

EFFECTS OF APPLYING BORDERS, FORMATTING
CHARACTERS AND ANNOTATING WITH VOICE DURING
WORD PROCESSING ON THE QUALITY OF
STUDENT WRITING

CENTRE FOR NEWFOUNDLAND STUDIES

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DAVID G. STOODLEY



EFFECTS OF APPLYING BORDERS, FORMATTING CHARACTERS
AND ANNOTATING WITH VOICE DURING WORD PROCESSING
ON THE QUALITY OF STUDENT WRITING

by

David G. Stoodley

A thesis submitted to the School of Graduate Studies
in conformity with the requirements for the *degree of*
Master of Education

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*Effects of Applying Borders, Formatting Characters and Annotating
with Voice During Word Processing on the Quality of Student Writing*

ABSTRACT

The purpose of this thesis was to determine whether the quality of students' writing was affected by three types of word processor enhancements, namely, formatting characters, applying borders or annotating with voice. A team of evaluators independently scored three sets of writing assignments which were collected from 30 grade 7 students over a period of 39 weeks. An analysis of the data revealed no statistically significant differences between the treatment groups. The quality of writing was not affected by the type of word processor enhancements used during the composing and revising processes.

The results of the study with these writers showed that 1) the research subjects did not possess sufficient knowledge of what could be expected from using the enhancements or the requisite skills to use the enhancements to affect the quality of their writing; 2) the constructivist writing model, along with the associated generative strategies which were employed with this group, were likely insufficient to effect a significant improvement in writing quality and, 3) a counterbalanced or repeated measures-by-treatment assessment should not have been used due to contamination of aural memory traces from speech to visual conditions. Limitations and implications of the study for further research are identified.

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TABLE OF CONTENTS

List of Tables	vi
List of Figures	vii
1. Introduction	1
The Research Question	5
Summary	6
2. Literature Review	8
Traditional Writing Approaches	9
Composing Strategies	10
Thinking Processes During Word Processing	12
Proposed New Strategies.....	24
Conclusion	26
3. Methodology	27
Subjects	27
Instruments and Materials	28
Procedure.....	40
Research Design	52
Summary	65
4. Results	67
Analysis	67
Summary	85

5. Discussion	86
Conclusions	86
Implications of the Study	86
Limitations of the Study	89
Suggested Improvements	90
Summary	92
Bibliography	93
Appendices	104
A. Student Booklets	105
B. Story Ideas	144
C. Final Draft	153
D. Pretest	154
E. Posttest #1	156
F. Posttest #2	158
G. Questionnaire #1	160
H. Questionnaire #2	162
I. Project Time Frames	164
J. Self Instruction Booklets-Skills Development Outline	167
K. Group Assignment Chart	170
L. Teacher Dialog	172
M. Consent Form	177
N. Evaluator's Scoring Sheet	178
O. Categories for Writing Evaluation	179
P. Steps for Writing	182
Q. Descriptive Statistics for Writing Components	184

LIST OF TABLES

Table 1	Planning and Revision Stages of Writing	11
Table 2	Time Frames for Phase 1, 2, 3 and 4	43
Table 3	Group Assignments of Word Processor Features	55
Table 4	Descriptive Statistics of Test Writing Scores	68
Table 5	Descriptive Statistics of Mean Test Scores	69
Table 6	Descriptive Statistics of Pretest Writing Scores for Treatment Groups (Posttest #1 Grouping)	71
Table 7	Summary of Anova Results of Pretest Writing Scores (Posttest #1 Grouping)	72
Table 8	Descriptive Statistics of Posttest #1 Writing Scores for Treatment Groups	73
Table 9	Summary Results of Analysis of Variance of Posttest #1 Data	74
Table 10	Descriptive Statistics of Pretest Writing Scores for Treatment Groups (Posttest #2 Grouping)	75
Table 11	Summary of Anova Results of Pretest Writing Scores (Posttest #2 Grouping)	76
Table 12	Descriptive Statistics of Posttest #2 Writing Scores for Treatment Groups	77
Table 13	Summary of Anova Results of Posttest #2 Writing Scores	78
Table 14	Descriptive Statistics for Questionnaires	80

LIST OF FIGURES

Figure 1.	Sample computer screen containing document icons as seen by students.	30
Figure 2.	Text characteristics for borders and characters treatments.....	34
Figure 3.	Graphic image of a speaker applied as a result of voice annotating.	35
Figure 4.	Frequency distribution for scores on questionnaires.....	81
Figure 5.	Frequency distribution for knowledge of other treatments question.	82
Figure 6.	Scatterplot of writing score versus knowledge of other features.	84
Figure 7.	Gantt chart of project timelines.	166

1. INTRODUCTION

Chapter one is an introduction to an inquiry into the students' use of sound, graphic and text formatting attributes in word processing software as a means of improving the quality of student writing.

The use of computers for word processing offers many advantages to writers, especially in terms of planning and revising the text. Some of these advantages are directly related to the physical tasks of hand-writing, reading handwritten text and producing a good copy of the revised text (Erickson, 1992). Other advantages are related to the ease of editing text and making structural changes (Lockard, Abrams & Many, 1994). Still other advantages, such as equipping people with thinking skills and strategies that reorganize and enhance their performance (Salomon, Perkins & Globerson, 1991, p. 8), are related to the higher levels of cognitive processing that students must engage in as they develop a partnership with the computer .

Researchers (Cochran-Smith, 1991; Erickson, 1992; Montague, 1990; Morton, Lindsay, & Roche, 1989; Owston, Murphy, & Wideman, 1990; Roblyer, Castine, & King, 1988; Snyder, 1993) have implemented studies in a wide variety of populations and have utilized many types of methodologies and analysis tools to determine the effects that word processing has upon the quality of students' writing. Snyder (1993) reports that while "more studies have found an improvement in quality.... Indeed, the effects of using computers are influenced by the

entire writing context" (p. 63). "It is apparent that, in and of itself, word processing does not improve writing skill. Writers still have to understand the need for and practice the art of editing and revising" (Lockard, Abrams & Many, 1994, p. 44).

Research into writing (Collins, Brown & Newman, 1989; Scardamalia & Bereiter, 1985; and Snyder, 1993) indicates that it is important to teach planning and revision strategies in order to enable students to become successful writers. "The pedagogical tenet is that writing development usually occurs in conjunction with good instruction, such as a teaching approach which draws students into reading their texts critically and developing revising strategies" (Snyder, 1993, p. 61).

One of the common factors appearing in word processing research is the widespread use of character-based word processors. Typical studies (Daiute, 1986; Owston et al., 1990) comparing writing samples done by students using word processors with those using paper and pencil have relied upon character-based word processors rather than graphical word processors. Graphical word processors allow the user to modify text characteristics such as the size, style and font, and view the changes on the computer monitor as they occur. Character-based word processors typically display a standard font and use special symbols to indicate which sections of text will have specific font characteristics applied when the text is printed.

The evolution of hardware and software in recent years has made graphical interfaces and graphical word processing a reality in the classroom. In 1984, Apple Computer Inc. produced a desktop computer that utilized a graphical interface. Software companies soon began to produce word processing software to take advantage of this graphical interface. In 1992, Apple Computer Inc. introduced components into the Macintosh system software that enabled Macintosh users to digitize and incorporate sound into word processing documents. Microsoft Corporation was one of the companies to take advantage of this new feature by building routines into their word processing packages that would allow users to easily record and playback their own voice and include the digitized sound as an integral component of the word processor document.

