to relieve our tensions (mostly hers). We decided to go home and change clothes first (We couldn't possibly go shopping in heals!).

I put on a pair of jeans and a T-shirt. Ann, on the other hand, decided to wear her jumpsuit, the peach one that was just like mine. I remember it well because it would later occupy our bathroom sink, soaking.

After changing clothes, we hopped into Ann's Escort. She had just gotten it 2 weeks before. It must have been a warm day because I remember holding a diet A & W rootbeer that I had grabbed on my way out the door.

As we were making our way to the mall, I remembered that I had something I had to drop off at the Quad. Ann said that would be okay. As I look back now, I also remember

coming to a stop sign that had a red flashing light just above it. How odd for me to have noticed it, but I did. I remember thinking that it was a smart idea to put a red flashing light above that particular sign because it rested in an area often travelled by college students.

**

Ann pulled into the circle drive by the Quad so I could run in and take care of my business. Then it was off to the mall. I recall that the radio was playing, though I don't remember the song in the background. Ann and I were chatting about how the day had gone. We were best of friends and often discussed the goings-on of the day.

As we approached the stoplight, I remember noticing that it was red, just like the flashing light I had noticed earlier. Ann and I were in the right-hand lane, first in line. I recall how we came to a stop, and I was looking at Ann, telling her about something that had happened to me that day.

The next thing I remember is turning 180 degrees in the car. I looked at Ann to see if she was okay. A trickle of red ran down the back of her head. It seemed that people appeared out of nowhere almost immediately. They were just standing there watching us.

****

They let me ride with Ann in the back of the ambulance. She was scared. She wanted me to call Tim, a friend of hers. I tried, but no one was home.

Ann ended up with a concussion on the back of her head. I had a few sore muscles, but other than that, we were okay. I think we were both very lucky.

APPENDIX D: RUBRICS FOR SCORING WRITTEN PIECES

Writing Activities 1 and 4

1 and 2

Content: (presence/demonstration of at least 5)
Addresses prompt perceptively.
Catchy lead; attention grabber; possibly different sentence structure than other sentences in the text.
Strong verbs (i.e. more interesting than the word 'said').
Balance of narrative and dialogue, *if dialogue is used.*
Similes and/or metaphors for comparisons.
Beginning sentences with a variety of words.
Memorable conclusion.

Length:
At least a page long, double-spaced.

Organization:
Competent organization, sense of development is present from beginning to end.
Sentences and paragraphs divided sensibly.
Ideas are clear and understandable.

Mechanics: (may have occasional problem with some)
Complete sentences.
Correct punctuation of dialogue, *if dialogue is used.*
Presence of end marks: periods, question marks, or exclamation points.
Capital letters for proper nouns and sentence beginnings.
Presence of commas in: lists, direct addresses (i.e. Joe, come here.), and introductory words (i.e. Yes, I heard you.).
Apostrophes in contractions.
Correct spellings.

3 and 4

Content: (presence/demonstration of at least 5)
Addresses prompt appropriately.
Definite presence of a lead, although not necessarily a catchy one.
Some strong verbs, but could be more (i.e. more interesting than the word 'said').
Imbalance between narrative and dialogue, *if dialogue is used.*
Few similes and/or metaphors for comparisons.
Beginning a few sentences with a variety of words.
Definite conclusion, although not necessarily memorable.

Length:
Close to a page long, double-spaced.

Organization:
Discernible pattern of organization with occasional digression.
Sentences and paragraphs divided sensibly most of the time.
Ideas are slightly unclear.

Mechanics: (frequent problems with some)
Complete sentences.
Correct punctuation of dialogue, *if dialogue is used.*
Presence of end marks: periods, question marks, or exclamation points.
Capital letters for proper nouns and sentence beginnings.
Presence of commas in: lists, direct addresses (i.e. Joe, come here.), and introductory words (i.e. Yes, I heard you.).
Apostrophes in contractions.
Correct spellings.

Person #:	Activity #1 Score	Activity #4 Score
01		
02		
03		
04		
05		
06		
07		
08		
09		
10		
11		
12		
13		
14		
15		
16		
17		
18		
19		
20		
21		

5

<u>Content:</u>
Addresses prompt inappropriately or not at all.
No presence of a lead.
No dialogue.
No similes and/or metaphors for comparisons.
Sentences begin with the same types of words.
No presence of a conclusion.

<u>Length:</u>
Less than 3/4 of a page long, double-spaced.

<u>Organization:</u>
Random organization.
Sentences and paragraphs seldom divided sensibly.
Ideas are unclear.

