Effects of computer use on the writing process

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Effects of computer use on the writing process

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EFFECTS OF COMPUTER USE ON THE WRITING PROCESS

By

Nancy Bates

A thesis submitted in partial fulfillment
of the requirements for the degree of

Master of Science

in

Post Secondary Education

Department of Secondary, Post Secondary and Vocational Education

University of Nevada, Las Vegas

August, 1988
The Thesis of Nancy Sue Bates for the degree of Master of Science in Secondary, Post Secondary and Vocational Education is approved.

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University of Nevada, Las Vegas
July, 1988
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With appreciation to Connie and Frank Kratky who spoiled my children thus relieving me of the guilt I felt for neglecting them while I worked on my thesis.

To my children, John and Jennifer, who were patient and understanding with a mother who was often times grouchy and neglectful.

With deepest thanks to my husband, Jack, not only for his love and encouragement, but for his guidance and help throughout this entire process. His expertise as a statistician and editor were used extensively to produce a product of which I can truly be proud. Thanks babe.
Abstract

As educational institutions continue to incorporate computers into the curriculum, one logical question that arises is whether computers could be effective tools in composition classes. A review of recent research literature examined the computer as motivator, editor and idea reshaper. Research by Kurth (1987), Harris (1985), and Dauite (1983) have revealed positive attitudinal changes toward writing with the addition of computers to writing curricula. Kieffer and Smith (1983), Collier (1983), Dauite (1983), and Harris (1985) have reported that word processors lead to drafts that contain fewer grammatical and spelling errors. However, investigations by Collier (1983), Harris (1985), Kieffer and Smith (1983), and Kurth (1987) have found little evidence that word processors encourage writers to revise beyond simple editing.

The purpose of the present study was to determine whether the addition of computerized software into the writing process would aid students in making significantly more revisions at the macrostructure level of writing than would be made by those using traditional methods. In contrast to earlier research, the present study looked for such changes over a longer period of time, and with a younger, larger sample of subjects. In
addition, this research sought confirmation of previous findings concerning increased draft length and reduction in grammatical and spelling errors with the use of computers.

Three groups of sixth-grade students received writing instruction over a six-month period with different degrees of computer involvement. Results from this study provide empirical support for the addition of computers into the writing process. ANOVA calculations revealed that the experimental group, those writing with computers, demonstrated the greatest increase in holistic scores from pretest to post-test, the greatest increase in draft length and the fewest grammatical and spelling errors. The calculations for the analytical data revealed some unexpected results. All groups, regardless of condition, made more errors from pretest to post-test and corrected a smaller percent of these errors on the post-test second draft.

Future research needs to address: the variability of student writing, a more precise measuring device, and the relationship between computer usage and cognitive strategies used in revision.
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CHAPTER ONE

Introduction

Revision, the ability to evaluate effectively one's writing from a detached, non-egocentric perspective, is critical to the writing process. The Bay Area Writing Project (cf. Camp, 1982) has established that revision involves more than just the acts of refining, polishing and copying over in ink. It is the rethinking and restructuring of the writers' written work.

As educational institutions continue to incorporate computers into the curriculum, one logical question that arises is whether computers could be effective tools in the teaching of the revision process in composition classes. Many researchers have lauded the use of computers to both motivate and teach children in various content areas. The computers often produce better, more dramatic results than could the most creative teacher. Papert (1980), for example, hypothesized that through the manipulation of the turtle in LOGO children actually learned to become creative problem solvers. They learned to see the relationships and the logic within mathematics, specifically where geometry was concerned, in a more systematic manner than a teacher could provide. Southwell (1982) has argued that the computer is consistent and eternally patient, and provides individual instruction for the learner. It requires the active
involvement of the learner and fosters a concern for accuracy while providing relative privacy for the act of learning. Given these capabilities, computers may be expected to have similar positive effects on the teaching of writing in composition classes.

Many claims of the effectiveness of word processors in the realm of education lack empirical support. The purpose of this review is to investigate research evidence regarding three aspects of computer use in the teaching of the writing process: relative effects on writer motivation, ability to aid the writer in the editing process of revision, and ability to aid students in the restructuring of their writing.

**The Computer as Motivator**

Collier (1983), Kurth (1987), Muldrow (1986), and Southwell (1982) have noted changes in attitude toward writing once computers have been added to composition curricula. Kurth, for example, randomly assigned high school students to two groups. One group was taught the writing process with traditional methods while the other was taught the writing process through the use of computers with word processing software. At the end of their twelve-week class, students responded to a questionnaire regarding attitudes toward writing. No questions on the attitude inventory dealt with the use of computers. Yet, when the results
were analyzed, significant differences were found between the two groups: Kurth reported that the word processing group were more positive about the instruction they had received, more positive about their abilities to write, and more positive about the editing groups used than were the non word processing group.

The application of Bruner's (1961) Discovery Learning methodology to computers may account for the sort of student motivation that appears to accompany the computer. Bruner believes that children are intrinsically motivated when what they learn is directly linked to personal experiences and desires. Through computer manipulations, students are provided opportunities to make decisions, investigate broad heuristic strategies for problem solving, and manipulate their environment. These activities provide a personal context for the learning that takes place making them not only memorable experiences, but motivating ones, as well.

Papert (1980) suggested that children need to be active learners, acquiring knowledge in a special way. He cited children in his MIT computer center who went from "total rejection of writing to an intense involvement (accompanied by rapid improvement in quality) within a few weeks of beginning to write with a computer" (p. 30). Schwartz (1983) noted that when students begin to use word processors they approach error in a
new way. Their vain struggle to avoid errors is transcended as they try to understand how and why the errors occurred. He concludes that computers create a positive attitude toward error wherein students learn to see errors as challenges. As they strive to correct their errors, not only do they learn, but the students also develop a sense of accomplishment that motivates them to continue.

Harris (1985), in her preliminary study on writing with word processors, reported that the accessibility of a clean copy appealed to the students. Errors were easier to detect. Daiute (1983) found that students did not like to revise in the traditional way because the changes looked messy. With the addition of word processors to the composition class, the spatial and aesthetic barriers to revision were removed. Because the changes were made neatly and incorporated into the text, students took pride in what they had written. Muldrow (1986) also noted that the professional appearance of the paper motivated her ninth-grade students to share their writing with response groups. As a result, students incorporated the changes suggested by their peers into their next draft. The printout became just one component of the writing process, rather than an end to writing.