One of the educational applications of these technological advances is an opportunity for student writers to include borders, a variety of font characteristics and voice annotations to their word processed documents. In this way, graphical word processing software provides students with opportunities that traditional, character-based word processing does not provide. The visual information that can be included when students use graphical word processing features such as borders (see Figure 2) or a variety of font characteristics (see Figure 2), can assist the student in revision of the visual presentation of the text as well as the sentence structure. Halio (1990) claimed that students who used graphical word processors produced text of a lower quality

than students who used character-based word processors. Erickson (1992) reports that it is important "to teach students to take advantage of the word processor's abilities to assist in the stages of the writing process, from prewriting through revisions and editing" (p. 181). Halio's students were not taught to take advantage of word processing features; they were given access to graphical word processors without appropriate instruction in the use of font characteristics.

The auditory information that can be included by using voice annotations allows the student writer to provide context that was not previously possible. When students learn to plan and revise by adding spoken annotations to the text, they come to understand the effects of bi-modal communication on the content of their writing. Students must be taught to use the technology available to them as an integral component of the writing process by incorporating visual and auditory information appropriately during the planning and editing stages of writing.

If the technological advancements in computers are going to affect achievement in writing, then it appears that it is necessary to focus upon the advancements and tie them to a teaching approach that encourages students to be more critical of their own work and their writing strategies.

The Research Question

Previous research shows that the quality of students' writing can be affected by the types of word processor enhancements that students apply when they compose or revise with a graphical word processor. These word processor enhancements have yet to be compared experimentally; the purpose of this thesis. Following a review of the available literature, therefore, an original study was designed to compare the effects of annotating with speech, applying borders and formatting characters on the quality of student writing. The review itself will attempt to answer the following questions:

1. Does students' use of informational voice annotation during prewriting improve their writing more than the use of either border application, or character formatting?
2. Does the students' application of borders during prewriting improve their writing more than the use of informational voice annotation or character formatting?
3. Does the students' use of character formatting during prewriting improve their writing more than informational voice annotation or applying borders.

Improved writing is operationalized as a higher score on a modified Scale for Evaluating Narrative Writing (Owston et al., 1990).

Students who participated in this project were taught to use borders, font characteristics and voice annotations as an integral part

of the planning and editing stages of writing. This thesis will compare the effects that these three types of word processor enhancements had upon student achievement in writing.

Chapter two is a review of the extant literature on conventional composing strategies and related thinking processes that purportedly occur during word processing. An interactive strategy called "assigning importance" is introduced based on print-based mathemagenic and generative strategies suggested by Hannafin (1989). Assigning importance in this thesis refers to the conceptual application of graphical and audio attributes during word processing. Chapter three is a description of the development of materials and tests, the research design, sampling procedures, subjects involved and the measures that were used to evaluate writing quality. Chapter four is a discussion of the statistical procedures used to analyze the writing scores and states the results of the analysis. Chapter five is a discussion of the results of the analyses and the educational implications of these results.

Summary

Chapter one was an introduction to the educational variables under investigation. A brief description of relevant research indicated that the effects of word processing seem to be positive, albeit complex. Until recently, students have not had the opportunity to apply graphics and sound during word processing. Graphical word processing provides students with features that are not available with character-based

word processing. Students can be taught how to use these features as a component of their composing and revising strategies. This thesis is an inquiry into the use of sound and graphic attributes of graphical word processing software in conjunction with composing and revising strategies as a means of improving the quality of student writing.

2. LITERATURE REVIEW

This chapter is a discussion of the literature concerning conventional writing strategies, composing strategies, thinking processes that occur during word processing, and the effects of graphics and sound upon writing strategies.

Word processing refers to the use of "a computer program for writing, editing, revising, formatting and printing text" (Lockard, Abrams & Many, 1994). The user is able to use the computer as an electronic typewriter to input text using the keyboard and have it appear on the computer screen. Once the text is "in" the computer, mistakes can be corrected, blocks of text can be repositioned, and margins, line spacing and page numbering can be controlled. The user is able to control certain font characteristics such as the size, and style of the lettering. Many word processors are able to check the spelling and grammar of the text as well as offer advanced outlining options. Features such as annotating with voice, applying borders, and formatting characters, that are available with graphical word processors may indeed have significant effects upon traditionally recognized writing strategies. However, they may also revolutionize the way we view writing and the writing process by offering opportunities that were never possible.

Traditional Writing Approaches

Traditionally, there have been two philosophical approaches to teaching writing skills, the reductive approach and the holistic approach (Hartwell, 1985). The reductive approach assumes that if students develop discrete mechanical skills, such as the proper use of punctuation, then they will become good writers. The holistic approach to writing assumes that students will naturally develop mechanical skills if they focus upon the meaning of what they are writing. Students who learn to write using the holistic approach are taught to place emphasis on planning, writing and revising (Hannafin & Dalton, 1987). Erickson (1992) reports five steps for completing writing assignments: "(a) prewriting, (b) writing the rough draft, (c) revising with major changes in ideas and organization, (d) editing for surface errors such as spelling and punctuation, and (e) publishing the final draft" (p. 172). Writing, therefore, is viewed as a process rather than a product. Students are taught to generate ideas, organize those ideas, compose the ideas into sentences and revise to improve the composition (Lockard et al., 1994). Students may repeat these steps until they are satisfied with their work. Strategies for teaching writing skills to students involved with this study more closely resemble the holistic approach than the reductive approach. This thesis concentrates on the organization and revision stages of writing.

Composing Strategies

Bereiter and Scardamalia (1987) recognized that successful writers and unsuccessful writers use different composing strategies. They refer to those procedures used by novice writers as "knowledge telling" and the procedures used by expert writers as "knowledge transforming" (Bereiter & Scardamalia, 1987, p. 18). Successful learners demonstrate "a variety of cognitive strategies and self-management procedures to pursue knowledge-related goals, to relate new knowledge to old, to monitor their understanding, to infer unstated information, and to review, reorganize and reconsider their knowledge" (Scardamalia, Bereiter, McLean, Swallow & Woodruff, 1989, p. 53). Students whose only exposure to expert writing strategies is through reading, may not adopt the expert strategies because reading does not provide insight into the processes the authors used to create the text (Collins, Brown & Newman, 1989). Instead, students tend to incorporate writing strategies that have been successful for them in school (Scardamalia et al., 1989). Students who are not taught strategies for revising while using a computer for word processing simply tend to "add words at the end of the text" (Erickson, 1992, p. 182). According to Erickson (1992) using the direct approach to teach strategies that expert writers employ appears to be more effective.

Collins et al. (1989) describe how Scardamalia and colleagues have broken down the planning component into five general processes: "(a) generating a new idea, (b) improving an idea, (c) elaborating an

idea, (d) identifying goals, and (e) putting ideas into a cohesive whole" (Collins et al., 1989, p. 465). Scardamalia and Bereiter (1985) have also identified four processes involved in revising: (a) comparing, (b) diagnosing, (c) choosing a revision tactic, and (d) generating alternatives. Table 1 summarizes the nine stages that are used in the planning and revision stages of writing.