<u>Mechanics:</u>
Some incomplete sentences.
Some incorrect punctuation of dialogue, *if dialogue is used.*
Absence of end marks sometimes: periods, question marks, or exclamation points.
Absence of capital letters for proper nouns and sentence beginnings sometimes.
Lack of commas in: lists, direct addresses (i.e. Joe, come here.), and introductory words (i.e. Yes, I heard you.).
Absence of apostrophes in contractions sometimes.
Frequent incorrect spellings of common words.

Writing Activities 2 and 3

1 and 2

Content: (presence/demonstration of at least 5)
Addresses prompt perceptively.
Catchy lead; attention grabber; possibly different sentence structure than other sentences in the text.
Strong verbs (i.e. more interesting than the word 'said').
Balance of narrative and dialogue, *if dialogue is used.*
Similes and/or metaphors for comparisons.
Beginning sentences with a variety of words.
Descriptive words/phrases weaved in rather than just stated.
Use of all five senses (Activity 3 only).
Memorable conclusion.

Length:
At least 1/2 of a page long, double-spaced.

Organization:
Competent organization, sense of development is present from beginning to end.
Descriptions are clear and understandable.

Mechanics: (may have occasional problem with some)
Complete sentences.
Correct punctuation of dialogue, *if dialogue is used.*
Presence of end marks: periods, question marks, or exclamation points.
Capital letters for proper nouns and sentence beginnings.
Presence of commas in: lists, direct addresses (i.e. Joe, come here.), and introductory words (i.e. Yes, I heard you.).
Apostrophes in contractions.
Correct spellings.

3 and 4

Content: (presence/demonstration of at least 5)
Addresses prompt appropriately.
Definite presence of a lead, although not necessarily a catchy one.
Some strong verbs, but could be more (i.e. more interesting than the word 'said').
Imbalance between narrative and dialogue, *if dialogue is used.*
Few similes and/or metaphors for comparisons.
Beginning a few sentences with a variety of words.
Use of descriptive words/phrases.
Use of at least 3 of the 5 senses (Activity 3 only).
Definite conclusion, although not necessarily memorable.

Length:
Close to1/2 of a page long, double-spaced.

Organization:
Discernible pattern of organization with occasional digression.
Ideas are slightly unclear.

Mechanics: (frequent problems with some)
Complete sentences.
Correct punctuation of dialogue, *if dialogue is used.*
Presence of end marks: periods, question marks, or exclamation points.
Capital letters for proper nouns and sentence beginnings.
Presence of commas in: lists, direct addresses (i.e. Joe, come here.), and introductory words (i.e. Yes, I heard you.).
Apostrophes in contractions.
Correct spellings.

Person #:	Activity #2 Score	Activity #3 Score
01		
02		
03		
04		
05		
06		
07		
08		
09		
10		
11		
12		
13		
14		
15		
16		
17		
18		
19		
20		
21		

5

Content:
Addresses prompt inappropriately or not at all.
No presence of a lead.
No dialogue.
No similes and/or metaphors for comparisons.
Sentences begin with the same types of words.
Infrequent use of descriptive words/phrases.
Use of less than 3 of the 5 senses (Activity 3 only).
No presence of a conclusion.

Length:
Less than 1/3 of a page long, double-spaced.

Organization:
Random organization.
Ideas are unclear.

Mechanics:
Some incomplete sentences.
Some incorrect punctuation of dialogue, *if dialogue is used.*
Absence of end marks sometimes: periods, question marks, or exclamation points.
Absence of capital letters for proper nouns and sentence beginnings sometimes.
Lack of commas in: lists, direct addresses (i.e. Joe, come here.), and introductory words (i.e. Yes, I heard you.).
Absence of apostrophes in contractions sometimes.
Frequent incorrect spellings of common words.

APPENDIX E: DESCRIPTION OF WRITING ASSIGNMENTS
GIVEN TO ENGLISH PROFESSORS

Description of Writing Assignments

Students participated in four writing activities. The first and last were individual writing activities, and the second and third were collaborative. All writing assignments were comparable in length of time required to complete and in level of difficulty.

No time restrictions or length requirements accompanied any of these assignments. Students were encouraged to write as much as they needed to communicate their ideas. Prior to the start of each of the writing assignments, the researcher read an example to the students and then briefly discussed it.

For the first writing assignment, students worked alone to write a piece describing how to do something. After completing a first draft, students were encouraged to read their documents to make sure that they had included all the necessary steps/directions for carrying out the task they were describing. Each student wrote at his/her own computer and printed when necessary.

The second writing assignment, completed with a partner, was to produce a character description of a real person or someone who could be real. During this assignment, pairs of students were encouraged to use descriptive language to characterize both the outside and the inside of a person. Each student pair produced one paper, with both students receiving the same grade.