This change in attitude toward writing is contrary to what Beach (1983) found as he studied the strategies of extensive
revisers and nonrevisers. He reported that students lost interest in revising, set premature quotas for drafts and did not write beyond that arbitrary number. He was not using computers with word processors in his study, however. Rather, the classroom involved was a traditional, teacher-directed composition course using pencil and paper technology. In contrast to Beach's report, the bulk of the evidence suggests that computers can aid students in acquiring a critical aspect in the revision process: the ability to view writing as fluid and dynamic.

The Computer as Editor

A number of studies (Bean, 1983; Collier, 1985; Daiute, 1982; McGavey, 1986; Muldrow, 1986) have demonstrated that word processing programs are extremely effective for aiding students in carrying out the tasks of editing. Collier (1983) found that the word processor encouraged inexperienced writers to make two-thirds more substitutions, to reorder their ideas twice as much, and to reduce deletions by two-thirds once word processors were added to the program. Their manipulation of the written domain, words, phrases and clauses increased as did the length of their compositions. Daiute (1983) provided evidence that, with word processors, student made twice as many deletions and eight times as many insertions as did those without the computer.
Harris (1985), after interviewing the subjects of her preliminary study, found that the students liked using the word processor because it made making corrections, additions and deletions easier, faster and neater than was possible with the traditional pen and paper method. The six students in the study all commented that they would use word processors for future writing tasks.

Students have complained about the efforts involved in the rewriting of their essays. However, Schwartz (1983) states that the use of computers takes the drudgery out of rewriting. The formerly onerous task of revision becomes a creative act performed quickly and effortlessly. In addition, Daiute (1983) found that her students felt in control of their writing because they could instruct a machine to carry out the tedious editing tasks that would have taken much energy with the traditional method.

Wresch (1983) describes several software programs—"Writer's Workbench," "Quill," "Wandah," and "The Writer's Helper"—that could help the writer in all areas of editing. These new programs rely not on traditional drill and practice, but on the strengths and weaknesses of the prose of the writer. They speak to the individual needs of the writer, aiding him to correct errors while sensitizing him to the ambience of written
language. The use of this type of software was found to be extremely helpful in the editing aspect of revision.

Spelling checkers, which check text for spelling errors, also may be of great use to writers. They free the writer in the beginning stages of writing from worrying too much about spelling and allow him to concentrate on the logic, organization and clarity of his composition. Once the first draft has been completed, it may be proofread for spelling errors with the spelling checker. Harris (1985) found that the spelling checker was especially helpful to the poor speller. When spelling checkers were added to the search and replace feature of the word processor, students were able to identify commonly misspelled words, correct them and continue concentrating on one error at a time. Daiute (1982) also reported that grammar identification programs helped the writer to identify habitual errors and guided them to revise the errors one step at a time.

Kiefer and Smith (1983) reported that the freshman composition students in their experimental group, who wrote essays using computers equipped with word processing and text analysis software ("Suggest," "Style," "Diction," and "Spell"), made more corrections and spent more time revising and editing than did those without this equipment. They also noted that what the students had learned about style was carried over to texts in
which these analysis programs were not used. That is, the
learning that took place while working with computers equipped
with text analysis software was applied in other writing
contexts.

The research cited to this point has investigated computer
effects on the surface changes to a composition. This literature
has been supportive of the use of the computer in the edition
part of revision, but if true revision is to take place, then
students must go beyond lexical substitutions and grammatical
corrections—they must reshape their ideas, making revisions at
the macrostructural level of their writing. What follows is a
summary of the research investigating whether computers can
affect this aspect of revision.

The Computer as Idea Reshaper

Faigley and Witte (1981) analyzed revision and categorized
it into two major areas: surface changes and meaning changes.
Surface changes deal with spelling, tense, punctuation, format
and other mechanical changes, while meaning changes deal with
tone, voice and overall flavor of the piece of writing. Meaning
changes were further categorized into microstructures, with all
concepts included, and macrostructures, which are the gist of the
text.
The research of Collier (1983), Harris (1985), Kiefer and Smith (1983), and Kurth (1987) suggests that computers may not aid writers in the making of more extensive revisions at the macrostructure level than are made by those writers using traditional methods. Collier (1983) found that students using a text editor did not encourage students to make serious or elaborate additions to their essays. In addition, he demonstrated that students using the traditional, pencil and paper method of revising made more changes in idea clusters and paragraphs than those using word processors.

Kurth (1987) tried to determine whether high school students using computerized word processing would improve the quality of their revisions. She divided her study of revision into three categories: number of overall revisions (including surface changes), number of sentence and phrase revisions, and number of global revisions (those affecting at least two or more sentences). In four papers submitted for a grade, no significant difference was discovered between groups of writers using or not using word processors with respect to the number of revisions that had been made between the first draft and the final paper. In fact, the author noted that the non word processing group made greater total numbers of revisions and greater numbers of revisions to sentences and phrases than did the group using word
processors although the differences were not significant. Students using word processors consistently made greater numbers of global revisions on each of the four assignments than did the non word processing group, although again, no significant difference was obtained.

In summary, the research literature has demonstrated that the attitudes of the majority of word processing users toward writing and revising are more positive than they are for those not using computers. Students who use text editors tend to write longer compositions, revise more often and make more surface changes than do those using traditional methods. There is little evidence, however, to support the contention that the computer encourages the writer to revise his writing beyond simple microstructure editing.
CHAPTER TWO

The Present Study

One avenue of necessary research is to determine the effectiveness of computers in aiding writers to revise at the microstructure and macrostructure level. This is particularly important as more advanced interactive software becomes available. As the research verifies, simply adding word processors to the curriculum can motivate writers to spend more time writing. With the invention of improved interactive software that questions the writer or models various revision strategies, the computer may encourage writers to reshape their ideas and to critically analyze their own writing.