Table 1

Planning and Revision Stages of Writing

Writing Process	
<u>Planning</u>	
	<ul style="list-style-type: none"> • Generating a new idea • Improving an idea • Elaborating an idea • Identifying goals • Putting ideas into a cohesive whole
<u>Revision</u>	
	<ul style="list-style-type: none"> • Comparing • Diagnosing • Choosing a revision tactic • Generating alternatives

When these nine processes are used in the planning and revision stages of writing they may bring about "significant changes in the nature and quality of student writing" (Collins et al., 1989, p. 468). Students are not only improving the quality of their writing, they are also incorporating more complex writing strategies into their existing executive control structures. As a result, there is a shift from knowledge-telling strategies towards knowledge-transforming strategies.

Thinking Processes During Word Processing

Research in writing (Bereiter & Scardamalia, 1987; Scardamalia & Bereiter, 1985) indicates that writing is improved by modifying the cognitive processes that occur during writing. Many researchers (Dudley-Marling & Oppenheimer, 1990; Feldman, 1984; Levin, Boruta, & Vasconcellos, 1983; Montague, 1990; Morton, 1988; O'Brien, 1984; Owston et al., 1990; Schramm, 1989; and Zurn, 1987) have identified positive effects of word processing. If word processing can have a positive effect upon writing quality and if modifying cognitive processes that occur during writing also has a positive effect upon writing quality, then modifying cognitive processes that occur during word processing should also improve writing quality.

Salomon, Perkins and Globerson (1991) distinguish the "effects with the technology" from the "effects of the technology" by considering whether students' improvements are contingent upon the computers'

presence. If students' writing skills are improved while they have access to specific word processing features, then the observed effect is an effect with the technology. A partnership develops between the student and the computer that "allows mindful learners to engage in cognitive processes that are of a higher order than the ones they would display without the partnership" (Salomon et al., 1991, p. 5). The outcome of the partnership depends as much upon the role played by the student as it does upon the role played by the technology.

If students continue to engage in higher-order cognitive processes, even when the technology is not available, then an effect of technology has been observed. Effects of technology imply cognitive development because the student is operating at a higher cognitive level without the support structure that was previously provided by the technology. Research indicating that the writing skills that junior high students learn on computers may effectively transfer to writing tasks requiring pencil-and-paper (Erickson, 1992; Montague, 1990) supports the concept that cognitive processes learned through computer use may be available during other activities.

If the students' knowledge-transforming strategies that are developed as a result of using special characteristics of a word processor (i.e., the speech attribute, the borders attribute or the character formatting attribute) are applied when students do not have access to the computer, then the development would be an effect of the technology. Students have a greater achievement or reach a particular

level of achievement more quickly by using software to modify their cognitive strategies than would have been possible without using the technology.

The development of knowledge-transforming strategies is not a passive activity. In fact, the magnitude of the benefit that students realize is a function of the mental effort that is expended by the student (Salomon, Globerson, & Guterman, 1989). The computer should "provide temporary supports while they (the students) are trying to adopt more complex strategies" (Scardamalia et al., 1989, p. 54). When students enter into a partnership with the computer and exercise cognitive processes as a result of that partnership "the program can be said to cultivate skills or strategies by activating them repeatedly, by stretching at abilities' boundaries" (Salomon, 1990, p. 35). Entering into a partnership with the computer is a likely outcome considering the fact that junior high students show definite affective gains in motivation for revision activities when they use computers for composition (Erickson, 1992).

If students develop a partnership with the computer during word processing, the computer's role in the partnership, that of providing a level of support, can vary in degree. The computer can perform an elaborate diagnosis of the text and prompt the student with suggestions for revision. It can also present menu items which permit access to features which can be used in the students' knowledge-transforming strategies. However, it is important for the student, not

the computer, to do the diagnosing, goal-setting and planning. Some intelligent tutoring systems (ITS) tend to limit cognitive development by offering too much support. "The computer environment should not be providing the knowledge and intelligence to guide learning, it should be providing the facilitating structure and tools that enable students to make maximum use of their own intelligence and knowledge" (Scardamalia et al., 1989, p. 54). In effect, computer use in this way increases the students' cognitive load. The computer is used as a tool to "provide an environment and vehicle that often requires learners to think harder about the subject matter domain being studied while generating thoughts that would be difficult without the tool" (Kommers, Jonassen, & Mayes, 1992, p. 5).

When used as a component of revision strategies, the speech attribute, the borders attribute and the character formatting attribute provide a unique kind of support while allowing students to evaluate their writing more deeply. "Cognitive learning theory assumes that learners interact with... information, interpret it, and build personal knowledge representations after relating that information to their prior knowledge" (Jonassen, 1992, p. 3). It seems reasonable therefore, to expect these three special word processing attributes (i.e., speech, bordering and character formatting) to encourage cognitive development if students employ them mindfully during the planning and revision stages of writing.

The writers of today, who would be models for novice writers, make use of a variety of visual and auditory techniques for enhancing their work. Bernhardt (1986) observes that "outside the classroom visually informative prose is pervasive" (Bernhardt, 1986, p.67). If students are encouraged to improve their writing by modeling expert writers, then it is reasonable to expect students to employ similar techniques to those that they observe in magazines and on television. However, unless students are trained to use enhancing techniques appropriately the result is often haphazard and confusing.

Successful writers use phrasing and elaborate sentence and document structure to develop a smooth progression from beginning to end (Bernhardt, 1986). Clues used by successful writers to guide readers along are subtle; vivid visual information is normally not required. Novice writers, on the other hand, who have not mastered the subtleties of the written language, may find it desirable to incorporate visual clues in the initial stages of their document. In fact, it may be desirable to encourage novice writers to include visual clues as a means of externalizing their thought processes. "Writing, especially when visually informative, encourages the writer to be exact about grouping related ideas, delineating beginnings and endings, and using clues to signal to the reader a graphic representation of cognitive organization" (Bernhardt, 1986, p. 67).

In traditional writing exercises, the decisions and value judgments that students make about the material they have written

are not apparent except through careful reading and analysis. Applying borders, changing character formatting and including voice annotations may enable students to externalize the goal-setting and decision-making processes by using procedures that are not normally available. The number of choices available to students when they utilize the special features are limited and each of the features provide unique cues to the students about the decisions they have made.

Borders and a variety of fonts are typically used as graphic organizers which "are a widely accepted instructional strategy to assist students in learning from informational texts" (Rice, 1994, p. 58). According to Rice (1994) research regarding the effectiveness of graphic organizers is inconclusive. Borders and fonts are typically used in a passive mode as mathemagenic devices. While this thesis takes advantage of borders and fonts as mathemagenic devices, their primary function is generative. Research in instructional design indicates that students' performance is improved through the use of generative strategies (Grabinger & Albers, 1989; Jonassen, 1992; Mann, 1992a). "Generative processing occurs when learners assign meaning to new information by relating it to prior knowledge" (Jonassen, 1992, p. 2). Research shows that "direct manipulation enhances cognitive control in a judgment task" (Te'eni, 1990, p. 464). The feedback that students receive as a result of directly manipulating their text on the screen affects cognitive processing. Also, Grabinger and Albers (1989) and Mayes (1992) report that when learners are

directly involved with the interventions, learning is more successful. In this thesis the author employs a generative use of these mathemagenic devices: borders and fonts. Available research concerning the use of borders and fonts tends to treat these enhancements as mathemagenic devices, devices which are "designer-centered interactions" (Hannafin, 1989, p.171) rather than "learner-centered interactions" (Hannafin, 1989, p.171). The generative use of these mathemagenic devices as an integral part of word processing is a new strategy that is studied in this thesis.