The third writing assignment, also completed with a partner, was to describe a setting. Students worked with the same partner as in the first collaborative assignment. During the second collaborative assignment, students were encouraged to either choose a setting that was familiar to

both students in the pair or to describe a make-believe setting. Students were also urged to make use of all five senses in their descriptions. As in the first collaborative writing assignment, both students in each pair received the same grade as a result of the one paper they produced together.

The fourth writing assignment had the students working alone again to create a narrative of an ordered event. Each student worked at his/her own computer to produce a written piece. Students were encouraged to read their first drafts to make sure they had not left any important details out or gotten any parts out of order. Each student printed his/her own paper as necessary.

APPENDIX F: LETTER TO PARENTS

Iowa State University *of Science and Technology*   *Ames, Iowa 50011*

Instructional Resources Center
Quadrangle North

March 7, 1991

Dear Parents/Guardians:

As a graduate student in Professional Studies in Education at Iowa State University, I am interested in assessing whole language students' attitudes toward using the computer for writing as well as their accomplishments while using the computer during the writing process. Results from this study should help teachers in whole language classrooms understand how to best meet the needs of students who choose to write using a computer.

For this study, students will be asked to complete a questionnaire both before and after writing at the computer. Completion of the questionnaire should take approximately 15 minutes. The questionnaire will include items measuring demographic information, attitudes toward writing with a partner, and attitudes toward writing using a computer. The questionnaire will not ask for any names. Students will only be identified by an ID number for data analysis, and the questionnaires will be destroyed as soon as the study is completed.

Students will also participate in both individual and paired writing activities at the computer. The writing activities will take place in the computer lab at Rex Mathes Elementary School and will require approximately 1 hour per day for 12 days. Students will obtain printouts after each stage of the writing process for all writing activities. Variables to be measured using student printouts include: the number of ideas brainstormed, the percentage of revisions made, the percentage of items edited, and the overall writing score. The printouts will be identified by student ID numbers only and will be destroyed after analysis of the data.

In addition, student conversations while writing with a partner will be tape recorded. Cassette tapes will be analyzed in terms of how students cooperate and solve problems while writing at the computer. Students will not be identified on the cassette tapes, and the tapes will be erased after the data analysis is complete.

Although all students will complete the questionnaire and participate in the writing activities, you may request, at any time, that the information collected from your child not be included in the analysis of the data. Should you have any questions, please do not hesitate to contact me (515) 294-6840, or Dr. Ann Thompson (515) 294-5287.

Please sign and return the bottom portion of this letter to your child's teacher by Friday, March 15. Thank you for your cooperation.

Sincerely,   Approved by:

Dale R. Greer   Dr. Ann D. Thompson
Graduate Student   Major Professor

Please circle your response and fill in your child's first and last name.

I   do / do not   wish the information collected from my child _____   to be included in the data analysis of this research study.

Signature

Date

APPENDIX G: HUMAN SUBJECTS FORM

Last Name of Principal Investigator <u>Greer</u>

Checklist for Attachments and Time Schedule

The following are attached (please check):

12.☐ Letter or written statement to subjects indicating clearly: To be filed.
    a) purpose of the research
    b) the use of any identifier codes (names, #'s), how they will be used, and when they will be
       removed (see Item 17)
    c) an estimate of time needed for participation in the research and the place
    d) if applicable, location of the research activity
    e) how you will ensure confidentiality
    f) in a longitudinal study, note when and how you will contact subjects later
    g) participation is voluntary; nonparticipation will not affect evaluations of the subject

13.☐ Consent form (if applicable)   Part of letter above.

14.☐ Letter of approval for research from cooperating organizations or institutions (if applicable) Pending.

15.☐ Data-gathering instruments To be filed.

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16. Anticipated dates for contact with subjects:
    First Contact   Last Contact

  <u>February 22, 1991</u>   <u>March 21, 1991</u>
        Month / Day / Year   Month / Day / Year

17. If applicable: anticipated date that identifiers will be removed from completed survey instruments and/or audio or visual tapes will be erased:

  <u>May 1, 1991</u>
       Month / Day / Year

18. Signature of Departmental Executive Officer   Date   Department or Administrative Unit

     —   1/24/91   Professional Studies in Ed.

19. Decision of the University Human Subjects Review Committee:

  X Project Approved   ___ Project Not Approved   ___ No Action Required

  <u>Patricia M. Keith</u>   2-19-91
  Name of Committee Chairperson   Date   Signature of Committee Chairperson

GC: 1/90