A more critical and accessible issue is whether computer use during the acts of composition and revision can facilitate changes in the quality of the written product, and not just in its technical attributes (e.g., spelling, grammar, etc.). Recent investigations of the effective use of computers in the revision process have revealed little evidence of such an effect. However, three major weaknesses in the designs of these investigations may account for this lack of significant change. First, researchers have based their conclusions on studies conducted with only four to twenty subjects (Daiute, 1983; Harris, 1985). Increasing the size of the experimental group
would increase the power to detect an effect. Second, most of the research concerning revision has been conducted with college and high school students who already have acquired patterns of writing and who have had an opportunity to form strong opinions concerning computers (Kiefer & Smith, 1983; Kurth, 1987; Muldow, 1986). Elementary students, on the other hand, are still in the developmental stages of writing and are less likely to have been affected negatively by exposure to computer use. The use of a younger target population might allow for the flexibility in thinking and the willingness needed to incorporate editing commands into the revision process. Third, it is likely that time would be needed for students to incorporate the revision techniques of the writing process and the editing commands of the word processor into a cohesive strategy, so that macrostructure revision can become apparent in the written product. Kurth (1987) for example, did her study on students in a twelve-week course. Revision may need to be investigated over a period of five or six months of writing instruction, rather than over the shorter periods of time generally used in current research (Beach, 1983; Collier, 1985; Kurth, 1987).

The purpose of this study, then, was to determine the extent to which the addition of computerized word processing into the writing process would encourage revision at the macrostructure
level of writing. Further, it was expected that the use of a larger experimental sample, the extension of the investigation over a substantial period of time, and the use of a younger target population, would provide support for the hypothesis that computers can be effective tools in the revision process. This was the goal of the present study. Specifically, it was predicted that students who learned to use word processing as an integrated part of their writing would revise more at the macrostructure level, resulting in higher holistic scores on the final draft, increased length, and fewer grammatical and punctuation errors in the final draft than those who had not been exposed to the computer on a regular basis.

Writing samples using descriptive and narrative forms traditionally have been used to gather information regarding revision. However, expository writing was used for the pretest and post test in this study, rather than other forms of writing, because it is the form most used in the upper grades. It was reasoned that, if a significant change were detected in the revision of this type of writing, it would be of major importance because expository writing is the least practiced and one of the most difficult forms of writing to teach elementary children to use effectively.
CHAPTER THREE

Method

Subjects

Six intact core classes of 180 heterogeneously grouped sixth graders, ranging in age from 11 to 13, from a Las Vegas Sixth Grace Center (SGC) were randomly selected as the subjects for this study. Four core teachers from the eight core teachers at this SGC were the instructors for these six classes. By completion of the study, 140 children (69 males and 71 females) remained in these classes and constituted the subjects for the study.

Sixth Grade Centers were created to fulfill federal integration requirements for the Clark County School District. Several elementary schools in predominantly minority neighborhoods have been converted to Sixth Grade Centers. The elementary children in these areas are bussed to various schools across the county for their kindergarten to fifth-grade classes. Then, neighborhood students in the areas of these Sixth Grade Centers walk to school while all other students are bussed to the Center. The SGC also were intended to provide a transition between elementary and junior high school. To that end, half-day core classes (wherein Reading, Language Arts, Spelling and Social Studies are taught and oral and written communication are
practiced) and three 50-minute specialist classes (Math, Science/Physical Education, Music/Art) are combined to constitute the school day.

**Equipment**

This study was conducted within the SGC computer laboratory, making use of seven Apple IIe microcomputers, each with 128K of memory. Three of the computer stations contained single disk drives while four of the other stations had double disk drives. In addition, there were five Imagewriter II printers.

*Magic Slate*, the word processing software used in this school and purchased from the Sunburst Publishing Company, was the main software used in the study. In addition, disks containing Language Arts lessons, designed by the district's computer center and supplied by the district to the school, were used, as well as disks containing lessons in which word processing commands were practiced. Both the experimental and intermediate control groups received keyboarding instruction using MECC Keyboarding Primer software.

**Procedure**

Administrative permission was secured from the school principal to conduct this study. Because the design of this project required no manipulation or testing that was outside the realm of the regular school instruction, the school administrator
determined that no further district permission was needed. Once administrative permission was granted, the administrator instructed the researcher to gain parental permission following a standard policy for this type of research. Parental permission was obtained by sending home with each student a letter that explained the gist of the research, and requesting that parents respond in writing only if they did not wish their children to participate in the study. No parents so responded.

Next, two of the six preselected classes each were randomly assigned to be a part of the experimental group, the intermediate control group or the control group. The treatment of the experimental group consisted of four sessions that emphasized keyboarding skills, using MECC Keyboarding Primer software. Once students were familiar with the keyboard, lessons that focused on the word processing commands of "load", "save", "delete", "insert", "print", "move", "search and replace", and "create" were begun. Each of these commands was taught and practiced separately during a fifty-minute session using specific lessons that were compiled on a data disk. (See Appendix A for sample printouts of data disk lessons.) Each lesson lasted about fifteen minutes; then the students practiced the command at the computer for the rest of the class period using a lesson from the data disk. The following week, the command was incorporated into
one of ten writing assignments such as poems, creative stories, letters, expository and persuasive pieces. (See Appendix B for specific lesson plans.) The intermediate control group received the same keyboarding and word processing instruction as the experimental group, but practiced the commands through a series of ten Language Arts assignments designed by the school district computer center in conjunction with the elementary computer curriculum guide rather than with specific writing lessons. (See Appendix C for sample printouts of data disk file.) The control group received only classroom instruction, once weekly, for fifty minutes, on particular aspects of the writing process according to curriculum requirements, but wrote for short periods of time daily and did not use the computers for writing. (See Appendix D for a general overview of the writing curriculum guide.)

All conditions initially were balanced for the time of day of instruction. However, when the time came to schedule the weekly fifty-minute periods for the classes needing the computer laboratory, a scheduling problem arose. As a consequence, the four classes constituting the experimental group and the intermediate control group had to be taken from morning core classrooms; the control group classes, in contrast, both were taken from afternoon core classes.
In order to control for the possibility of differing teacher effectiveness, two teachers both taught one experimental and one control group. Because both of these teachers' lesson plans for the teaching of writing were the same for their experimental and control classes, any differences between these groups for those teachers would have to be attributed to the treatment.