Borders

Borders that are applied as a result of the treatments extend to the far right of the screen (page), beyond the text to produce a ragged margin. "The natural shape that ragged margins provide becomes a spatial attribute, allowing the student to recall from either the content or the location of the information" (Aspillaga, 1991, p. 56). The borders applied by the students provided specific visual clues to the reader as to the significance of the text and the organization of the document.

Borders may be used to provide visual reference points by extending beyond the normal boundaries of the text and by increasing the amount of space that is left between lines of text. "Extra space between lines contributes to legibility ...interlinear space may be used to demonstrate hierarchical order. Information should be grouped in relation to its content and divided according to ideas, discriminating

major points from subordinate ones" (Aspillaga, 1991, p. 54). When a border was applied, the interlinear space was increased in proportion to the level of significance assigned to a specific section of text. Points that students identified as being major ones were automatically given a double top and bottom border. Less significant points were given only a single top and bottom border. As a result of using borders to assign different levels of importance to different ideas, the space between the lines of text automatically increased, with more significant points receiving more interlinear space. As the students organized their ideas, different types of borders and interlinear space helped indicate the hierarchical order of their ideas.

Font Characteristics

Modifying the formatting characteristics of text can also permit students to include visual information with their text. Grabinger and Amedeo (1988) report that the use of directive cues (i.e., different font characteristics) can facilitate learning when they are used to demonstrate hierarchical order, as long as they "are systematically related to desired outcomes,... used sparingly to indicate only those ideas which are superordinate, and when they do not inhibit or circumvent the desired processing activities" (Grabinger & Amedeo, 1988, p. 190). Increasing the font size causes an increase in the interlinear space which also helps to demonstrate hierarchical order (Aspillaga, 1991).

The visual information supplied by borders and a variety of character formats should help students get a visual sense of the organization of their document. "The presence of a visual structure should free mental resources for learning" (Tripp & Roby, 1990, p. 121). If students are able to utilize mental resources that would normally be used for keeping track of information related to story sequence during prewriting, then the writing quality may improve.

Borders increase the interlinear space as well as use the margin to define the shape of the paragraph. A variety of font characteristics increases the interlinear space without affecting the margins. It appears that borders may contain more information about the structure and organization of the document than will a variety of font characteristics. Therefore, students using borders should see a greater benefit than students using a variety of character formats and should realize higher mean writing scores.

Voice Annotations

"Computer interfaces that deliver information in text and sound are believed to improve users' understanding." (Mann, 1993, p. 1). When information is processed through both visual and auditory channels, learning can be expected to occur (Barron & Kysilka, 1993; DeHaemer & Wallace, 1992). Adding audio is believed to enhance the users' understanding (Buxton, 1989; Milheim & Martin, 1991). Moreover, curricular uses of digitized and synthesized human speech

appears to be increasing (Aarntzen, 1993; Barron & Kysilka, 1993; Davidson, 1994; DeHaemer & Wallace, 1992; Hartas & Moseley, 1993; Muraida & Spector, 1993; Sutherland, 1993).

The results of research that tends to identify the user as the receiver of the sound may not provide a full description of the benefits available for students who author, as well as receive, the sound. A generative task "requires that one generate the sub-problems to be solved" (Barron et al., 1991, p. 34). Users who author, position and receive sounds are required to generate more sub-problems than users who receive only the sound. Therefore, authoring voice annotations requires more generative strategies than receiving predetermined sound components.

Research (Mann, 1992a) indicates that temporal sound, sound which is used "to orient learners about a future event or give feedback about a past event" (Mann, 1995, p. 9), can significantly improve the recall, concept recognition and problem solving ability of students. "Temporal sound can be made to imply more information or something else ... than what is stated" (Mann, 1992a, p. 64). Students who use temporal sound in their voice annotations may have distinct advantages during the revision stages of writing compared to students who have access to textual information only.

A comparison of research involving readers versus listeners, with research describing the effects that word processing has upon the quality of writing, reveals interesting similarities. Snyder (1993), after

reviewing current literature on word processing, reports that “students tend to revise more but at a surface level rather than at a meaning level” (p. 63). Bimodal research (Brainerd, 1993; Draper & Anderson, 1991; Halliday, 1987; Hildyard & Olson, 1982; Mann, 1988, 1995; Martin & Briggs, 1986; Reyna, 1992; and Tannen, 1985) indicates that groups which did not have access to sound tended to report surface features of the text while groups that were given a sound component were more concerned with the meaning of messages. In each case, students working without a sound component, tended to be more concerned with surface features than they were with the meaning of the text. Students who are given access to a sound component during word processing may tend to do more revisions at a meaning level and, as a result, receive higher mean scores on the writing test.

The ability to quickly and easily include the student's voice as part of the word processed document offers a new dimension for novice writers. Poor penmanship and the tedium of writing and rewriting, associated with the traditional writing instrument, a pen or pencil, often represent a significant physical burden for students (Erickson, 1992; Lockard et al., 1994; Papert, 1980). Even though word processors eliminate problems caused by poor penmanship and reduce the need for writing and rewriting, students may still become frustrated while typing on the computer. Unless students have well developed keyboarding skills, their typing speed is often slower than their writing speed (Erickson, 1992). Students can record their ideas much more

quickly if they use voice annotations rather than the keyboard, or a pen or pencil. The ability to use voice annotations in conjunction with word processing allows the students to record new ideas, as well as suggestions for revisions, as quickly as they are conceived. Students realize they can use voice annotations to record suggestions for modifications and additions, listen to them at a later time and make revisions leisurely when time permits.

Mann (1993) reports that "computer sound should convey the kind of information about events not visually attended to" (p. 26). The voice annotations used by students in this project either contain information that is relevant to the goals and organization of the document or they contain new ideas. As such, the students' voice annotations provide information that is directly related to the text, but is clearly not visible. When students listen to the annotations they use the gist, which is retrieved from the audio, along with the verbatim information, which is retrieved from the screen text, to create a richer mental image of the situation than if only one mode were utilized. "Listeners... tend to extract gist information for processing in a predominantly auditory memory, whereas readers extract verbatim information for processing in visual memory" (Mann, 1995, p. 15). The use of auditory and visual modes may show increased achievement over single modality if the information is related but not redundant (Mann, 1992b).

The primary intent of the component of sound in this thesis was to provide a new resource for use during the composition and revision stages of writing; voice annotations that students authored would either contain information reflecting decisions that the students made related to the organization of their document or they would contain the gist of new ideas that were relevant to the document. When students added voice annotations, they first had to evaluate their text, decide what changes they would make, decide what statement would be more appropriate, and finally, record the annotation. Students who annotated with voice utilized a dual modality (i.e., visual and auditory) characteristic of the verbal symbolic system as they read, spoke and listened during the revision stages of writing. Students using voice annotations were required to participate more actively and use more complex cognitive strategies than students using the graphic treatments and, as a result, would be expected to attain higher mean scores for writing quality.

Proposed New Strategies

Opponents of the use of graphical word processors would contend that students spend more time making their documents "look pretty" than they spend making quality revisions (Halio, 1990). It is true that these features may be used incidentally by students during the writing process to give their text the same flashy appearance to which students are exposed through advertising. However, students

should be trained to use the features of graphical word processors in conjunction with the writing process (Erickson, 1992). This will provide opportunities for them to associate the different characteristics of the text with the notion that the characteristics hold or provide additional information rather than the notion that the text simply looks better. The additional information may be intended to elaborate an idea or it may reflect some organization or structure within the document. This association should cause the students to operate at a higher cognitive level as they are composing and revising. It should cause students to evaluate their text more closely while they are revising, in order to determine whether or not modifications of the characteristics are appropriate. They are required to make value judgments about what they have written and about the structure of their document.

Students who have evaluated their text to decide whether some parts of the text are more important than others and voluntarily assigned special characteristics to those parts, have thought, not only about what they have written, but also about the process they undertook as they wrote. This inclusion of visual or auditory information as an integral component of the text, represents a higher level of cognitive processing. A new metacognitive strategy may be available to students as they evaluate their writing and attempt to prioritize their ideas. The author suggests that this metacognitive strategy may be referred to as "Assigning Importance". Annotating with voice, applying borders and formatting characters as part of the

writing process not only support this new metacognitive strategy, they also encourage its use.

Conclusion

An analysis of the relationships between writing strategies, word processing and the use of graphics and sound indicates that using these features as a component of word processing with appropriate instruction can provide structures for students to improve the quality of their writing. Improved writing quality, as a result of the use of graphics and sound, may indicate a shift from knowledge-telling strategies towards knowledge-transforming strategies.

Chapter three is a description of the development of materials and tests, the research design, sampling procedures, subjects involved and the measures that were used to evaluate writing quality.

3. METHODOLOGY

This chapter is a detailed description of the research methodology of this thesis. It contains descriptions of the subjects, the materials, the research design, data collection procedures and analysis, and the procedure.

Subjects

The subjects were grade 7 students enrolled in two classes (n=16, n=14) in an eastern Canadian High School in September, 1992. At that time the school was a typical junior/senior high school offering a program to all students in Bishop's Falls, Newfoundland, who were under the jurisdiction of the Exploits Valley Integrated School Board. The school offered a full range of subjects in its curriculum to satisfy the needs of students with a variety of academic abilities. Students who were admitted to the school in September 1992 had no previous formal training with a word processor. Students' exposure to computer software had typically been through the use of Type I (Maddux, Johnson & Willis; 1992) software using Apple II computers. During the previous year a computer had been made available to the students for one week out of each month. Simple drill and practice applications as well as various games were provided for student use. Several students have used character-based word processing programs on home computers. None of the students had used graphical word processing software previously.

Instruments and Materials

Hardware

The study took place in a computer lab equipped with eight Apple Macintosh LC computers. The computer lab was arranged so that there were three benches. The computers at the first bench were used by students using voice annotations. The computers at the second bench were used by students applying borders and the computers at the third bench were used by students applying character formatting.

Macintosh computers were selected because they have a reputation for having a very stable mouse-driven graphical user interface that provides the user with significant word processing power while requiring relatively undemanding navigational skills. The available hardware was easily configurable for the purposes of this study. The computers had 12-inch RGB monitors, four megabytes of RAM memory and 40 megabyte hard drives. Each computer used for voice annotations was equipped with the microphone for digitizing sound that was supplied with the computer and a set of headphones so that students could easily record and listen to their annotations without interference or interruption from other students or from background noise in the lab. One set of headphones was attached to each computer. Subjects in each group were required to take turns listening to the voice annotations.

Software

The software package "At Ease" was installed as a shell on all the computers to simplify access to applications and documents. Under this shell, users see a number of cards with icons representing applications and documents, arranged alphabetically on the screen. Users begin a session by simply scrolling through the cards to find the application or document they wish to work on, then they use the mouse to click the icon.

System 7, the operating system software for Macintosh computers, also permits a user to save documents using "Stationery" format. When a user opens a document with the stationery format, a new document appears with the same characteristics as the original document. Three stationery documents with the features that the subjects would require for the specific treatments were created and made available to students on the At Ease menu. These documents were entitled "A Border", "A Character" and "A Voice". The "A" was placed at the beginning of each title to ensure that the documents would be found near the beginning of the alphabetical document listing.

Students would simply select the icon bearing the title that corresponded with the particular features they were using. For example, a student who was assigned to Borders would simply use the mouse to click on the icon labeled: "A Border". This procedure would automatically start up the word-processing application with a blank

document that provided the student with specific bordering features. Figure 1 displays a typical view of a computer monitor as seen by students who are about to begin a writing session. The screen contains icons of two file cards. Partially hidden is a card which contains icons representing applications. In the forefront is a card which contains icons representing documents that are available to students. The Documents card displays icons of 3 documents: A Border, A Character and A Voice.

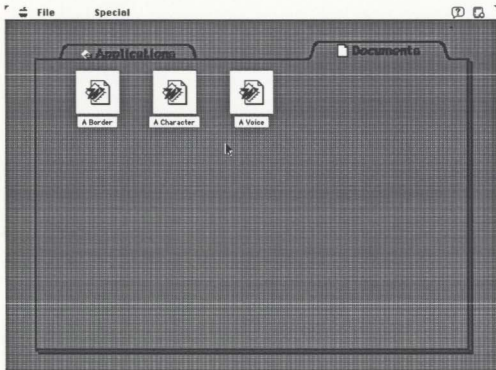


Figure 1. Sample computer screen containing document icons as seen by students.

Students used Microsoft Word version 5.1 for the Macintosh for word processing. Microsoft Word is a graphical word processing package that provides the user with the ability to add voice annotations to word processing documents. Voice annotations are available through the selection of a menu item. When Voice Annotation is selected from a menu, simple controls appear on the screen. The user selects the "Record" button and speaks into the computer's microphone. When the user is finished speaking the voice annotation, a small icon of a speaker appears on the screen to identify the location of the voice annotation. The students' digitized voice is saved as part of the document. Menu items and other features can be accessed with the mouse or by using keyboard commands. Students were trained to use the mouse to access features from the menus. Microsoft Word 5.1 also permits the user to modify menu items by adding features to menus or removing them from menus. The menus were modified by the investigator to reflect the three treatments. Students receiving the specific treatments had access to only menu items as defined for the specific treatments. Features that students did not have access to did not appear in the menus (i.e., no 'grayed-out' items as a result of the treatments). Students were not able to modify the menus.

Collaborative Learning

Students worked in pairs while using the computers for all activities except testing because enough computers could not be

obtained to provide a one-to-one ratio of computers to students and logistically, it was not possible to divide the classes for computer sessions. Student collaboration was believed to be beneficial (Erickson, 1992; Maddux et al., 1992) when they were learning new features, when they were brainstorming and when they were classifying their ideas. While one student was using the computer, the partner would provide support. Students were reminded to alternate roles regularly. During writing sessions both students were expected to provide input with respect to idea generation and classification.

Self-Instructional Booklets

All students received training through the use of self-instructional booklets (see Appendix A). These booklets were designed to instruct students in the basic operations required to access features of the word processing software, as defined in Appendix J for applying borders, formatting characters and annotating with voice. The booklets instructed the students in strategies for using borders, character formats and voice annotations as part of the planning and revision stages of writing. Separate booklets were designed for applying borders, formatting characters and annotating with voice. Each booklet introduced the specific enhancements that were to be used. Examples of the enhancements were provided and step-by-step instructions allowed the student to work through simple exercises using the enhancements. Helpful hints, suggestions and a review of the

writing process were provided near the end of the booklets. These booklets were as similar as possible, given the differences in the features.

Presentation Attributes

Character text-characteristics.