Once the experimental and control groups were determined and after the keyboarding lessons were completed, all students were given a writing assignment that would serve as a pretest of writing skills. This assignment consisted of having students "write an expository descriptive paragraph of a table, providing both sensory and specific details in such a manner that a blind person would be able to imagine the essence of the table."

Neither time constraints nor length requirements were given. Although all students experienced the same assignment and instruction, the experimental group typed their drafts directly at the computer, while the drafts of the other groups were handwritten. Prior to revision of their drafts, all student participated in a Read Around Group (RAG) Session. This revision technique, developed by a Bay Area Writing Fellow, is a part of this school's writing curriculum guide (see Appendix E for specific RAG Session instructions) and generally is viewed as a valid revision and evaluation technique by writing teachers.
Students, in a twenty to fifty-minute period of time, read all other papers and determined the best paper from each group. Later, students discussed the characteristics common to the best papers, establishing criteria for evaluation. Students then were asked to revise their first drafts, keeping in mind the established criteria. The experimental groups revised directly at the computer while the others did so by hand.

After six months of similar instruction and practice, all students were post-tested to determine the effectiveness of computer use. The post-test consisted of requiring students to "write very specific instructions for the making of a peanut butter and jelly sandwich." After the first draft, several students read their instructions aloud while the teacher attempted to make a sandwich following those instructions. After several failed attempts and a discussion concerning the need for precise instructions, students began to realize the importance of being very specific; then they were asked to revise their first drafts using precise language and specific details.

Scoring

Student writing samples were evaluated on both the pretest and post-test using analytical and holistic scoring techniques. These drafts were evaluated first analytically to determine the length of the draft (in words), and the number of spelling and
punctuation errors made per 100 words of draft length. Repetitive spelling errors for the same word were only counted once. The punctuation errors noted consisted of incorrect ending punctuation, comma errors made in a series and after signal words that showed time order, and apostrophe errors made when contractions were used.

Next, writing samples were scored to determine changes in tone and voice from first to final draft. All first and final drafts were scored using a nine-point holistic scale to determine tone and voice. In the present study, as is common in writing research, tone referred to the writer's attitude toward his or her subject. A writer's tone revealed itself through word choice and syntax. Voice, a writer's style, is in writing what gestures, speech, and personality are in a person. In the present study, the writer's voice was evidenced by choice of words, events and details used to describe the subject. To earn a full nine points, a draft would contain few spelling, mechanical or structural errors. The voice of the draft would reflect an authoritative, committed, and assured writer while the writer's tone would draw the reader into the subject and keep his interest alive throughout the piece.

Training sessions were held for two core teachers, not otherwise involved in the study, who volunteers to help score
student writing samples. Two training sessions were conducted: one was held for the scoring of the pretest first and final drafts, and a later session was set up to establish criteria for the post-test first and final drafts. The design of both sessions followed the holistic scoring session used by the state of Nevada to train scorers for the written portion of the competency tests needed for high school graduation. Each session lasted six hours. Two hours were spent in the training session and the rest of the time was spent scoring the papers.

The training session began with the details of the writing assignment being given by the trainer. The teachers were then asked to try writing the assignment. Next, the nine point rubric to be used in scoring was given to them. The rubric was explained and the characteristics of a paper in each category discussed. (See Appendix F for the nine point rubric.) The teachers, as well as the trainer, then were given a packet containing the same twenty-five randomly selected papers representing all groups to be scored for the study. (To prevent the scorers from knowing which student papers were from experimental group members, all control group and intermediate control group student drafts were entered into the computer by the researcher, and displayed to the scorers as printouts.) They then scored the first paper discussing their reasons for their
scores. Any discrepancies between scorers were resolved so that all agreed on the final score assignment. This procedure continued until all twenty-five papers had been scored and the scorers consistently gave the same score to each paper. Only then were the teachers ready to score the drafts on their own.

Both teachers scored randomly balanced sets of drafts. After each set of twenty-five, or approximately every hour, the scorers rested for five minutes. Inter-rater reliability was established by correlating ratings of two sets of twenty-five randomly selected drafts (one pretest and one post-test) that were scored by both teachers, independently of each other. The inter-rater correlations were .93 for the pretest scores and .97 for the post-test scores.
CHAPTER FOUR

Results

At the completion of the study, unequal numbers of students remained in the three conditions. The data from eleven experimental subjects were discarded, so that randomly selected performances of 43 subjects in each of the three conditions remained for analyses.

Means and standard deviations of holistic, paragraph length and analytical data for the control group (C), the intermediate group (I), and the experimental group (E) are presented in Tables 1a, 1b, and 1c, respectively. Analytical scores (Table 1c) were obtained by adding punctuation and grammar errors for each paragraph, dividing by the number of words in the paragraph, and multiplying by 100. Thus, all analytical scores were standardized to reflect the same paragraph length.

Holistic Scoring

It was predicted that students using word processors would receive higher holistic scores on final drafts than would those students who did not use the computers. This prediction was tested by performing a univariate analysis of variance of the holistic data. Table 2 contains the results of this analysis. No main effect was found for Instruction. That is, simple exposure to the word processor, independently of instructional
### Table 1a
Mean Holistic Scores

<table>
<thead>
<tr>
<th>Conditions</th>
<th>C</th>
<th>I</th>
<th>E</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Pretest</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1st Draft</td>
<td>5.26 (1.05)&lt;sup&gt;a&lt;/sup&gt;</td>
<td>4.77 (1.25)</td>
<td>4.93 (1.22)</td>
</tr>
<tr>
<td>2nd Draft</td>
<td>5.91 (1.15)</td>
<td>5.81 (1.48)</td>
<td>6.02 (1.14)</td>
</tr>
<tr>
<td><strong>Post-test</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1st Draft</td>
<td>5.14 (1.15)</td>
<td>5.30 (.89)</td>
<td>5.63 (1.02)</td>
</tr>
<tr>
<td>2nd Draft</td>
<td>5.86 (.83)</td>
<td>5.77 (.84)</td>
<td>6.19 (.88)</td>
</tr>
</tbody>
</table>

<sup>a</sup> Numbers in parentheses are standard deviations.
Table 1b
Mean Draft Length
(Number of Words)