Students had the opportunity to apply four different types of text-characteristics automatically to a section of text by selecting a menu item from a Style menu. These characteristics are displayed in Figure 2. When 'Topic Sentence' was selected from the Style menu, the paragraph indicated by the cursor position would be formatted with a 24 point, New York font. When 'Main Idea' was selected from the Style menu, the paragraph indicated by the cursor position would be formatted with a 12 point, shadowed, New York font. When 'Fix this paragraph' was selected from the Style menu, the text in the paragraph indicated by the cursor position would be formatted with a 12 point, single-underlined, New York font. When 'This paragraph is not needed' was selected from the Style menu, the paragraph indicated by the cursor position would be formatted with a 12 point, strikethrough, New York font.

Style Menu Selection	Borders	Characters
Topic Sentence	The fox	The fox
Main Idea	The fox	The fox
Fix this paragraph	The fox	The fox
This paragraph is not needed	The fox	The fox

Figure 2. Text characteristics for borders and characters treatments.

Border characteristics

Students had the opportunity to apply four different types of borders automatically to a section of text by selecting a menu item from a Style menu. These border types are displayed in Figure 2. When 'Topic Sentence' was selected from the Style menu, the paragraph indicated by the cursor position would be formatted with 12 point, New York font with a double border on all sides. When 'Main Idea' was selected from the Style menu, the paragraph indicated by the cursor position would be formatted with 12 point, New York font with a single border on all sides. When 'Fix this paragraph' was selected from the Style menu, the paragraph indicated by the cursor position would be formatted with 12 point, New York font with a single border under the text. When 'This paragraph is not needed' was selected from the Style menu, the paragraph indicated by the cursor position would be surrounded with a box that had a border with weight zero and a fill of 10 percent shading.

Voice annotation characteristics.

Students had the opportunity to include voice annotations by selecting a menu item from the Insert menu. The graphic characteristics of the voice annotation symbol are displayed in Figure 3. After students had inserted a voice annotation in the text, the position of the annotation was indicated by the placement of a graphic image of a speaker. The graphic image of the speaker was automatically placed at the position that the cursor was in when the voice annotation was created.



Figure 3. Graphic image of a speaker applied as a result of voice annotating.

Instructional Method

The main purpose of the self-instructional booklets was to teach students how to access special features such as applying borders, character formatting and inserting voice annotations during the composing and revision stages of writing. The booklets guided the students through a process similar to the process they had used when they were writing with paper and pencil (see Appendix P).

When students were first introduced to new features on the computer, they were provided with self-instructional booklets designed by the investigator in order to provide consistent instruction for each of the features for all of the treatments. Before the booklets were distributed, students were given a brief description of the proceedings for the next few months (see Appendix L, Part B for the teacher dialog).

Applying borders.

Students used self-instructional booklets to learn how to access a style menu that automatically drew or removed different types of borders around text. Once students had typed some of their ideas into the computer they reviewed and critically evaluated their text with the intention of identifying their topic sentence, main ideas, paragraphs that needed to be fixed, and paragraphs that needed to be removed. Students placed the cursor in the paragraph that had been evaluated and used a mouse to access a style menu that listed "Topic Sentence", "Main Idea", "Fix this Paragraph", "Remove this Paragraph" and "Normal". Students would select the appropriate item from the menu to add borders to the selected text. Borders reflecting their decision were automatically placed around the paragraph where the cursor lay.

Formatting characters.

Students used self-instructional booklets to learn how to access menu items that automatically applied predetermined formatting

characteristics to a paragraph. Once students had typed some of their ideas into the computer they reviewed and critically evaluated their text with the intention of identifying their topic sentence, main ideas, paragraphs that needed to be fixed and paragraphs that needed to be removed. Students placed the cursor in the paragraph that had been evaluated and used a mouse to access a menu that listed "Topic Sentence", "Main Idea", "Fix this Paragraph", "Remove this Paragraph" and "Normal". Students then selected the appropriate menu item to add text formatting to the selected text. Text of the paragraph where the cursor lay was automatically formatted in a style that reflected their decision.

Voice annotating.

Students used self-instructional booklets to learn how to access menu items that allowed them to add voice annotations to the text, modify the annotations or remove the annotations from the text. Once students had typed some of their ideas into the computer they reviewed and critically evaluated their text with the intention of adding appropriate voice annotations to the text. Students placed the cursor in the paragraph that had been evaluated and selected Voice annotation from the Insert menu. Students would use voice annotations to identify their topic sentence, main ideas, paragraphs that needed to be fixed and paragraphs that needed to be removed. Students could also use voice annotations to add the gist of any new

ideas or information that came to mind as they were evaluating their text.

Practice Exercises

When students finished working through the instructional booklets in each of the three treatments, they worked through two practice writing exercises (see Appendix B). The practice exercises guided students through simple writing exercises requiring the students to compose and apply the special features available to them. The 18 topics that were used as story starters during practice sessions were decided upon during the early stages of the study, in conjunction with the English teacher. These topics were randomly divided into six groups; one group for each practice session.

Evaluation Instruments

An adaptation of the Scale for Evaluating Narrative Writing (Owston, Murphy & Wideman, 1990) was used to evaluate four aspects of student pretest and posttest Narrative writing: General Competence, Focus/Organization, Support and Grammar/Mechanics, as defined in Appendix O. Owston et al. (1990) used a six-level scale for evaluation of each of the four aspects of writing of grade 8 students on and off the computer. A mean of the scores of the four aspects of narrative writing was used to indicate overall writing quality. The Owston model (1990) has been modified for use in this study to more accurately reflect typical marking procedures of the evaluation team.

Teachers of this evaluation team preferred to evaluate student documents using percentages rather than Owston's six-level scale. The use of percentages was more familiar to the evaluators and it gave them more leeway in assigning scores.

Writing Assignments

Students completed three writing assignments for evaluation purposes: the Pretest, Posttest #1 and Posttest #2 (see Appendices D, E and F). During each of these tests students were asked to complete an essay about one of the five topics provided. Different topics were used for each of the three writing assignments. The topics were decided upon prior to the study by the evaluator and the English teacher and were deemed to be of an appropriate and equivalent difficulty level. Topics were related to regular classroom work but did not duplicate classroom work. Topics of a general nature were chosen to ensure that students would not require any specific knowledge in order to complete the assignment.

Questionnaires

Two questionnaires (see Appendix G and H) were developed by the investigator to determine the students' level of knowledge concerning features of the treatments. A draft copy of the questionnaire was created, tested using a group of grade 8 students and modified slightly to remove ambiguities. The questionnaires were pretested using grade 8 students who were familiar with graphical

word-processing and who had worked through the training materials. The final versions of the questionnaires would be used late in the school year. Using grade 8 students to pretest the questionnaire early in the year would help to ensure that there would be a minimal age difference between the grade 8 students involved with the questionnaire development and the actual grade 7 subjects.

Questionnaire #1 (see Appendix G) contained six essay-type questions. Questions one through five were used to determine the students' level of mastery of the features they had used to complete Posttest #1. Students were asked to describe the steps they would use to apply a variety of borders, font characteristics or voice annotations. Question six was used to determine whether or not students were familiar with borders, fonts or voice annotations that other students were using and that they had not been trained to use.

Questionnaire #2 (see Appendix H) contained questions one through five from Questionnaire #1. This questionnaire was administered to determine the students' level of mastery with applying borders, font characteristics and voice annotations that they had used to complete Posttest #2.

Procedure

The following sections describe the procedures that were followed during the 1992/93 school year in order to collect information

needed to test the hypothesis. Testing procedures which applied to all three testing sessions are described first.

Each pretest and posttest session was scheduled in four stages over a two-day period. Due to hardware limitations, students worked in pairs for all writing sessions except testing. The four stages were required to allow students, without their partner, to use the same computer for the test that they had used for the treatment. The first stage was completed during the first two periods on a Tuesday morning, the second stage was completed during the third and fourth periods of that same morning. The third stage was completed during the first two periods on Wednesday morning and the last stage was completed during periods three and four. Tuesdays and Wednesdays were selected for testing because an analysis of absenteeism records indicated that there were fewer absences on these days. Also, Thursday would be a suitable alternate day if a problem arose during one of the previously scheduled days. All tests were completed as scheduled.

Each class was randomly assigned to either a Tuesday or Wednesday for testing purposes. At the beginning of the first period on Tuesday morning, the class that was scheduled for testing on that day was divided in half by randomly selecting one person from each pair of students in the class. These students were asked to go to the computer lab where they were given typewritten instructions for the writing assignment. The supervising teacher read the instructions to the students and then proceeded to read the list of topics for the

assignments. All students were given 90 minutes to complete the writing assignments. At the end of 75 minutes, students were advised that they had 15 minutes left to complete the assignment. When the time had expired, the students were asked to leave and not to discuss the writing assignment with other students. Then, the lab was prepared for the second half of the class. During the third period, the students from the second half of the class were taken to the computer lab to complete their assignment. On Wednesday, students in the other grade 7 class were divided in a similar manner and were given the same writing assignment.

Project Phases

The project consisted of four phases. During Phase 1 preliminary word processing skill development took place. During Phase 2 students were given a pretest, they were exposed to their first set of treatments and then they were given Questionnaire #1 and Posttest #1. During Phase 3 students were exposed to the second set of treatments. Students did not complete a posttest at the end of Phase 3 because the need for three sets of posttest scores was not anticipated. During Phase 4 students were exposed to the third set of treatments and then were given Questionnaire #2 and Posttest #2. Table 2 outlines the time frames implemented for each of the 4 phases.

Table 2

Time Frames for Phase 1, 2, 3 and 4

Phase	Beginning week	Ending week	Duration
1	1	16	16 weeks
2	17	24	8 weeks
3	25	30	6 weeks
4	31	37	7 weeks

Phase 1

During the first week of the project, the investigator met with the school principal to discuss procedures and test scheduling for the study. During the first week, meetings were also arranged with the teachers who would be involved with the study or who may be influenced by the students who were involved with the study, to outline project time lines, procedures for all aspects of the study and to discuss potential problem areas. The investigator then met with the English teacher to select appropriate topics for writing assignments.

Each of the students was issued a permission form (see Appendix M) during week two, which their parents were required to sign before any student would be permitted to participate in the study. Students were asked to return the form on or before the end of the

third week. All students returned their forms with their parents' signature.

When students are expected to use computers as part of a study, it is important that they have sufficient time and training to develop the skills which they will be required to use during the study (Morocco & Neuman, 1986). Therefore, from week 2 until week 16, students were given training to develop basic computer and word processing skills. At this stage of the study students completed the composing and editing stages of writing on paper. Students developed a first draft, worked through several revisions and completed a final draft on paper. The final draft was then typed into the computer to be printed out neatly. To ensure that students would not have experience using borders, text attributes and voice annotations prior to the training they would receive in Phase 2, computer menus were modified so that when students typed in their final draft, menu items did not contain any of the items that would be available as treatments. To ensure that students would be familiar with the process approach to writing, the writing process they used at this stage was similar to the process that students used during the treatment phases when they used the computer for composing. Students were taught to use the steps outlined in Appendix P as they used paper and pencil to compose and edit an assignment. These students had access to the computer lab as a regular component of the English, Social Studies, and Science programs as well as during lunch times each day. At the end of Phase

1, the teachers and the investigator determined, through direct observation, that all students' basic computer and word processing skills had been developed to a minimum level of acceptance to begin Phase 2. All students were able to start a new document, open an existing document, complete simple editing tasks, check the spelling, save and print the current document and demonstrate an ability to access menu items using the mouse. The investigator and teachers felt that any degradation of writing quality that may be observed during the project could not be attributed to the students' inability to use a word processor.

Phase 2

Pretest.

During week 17, students were given the pretest (see Appendix D). During the pretest, all students were given 90 minutes to compose and edit an assignment using a pencil in booklets provided by the investigator. The instructions asked the students to write and edit their assignments and then rewrite the final version of the assignment on a specially prepared separate sheet of paper. Teachers were not allowed to assist any student.

Treatment # 1.

At the end of the 17th week, the investigator met with the students to explain the process to which they would be exposed over

the next few months (see Appendix L). Students were not told the true purpose of the study. They were told that the study was designed to test the specific features of a graphical word processor and to find out if grade 7 students could learn to use the features properly. Students were told that they were participating in an experiment and, in order to give each person equal time on the computer, they would have to work in pairs and take turns every 10 minutes. They were told that, as part of the experiment, the pairs had to be chosen randomly with approximately one third of the class using each of the features. Under those conditions all students would get equal opportunities to use each set of features. Each group would have access to the features in a different order. A poster (see Appendix K) was displayed listing the students' names, their partners and when they would have access to specific features.

The three groups of students worked through the booklets concurrently. For example, during a typical 40-minute period, while students were working through the first treatment, approximately one third of the students from one of the grade 7 classes were working on Borders, one third of the students were working on Characters, and one third of the students were working on Voice annotations.

The students worked in pairs and took approximately two 40-minute periods to work through the activities in the booklets. After completing the self-instructional booklets, they worked through two exercises (see Appendix B) to practise accessing new features. The

investigator supervised all training sessions where students used self instructional booklets or worked through practice exercises. During this time the investigator assisted and prompted the students and answered any questions related to the application of the features they were using or related to the writing process.

Following these scheduled instructional sessions, the students spent several periods working with their partners each week using the computers for composing and revising a variety of assignments related to classroom work. As students worked on their assignments, teachers reminded them to use the features as they composed and revised their text.

Students spent a minimum of 12 hours (3 periods X 40 minute periods/week X 6 weeks = 12 hours) using one of the sets of features (i.e., formatting characters, applying borders and annotating with voice) for composing and revising during the writing process.

Posttest 1.

During week 24, the students were given Posttest #1 (see Appendix E). The testing procedure for Posttest #1 was identical to the procedure for the pretest except that students were required to use special features on the computer that they had been using during Treatment # 1 for composing and revising their first draft. Once students had completed their first draft on the computer, they were given a prepared sheet of paper (see Appendix C) on which they were

expected to write their final draft, making any further revisions that they thought were necessary. The final draft versions were submitted to the supervising teacher.

Questionnaire #1.

On the day following Posttest #1, the students were given Questionnaire #1 (see Appendix G) to determine the effectiveness of the training program and to determine their level of knowledge concerning the features that other groups were using. The investigator distributed the questionnaire to the students and read each question, allowing students time to complete their answers. Realizing that users often have difficulty recalling menu contents (Kommers et al., 1992), the investigator gave students access to the computers while they were filling out the questionnaire so that they could describe the procedure they followed to access features.

Phase 3

Treatment #2.