<table>
<thead>
<tr>
<th>Conditions</th>
<th>C</th>
<th>I</th>
<th>E</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Pretest</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1st Draft</td>
<td>65.56 (24.97)&lt;sup&gt;a&lt;/sup&gt;</td>
<td>53.98 (16.97)</td>
<td>50.72 (18.35)</td>
</tr>
<tr>
<td>2nd Draft</td>
<td>67.19 (23.63)</td>
<td>62.98 (23.74)</td>
<td>74.49 (19.86)</td>
</tr>
<tr>
<td><strong>Post-test</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1st Draft</td>
<td>74.74 (32.47)</td>
<td>75.86 (29.69)</td>
<td>67.21 (27.30)</td>
</tr>
<tr>
<td>2nd Draft</td>
<td>100.30 (37.10)</td>
<td>108.60 (29.46)</td>
<td>121.90 (53.74)</td>
</tr>
</tbody>
</table>

<sup>a</sup> Numbers in parentheses are standard deviations.
### Table 1c
**Analytical Scores**  
(Mean Errors per 100 Words)

<table>
<thead>
<tr>
<th>Conditions</th>
<th>C</th>
<th>I</th>
<th>E</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Pretest</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1st Draft</td>
<td>9.74 (9.24)&lt;sup&gt;a&lt;/sup&gt;</td>
<td>7.64 (7.12)</td>
<td>7.11 (6.79)</td>
</tr>
<tr>
<td>2nd Draft</td>
<td>5.21 (5.95)</td>
<td>5.92 (6.18)</td>
<td>3.41 (3.62)</td>
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<tr>
<td><strong>Post-test</strong></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>1st Draft</td>
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<td>8.79 (5.92)</td>
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<tr>
<td>2nd Draft</td>
<td>10.21 (5.97)</td>
<td>8.12 (3.80)</td>
<td>5.38 (4.24)</td>
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</tbody>
</table>

<sup>a</sup> Numbers in parentheses are standard deviations.
Table 2

ANOVA for Holistic Scores

<table>
<thead>
<tr>
<th>SV</th>
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<th>F</th>
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<tr>
<td>Between Groups</td>
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<tr>
<td>I</td>
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<tr>
<td>S/I</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>T</td>
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<td>5.04</td>
<td>8.54a</td>
</tr>
<tr>
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<tr>
<td>ST/I</td>
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<td>.59</td>
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</tr>
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</table>

^a p < .01
interval or practice, did not affect improved scores. However, significant Time, Practice, and Instruction X Time interaction effects were established. That is, the holistic scores of the drafts improved from pretest to post-test and from first draft to final draft for all groups. As expected, however, the experimental group demonstrated the greatest increase in holistic scores from pretest to post-test.

**Draft Word Length**

Table 3 contains the results from ANOVA calculations performed on paragraph-length data. The pretest mean word length for the first drafts of the experimental group was less than the means of the other drafts, though a Dunnett's test of experimental and control means (cf., Myers, 1972) demonstrated no significance. It is probable that the experimental group's lack of familiarity with the word processing software can account for these word length differences. The ANOVA revealed main effects for Time and Practice, and Instruction X Practice and Time X Practice interactions. That is, the paragraph lengths of all drafts for all groups increased with practice from first to final draft and across time from the pretest to the post-test. However, just as was the case for holistic scores, the greatest gain in draft length across time was demonstrated by the experimental group. In fact, both groups who had received some
Table 3
ANOVA for Paragraph Length

<table>
<thead>
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<th>F</th>
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<td>107.02&lt;sup&gt;a&lt;/sup&gt;</td>
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<tr>
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<td>IP</td>
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</table>

<sup>a</sup> p < .01
computer experience (i.e., experimental and intermediate control) wrote longer final drafts for the post-test than did the noncomputer (control) group.

**Analytical Scores - Errors Per 100 Words**

Because the mean scores of the pretest first draft appeared to differ across groups, a Dunnett's test was performed on the most disparate of these values (i.e., experimental and control). The calculation revealed no simple effect for the pretest first draft. That is, the two groups were not significantly different from one another at the beginning of the study. Contained in Table 4 are the data from ANOVA calculations performed on punctuation and grammar error data. The analysis demonstrated a main effect for Instruction. That is, as expected, the experimental group made fewer grammatical errors overall than did the other groups. A main effect for Practice also was obtained: all groups reduced their errors from first to second drafts.

The data also revealed some unexpected results. All groups, regardless of condition, made more errors from pretest to post-test, resulting in a significant Time effect. In addition, a smaller percent of these errors were corrected on the second draft of the post-test (22%) than on the second draft of the pretest (41%) for all groups. An account for this result, based on the researcher's first-hand experiences with classroom
Table 4
ANOVA for Analytical Data

<table>
<thead>
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<td>Within Groups</td>
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</tr>
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<td>16.18&lt;sup&gt;a&lt;/sup&gt;</td>
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</table>

<sup>a</sup> p < .01
implementations of the writing process, is provided in the following chapter.

In summary, the results of the study indicated that, counter to previous research, an Instruction X Time interaction effect was established for revision. That is, although the holistic scores for the drafts of all groups improved from pretest to post-test and from first draft to final draft, the experimental group demonstrated the greatest increase in holistic scores from pretest to post-test. The ANOVA calculations for word length revealed main effects for Time and Practice and Interactions or Instruction X Practice and Time X Practice. That is, the paragraph lengths of all groups increased with practice from first to final draft and from pretest to post-test. However, just as was the case with holistic scores, the greatest gain in draft length across time was demonstrated by the experimental group. The calculations for the analytical data revealed some unexpected results. All groups, regardless of condition, made more errors from pretest to post-test and corrected a smaller percent of these errors in the second draft. This is contrary to previous findings.
CHAPTER FIVE

Discussion

The review of recent research literature presented earlier in this thesis has examined the computer as motivator, editor, and idea reshaper. Research by Kurth (1987), Harris (1985), and Dauite (1983) all have revealed changes in attitude toward writing when computers have been added to writing curricula. Revision tends to be more rewarding once the spatial and aesthetic barriers to revision are removed. Once students have access to a clean copy in which changes are incorporated neatly into the text, they take greater pride in what they have written. Kieffer and Smith (1983), Collier (1983), Dauite (1983), and Harris (1985) all have reported that word processors can aid students in the editing stage of writing. Students using word processors correct more grammatical and spelling errors than do those using traditional methods. These students also made more deletions and additions to their drafts, causing the drafts to be longer than those written by students using traditional pen and paper methods. However, the investigations by Collier (1983), Harris (1985), Kieffer and Smith (1983), and Kurth (1987) have revealed no significant differences between drafts at the microstructure or macrostructure level of writing for computer users in contrast to those revising in the traditional way. That
is, there is little evidence to support the contention that word processors encourage the writer to revise his writing beyond simple editing.

The purpose of the present study was to determine whether the addition of word processing software into the writing process would aid in significantly more revisions at the macrostructure level of writing. In contrast to earlier research, the present study looked for such changes over a longer period of time, and with a younger, larger sample of subjects. In addition, an attempt was made to confirm some previous findings concerning the use of the computer. Specifically, it also was expected that the use of computers for writing would increase draft word length and reduce the number of grammatical and spelling errors contained in final drafts.

Three groups of sixth-grade students received writing instruction over a six-month period with different degrees of computer involvement: no formal exposure to or use of computers; exposure to computers during instructions, but no use of computers while writing; and formal exposure to and active use of computers throughout the writing process. All three groups improved their drafts with practice from first to final draft and from pretest to post-test for all three areas investigated: holistic scores, draft length, and analytical scores for errors
per 100 words. These results were consistent with expectations because the writing process was being taught throughout the course of the study and learning was taking place. However, analysis of holistic scores revealed at least one result that is contrary to previous research findings. Drafts from the experimental group showed greater improvement in holistic scores from pretest to post-test than did those from subjects not using word processors. This result is particularly compelling because the type of writing used was expository rather than a form of writing more familiar to sixth-grade students (e.g., narrative). Revision may have been greater and the holistic scores even higher had another, more traditional form of writing been used for the pretest and post-test.

Changes in paragraph length demonstrated a significant interaction between instruction and practice. That is, drafts from the experimental group increased in length more from first to final draft than did those from the other two conditions. The exposure to computers, as predicted, aided the students in the making of more additions to their texts.

Analyses of analytical data revealed a main effect for instruction, such that the experimental group made fewer errors than did the other two groups. However, in contrast to previous research findings, the present study found that all groups made
more errors across time (i.e., from pretest to post-test) and corrected fewer first draft errors on the post-test than on the pretest. One tentative, but plausible explanation for this result has to do with the teacher's lack of familiarity with the teaching of writing as a process. The notion of writing as a process is fairly new to the employed school district and its associated methodologies are not consistently used by district teachers. It is not unusual that such teachers would overlook the editing stage of the writing process, focusing on the fluency and content rather than on the technical correctness of what has been written. Typically, novices to process teaching view editing as too time consuming, not realizing that the expense is only temporary because students who are made to correct their errors tend to make fewer of them in the future. If the teachers in the present study thought they were teaching sufficient editing in their language arts classes and failed to encourage the systematic correction of errors in student drafts, it is possible that students would make more errors over time and correct fewer of them from first to final draft. In short, if there is no penalty for such errors, many students may become more and more careless about making them.

This review of purposes, structure and results of the present study points to several issues that are worthy of further
investigation. First, further research is needed to address the issue of variability of student writing performance. Standard deviations for draft length data, for example, were quite large in contrast to their respective means. In addition, as the number of words increased across time and with practice, for each group, so did the standard deviations. This variability may have hidden significant effects and may have made effects much more difficult to interpret. Subjects in the present study were afforded unlimited writing time with no minimal acceptable draft lengths. Perhaps future research should limit the time permitted for writing drafts, as well as specifying minimum length requirements, thus reducing the variability of draft length within groups.

Holistic and analytical scoring traditionally have been the measuring procedures used in research on revision. However, future research needs to incorporate a more precise rubric for draft scoring. Although a nine-point holistic scale was established for the scoring of drafts in this study, scorers typically made use of only the middle third of the scale. Very few papers obtained scores in the upper or lower thirds of the scale. Perhaps the implementation of a primary trait scoring procedure, in future research, would be more sensitive to revision effects at the macrostructure level than is holistic
assessment. The advantage of this technique is that it focuses on specific characteristics such as tone, voice, and vocabulary appropriate to audience rather than on the effectiveness of the entity.

Finally, the types of computer activities that enhance cognitive development need further investigations. Increased cognitive capabilities might result in students making revisions at higher cognitive levels. It is essential, therefore, that investigations be conducted that employ designs wherein computer usage, the writing process, and cognitive strategies all are manipulated. It may be possible, thereby, to determine whether students who write using computers make use of more sophisticated cognitive strategies in revision than do those students without access to computers.

The present study was an attempt to bridge the gap between research and the reality of the classroom. It was demonstrated, through the use of laboratory research in real classroom situations, that some areas of revision can be positively affected by the use of computers. These results should offer encouragement to teachers who are seeking the integration of computers into the writing curricula and should provide empirical support for those requests to that end.
References


APPENDIX A

(Sample Printouts of Data Disk Lessons Used to Practice Word Processing Commands)

Directions: Move the cursor to the homonyms in this story. Delete the incorrect one. Only the homonym that fits the story should remain.

Max-the RODE/ROAD Warrior

In the DAZE/DAYS after the GREAT/GRATE war when civilization DYED/DIED and no one defended the WEEK/WEAK, THEIR/THERE came a REAL/REEL man. His name was Max. Max was not what he SEAMED/SEEMED to BEE/BE. As a man and BUOY/BOY, he followed the warrior WAY/WEIGH.

THEY'RE/THERE will never again be a hero such as he. THROUGH/THREW war and pestilence, along the desert RODES/ROADS, he fought savages and ONE/WON. Each TAIL/TALE of daring, each FEET/FEAT of strength was told where good men MEAT/MEET.

Who'll RIGHT/WRITE the story of Max and his REIGN/RAIN as king of the highway? Who'll READ/REED and remember when Max defeated the barbarians?
Here are the "bare bones" of a story.
By filling in the blanks ( ) in an interesting way, you can make any kind of story you want—mysterious, funny, sad, silly—it's up to you. Be sure to chose an interesting title. When you have finished your story, save to story on your disk and then make a printed (hard) copy of your story.

***************

I always knew my Aunt ( ) was a real ( ). Why, she ( ), and one day she ( ). But even I was surprised when she planned to ( ). After all, she was ( ) years old, and this could be a ( ). We told her ( ) and begged her not to ( ), but nothing could ( ), and so, although we felt ( ), we watched her ( ).

( ) passed. No one heard from Aunt ( ). We were beginning to wonder if ( ) when suddenly our aunt appeared. She had been ( ) and she seemed very ( ). ( )ly, she told us the whole ( ). It seemed that she had ( ) and ( ). Now she was ( ), and we all felt ( ). Since then, Aunt ( ) has never ( ). Instead, she spends her time ( ). What a ( ) she is!
Sentence Expansion

Objective: To expand sentences from a three-word starter sentence.

Word Processing Feature Used: Insert, Delete.

Procedures:

1. Prepare data diskette containing several starter sentences under the file name "Sentence Starters".

   The snake sat
   The dog ran
   The cat cried
   The baby yelled
   The bike wobbled

2. Write "The snake sat" on the board. Ask students to replace sat with another action verb. Write ideas in a list under the word sat.

3. Next, brainstorm words which describe the snake. Make a list of these above the word snake.

4. Finally, ask students to brainstorm other words for snake and place them below the word snake.
5. Now, ask students to load the file "Sentence Starter" and use the delete command to get rid of snake and sat and insert command to replace them with words from the board.

6. Repeat this procedure with the other sentences on the file, expanding the three-word sentences to as many words as possible.
Friendly Letter

Objective: To understand and use the format for a friendly letter.

Word Processing Features Used: Insert, Delete, Tab, Print.

Procedure:

1. Review the parts of a friendly letter discussing the correct punctuation and spacing.

2. Ask students to individually brainstorm audiences for a friendly letter.

3. Have students choose one person from the list and cluster around that person's name topics to be covered in the letter.

4. Instruct students to compose the letter at the computer using the delete and insert commands to edit the letter. Students will use the Tab key to indent paragraphs.

5. Print the finished letter and have students sign after the closing.
Diamante

Objective: To write a diamante poem.

Word Processing Features Used: Delete, Insert, Center, Typestyles, Print.

Procedure:

1. Write a diamante on the board and explain that this type of poem compares two things.

2. Point to the sample and ask students to determine the characteristics on line one (a one-word noun).

3. Teach the form of the poem using the same procedure for all seven lines.

4. Brainstorm topics for a diamante — Make sure opposites are also given.

5. List suggestions on the board.

6. Pick one of the topics and make a group poem together following the form of the poem.

7. Teach students the Center command and the Typestyle command.

8. Direct students to write their own diamantes centering each line and selecting a typestyle to emphasize the subjects of the diamante.

9. Edit the poem using the delete and insert commands.

10. Print copies of the finished poems and illustrate them.
Descriptive Paragraph

Objective: To use sensory details to provide a vivid description of a picture while learning to revise.

Word Processing Features Used: Move, Insert, Delete, Save, Print.

Procedure:

1. Collect five pictures — animals, scenery, and still life.
2. Line them up across the front of the room.
3. Ask students to choose one of the pictures and write a description of that picture using as many details as possible.
4. Use the delete and insert commands to edit the paragraph.
5. Print the finished paragraph.
6. Review with the students the procedure for Block Moving.
7. Have students move one of the sentences from the paragraph to the beginning of the paragraph and rewrite the paragraph starting with that sentence.
8. Print the new paragraph and compare the two versions.
Persuasive Essay

Objective: To write a persuasive argument considering all aspects of the issue.

Word Processing Features Used: Insert, Delete, Move, Typestyle, Print.

Procedure:

1. Brainstorm with students circumstances which require them to use persuasive arguments with their parents.
2. List these circumstances on the board.
3. Have students get into pairs and choose a circumstance from the board.
4. Students should list arguments parents might give against the issue and counterarguments that could be used.
5. Write an essay using the arguments and counterarguments.
6. Edit using the insert and delete commands.
7. Use the Typestyle command to emphasize certain words or phrases.
8. Use the Move command to rearrange arguments into a more logical pattern.
9. Print the completed argument.
Point of View

Objective: To write two versions of the same story changing the point of view.

Word Processing Features Used: Search, Replace, Save, Print.

Procedure:

1. Brainstorm with students some of their early memories.
2. Choose one memory and list as many details as possible about it. Include sights, smells, tastes, thoughts, etc.
3. Instruct students to write a story telling about that memory in first person, at the computer. Save it in a file called "ME".
4. Review the Search and Replace commands with the students.
5. Have students search for all first person pronouns and replace them with third person pronouns using the correct commands.
6. Rewrite the story from this point of view.
7. Save this in a file named "HE".
8. When finished, have students print both stories and compare them for tone and voice. (This assignment will take two sessions).
Nursery Rhyme Crimes

Objective: To write a news story featuring a nursery rhyme crime.

Word Processing Features Used: Search, Center, Typestyle, Justification, Format, Print.

Procedure:

1. Brainstorm nursery rhymes and write titles on the board.
2. Ask what kinds of crimes could have been committed and who could have committed them.
3. Have this template available on the computer:
   
   Nursery Rhyme:
   Crime:
   Accused:
   Verdict:
   Sentence:

4. Ask students to choose a nursery rhyme and fill in the template.
5. Next, instruct students to write a news article, at the computer, as if they were reporting on the trial.
6. Have them Center the title
   Choose a typestyle for the story
   Format margins to newspaper column width
   Justify both sides of the article
   Boldface the name of the accused (use the Search feature to check for this)

7. Save and Print copies of article and have students edit them at their seats.
Business Letter

Objective: To write a letter ordering items from a catalogue.

Word Processing Features Used: Insert, Delete, Save, Print,
Justification, Typestyles.

Procedures:

1. Have students browse through several catalogues and select items they would like to have.
2. Review with students the parts of a business letter and the proper punctuation.
3. Discuss the information needed to be included in the body of the letter.
4. Have students type their letters at the computer.
5. Use Justify to set margins for a business look.
   Select Typestyles and boldface or italics to enhance letters.
   Insert additions or corrections.
   Delete unwanted material.
   Save and Print letters and edit at desks.
Haiku Poetry

Objective: To write a Haiku poem.

Word Processing Features Used: Insert, Delete, Typestyles.

Procedure:

1. Explain that Haiku poetry is a form of poetry started in Japan over 500 years ago.

2. Describe the form of the poem. Point out that the poem consists of three lines: the first line containing five syllables; the second containing seven syllables; and the third line containing five syllables.

3. Explain that Haiku poetry is usually written about nature.

4. Practice writing some poems together as a class.

5. Have students type their poems at the computer.

6. Underline descriptive words.

   Delete or Insert words as necessary.

7. Edit the poem for form, description, and content.

8. Print final poem and illustrate.
Make It Different

Objectives: To write a descriptive paragraph using the encyclopedia to find information.

Word Processing Features Used: Replace, Insert, Delete, Justification, and Typestyles.

Procedure:

1. Pass out slips of paper to each student with the names of famous people in history printed on them.

2. Explain to the students that they must write a paragraph of at least seven sentences about this person. They may use encyclopedias or other sources to find information.

3. Type paragraphs at the computer.

4. Center the title.

5. Insert and Delete when necessary.

6. Italicize the name of the famous person every time it is used in the paragraph.

7. Use the Replace feature to find and replace the italicized name with descriptive synonyms.

8. Print copies of revised paragraphs.
3842 mountain vista  las vegas nevada
89101  september 5  198.  dear terry i
just started my first computer class.
it is so much fun to work on the
computers at school.  we are learning
all about the different kinds of
computers and the software available.
this week we are using the computers to
write letters to our friends.  are you
able to use computers at your school?
do you think it is fun and exciting?
your friend  lynn
Spelling mistakes are easy to correct with a word processor and cursor movements. All you need to know is how to spell the word correctly or have a dictionary nearby.
The sun was shining. There were clouds in the sky. The girl was on the swing and her dog sat on the ground. When the dog barked, the girl looked down at him. She thought that he was a nice dog and wanted to be taken home. Soon they left the park and went home for supper.
APPENDIX D

(General Overview of the Writing Curriculum)

Scope and Sequence of the Program

Daily Written Language

September - Building fluency through focused writing
October-November - Sentence-combining
December-February - "Showing-not-telling" paragraphs
March-May - Journals and free writing

Writing Process

September - Word usage
October - Sentence variety/slotting
November - Development of paragraphs
December - Three-paragraph essays
January - Descriptive paragraphs
February - Narrative paragraphs
March - Expository paragraphs
April - Persuasive paragraphs
May - Poetry
APPENDIX E

(Read-Around Group Procedures)

1. Groups should be as nearly equal in size. Groups of four or five are best for most tasks.

2. For each group, appoint a leader to collect and pass the papers (choose students sitting closest to the group to which they will pass papers). Appoint a group recorder to list code numbers of chosen papers.

3. Have students use code numbers on their papers instead of their names.

4. Give groups a specific, simple task to perform, such as "Select the best paper in each set."

5. Set strict time limits. Give groups just a little less time than they would like. Keep careful track of the time (a stopwatch works well).

6. Set up a simple system for reading.

   a. Leaders collect papers from their own group and, on a given signal, pass the set to the next group.
b. Students read the first paper quickly. At the signal, "pass to the right," they pass papers to the person on their right in their group. Note: Students pass only at the signal, not before or after.

c. At the end of each set, groups choose the paper they liked best, recorders write down its code number, and leaders indicate that their group is finished.

d. When all groups have made a choice, leaders pass the papers to the next group at the signal, "change groups."

7. Follow Read-Around Group sessions with discussion of what students noticed while reading: qualities of the "best" papers; effective opening/closing lines, thesis statements, order of ideas; successes/problems in development, language use, etc.
Helpful Hints

1. Don't ask students to choose the best among their own group—it's too threatening, at least at first.

2. Adjust reading time upward or downward by a few seconds if students don't finish or finish too quickly.

3. Use the base Read-Around Group for short papers—1 or 2 pages. Have students read longer papers aloud to their group.
APPENDIX F

(Nine-Point Holistic Scoring Rubric)

9 - Tone and Voice present to a high degree
   Authoritative, committed assured writer
   5 or more sentences
   7 or more concrete nouns and specific details
   Concise organization - general to specific
   1 or 2 (minor number of combined) spelling, grammar or mechanical errors
   Sentence variety in both length and beginning of draft
   All details pertinent and necessary for description

8 - Weaker version of 9
   Tone and Voice to a weaker degree
   Writer not as assured or committed
   At least 4 sentences
   Less concrete nouns and specific details
   Looser organization - a few errors in this area
   3 or 4 combined spelling, grammar or mechanical errors
   Sentence variety still present but 1 or 2 sentences
      begin the same way
   All details pertinent
7 - Weaker version of 8

Tone or voice present to some degree
Writer not confident
At least 3 sentences
5-7 concrete nouns or specific details
Faulty organization - jumps from one thought to another
Some sentence variety - sentences may begin the same
    way, but vary in length
Most details provided are pertinent

6 - Weaker version of 7

Tone or Voice present to some degree
At least 2 sentences
3-5 concrete nouns and specific details
Faulty organization - jumps around
7 or more combined errors in spelling, grammar and
    mechanics
Most sentences begin the same way
Some unnecessary details provided
5 - Weaker version of 6

Tone or Voice missing
At least 2 sentences
2-4 concrete nouns and specific details
No apparent organization - jumps all over
Major number of spelling, grammar and mechanical errors for the length of the paper
Most sentences begin the same way
Many of the details provided are useless

4 - Weaker version of 5

Tone and Voice missing
At least one sentence
1 or 2 concrete nouns or specific details
Major mechanical, grammatical and spelling errors for the length of the draft
No organization
No sentence or length variety

3 - No paragraph form - just listing

A below-average paper that maintains the idea of the assignment but distorts the topic of fails to detail adequately with the topic.
2 - Given to any one-topic response that has little redeeming quality. Scarely coherent and full of mechanical and grammatical errors.

1 - Given to a blank paper or a non-topic response.