During weeks 25 to 30, students received the second treatment. Students worked through self instructional booklets, practice exercises and then completed assignments for their regular class work. Students spent a minimum of 12 hours (3 periods X 40 minute periods/week X 6 weeks = 12 hours) using one of the sets of features (i.e., formatting characters, applying borders and annotating with voice) for composing

and revising during the writing process. There was no testing during Phase 3.

Phase 4

Treatment #3.

Between week 31 and week 36, students received the third treatment. Students worked through self instructional booklets and practice exercises and then completed assignments for their regular class work. Students spent a minimum of 12 hours (3 periods X 40 minute periods/week X 6 weeks = 12 hours) using one of the sets of features (i.e., formatting characters, applying borders and annotating with voice) for composing and revising during the writing process.

Posttest 2.

During week 37, students were scheduled to complete Posttest #2 (see Appendix F). The testing procedure was identical to the other testing procedures except that, during this session, the students were randomly assigned to one of the three sets of features for composing their documents. Students were given typewritten instructions describing a writing assignment they were asked to complete. These instructions were read by the supervising teacher. The instructions asked students to compose and edit their assignment on computer using the features that were available to them. The topics of the assignment were similar to the topics for the pretest. Once

students had completed their first draft on the computer, they were given a prepared sheet of paper (see Appendix C) on which they were expected to write their final draft, making any further revisions that they thought were necessary. The final versions were submitted to the supervising teacher.

Questionnaire #2.

The day after all students had completed Posttest #2 they completed Questionnaire #2 (see Appendix H). This questionnaire was administered to determine the students' level of knowledge about the features they had used to complete Posttest #2. Students were given access to the computers while they were completing the questionnaire.

Evaluation Details

Evaluation Team

Student writing samples were evaluated by an evaluation team. Members of the team were chosen and trained during a series of individual recruiting and training interviews with the investigator. Evaluators were drawn from the population of Junior High School English teachers. The teachers all had direct experience in teaching and assessing students' narrative writing.

The investigator met with the evaluation team during week 4 to explain the scoring procedure for student pretest and posttest documents. At this time the evaluators were supplied with copies of the

Scale for Evaluating Narrative Writing form (Owston et al., 1990) (see Appendix O) as well as an Evaluators' Scoring Sheet (see Appendix N). The investigator discussed the scoring procedure with the evaluators to determine the level of satisfaction with the procedure and to make any adjustments that may have been necessary. The evaluators were not comfortable using the 6-level scale from Owston's model. They preferred to score on a percentage basis. Once the scale was revised to reflect this marking preference, the evaluators were quite satisfied with the format of the evaluation and expressed no further concerns. Evaluators agreed that the writing samples from each test should be marked at a single sitting. Members of the evaluation team were told that the purpose of the study was to compare the effects of different word processing features on the quality of student writing. They knew that each set of papers they marked contained samples from each of the three sets of features. Evaluators could not determine the authors of the documents nor which set of features the authors had used for their prewriting activities.

Evaluation Procedure

When the writing assignments were completed, the students' documents were collected by the supervising teacher, the students' names were removed from the documents and the documents were coded and duplicated. Any of the duplicated documents that were difficult to read were typewritten using a plain, 12 point, New York

font and included with the copied document for reference purposes. Members of the evaluation team read each of the student documents and independently evaluated them in each of four categories. Evaluators marked all assignments from each test in one sitting. Members of the evaluation team were asked to review the Scale for Evaluating Narrative Writing before each of the three evaluation sessions. They were also given the opportunity to discuss any concerns they may have had concerning the evaluation procedure. Evaluators used a list of guidelines to assign a mark based on a total possible score of 100 for each of the categories. These marks were recorded on a prepared form (see Appendix N) and collected by the investigator. Evaluators received the copies of the writing assignments on the Monday following the testing session. The student documents and Evaluators' Scoring Sheets were collected from the evaluators within the following 10 days (see Appendix I). Evaluators felt confident that the evaluation procedure would provide an accurate representation of writing quality of student documents.

Research Design

Design

This study used a counterbalanced experimental design (i.e., 3 treatments X 3 occasions) involving 30 grade 7 students. Students were randomly assigned a partner and each pair of students was randomly assigned to one of three groups according to a technique for random

assignments as described in Gay (1987). Students in each group were exposed to three treatments that involved using sets of special features of a graphical word processor. It was not possible to isolate students exposed to one set of features from students exposed to a different set of features. Therefore, it was necessary to expose each group to each of the treatments. When subjects are exposed to more than one treatment there may be an inoculation effect (Brainerd, 1993) carried over from one treatment to the next. In order to reduce multiple-treatment interference a counterbalanced design was used (see Table 3). "In a counterbalanced experiment, each subject is administered several treatments. The order of administering the treatments is varied across subjects to eliminate possible confounding of order effects with treatment effects" (Borg & Gall, 1989, p.709). It was also necessary to give a pretest of the writing quality to ensure that the groups were essentially the same on the dependent variable.

The conditions within the school were not conducive to the use of a control group which could be dissociated from any of the three "enhancements". The limited number of participants available (i.e., 30 grade 7 students) imposed restrictions upon the number of groups and the kinds of groups that could be involved. It was not possible to isolate a group of students for a full school year while their peers were using the three "enhancements". Involving a control group from another school would have introduced a number of additional confounding environmental factors (i.e., a group of different teachers, different

school events and a slightly different curriculum and approach). As well, hardware restrictions made it impossible to involve students from another school. Prior to using computers, students were taught to revise on paper by using arrows and other physical means to highlight portions of the text that needed to be rearranged or modified. The computer enhancements that were selected, provided students with a consistent method for revising their work. Having a control condition in which the proposed strategies were applied with no computer enhancements would depart from the writing approach that the students were taught.

Table 3

Assignment of Word Processor Features for Groups

	Weeks					
	17	18-23	24	25-30	31-36	37
Group 1	O ₁	X ₁	O ₂	X ₂	X ₃	O ₃
Group 2	O ₁	X ₂	O ₂	X ₃	X ₁	O ₃
Group 3	O ₁	X ₃	O ₂	X ₁	X ₂	O ₃

O₁-PretestO₂-Posttest #1 and Questionnaire #1O₃-Posttest #2 and Questionnaire #2X₁-BordersX₂-CharacterX₃-Voice

Two posttests and two questionnaires were administered. Posttest #1 was administered to test the quality of writing after the first set of treatments and to ensure that the on-computer testing procedures did not pose any serious logistical problems. Questionnaire #1 was administered to determine the level of students' knowledge concerning the treatment to which they had been exposed as well as the treatments to which they had not been exposed. If

students were more interested in treatments that other students had used than they were in the treatment to which they had been exposed, they may not have been mindfully engaged in their own treatment. If students indicated through the questionnaire that they had little or no knowledge about the other features, then it suggests they were mindfully engaged and analysis of the data collected from Posttest #1 may be used to support the analysis of Posttest #2. Posttest #2 was administered after students had completed the final treatment. Questionnaire #2 was also administered to determine the students' level of knowledge concerning the features they had used to complete Posttest #2. Data obtained from one pretest and two posttests should provide sufficient information to test the hypotheses. The administration of a posttest after students had completed the second treatment was not anticipated to be necessary.

Variables

Independent Variable

In this study, 'the types of strategies (i.e., applying borders, formatting characters and annotating with voice) that can be used for composing and revising during word processing' has been identified as the independent variable.

Dependent Variable

'Student achievement in writing' has been identified as the dependent variable. Achievement was operationalized as a high score on a holistic instrument (Owston et al., 1990).

Assumptions and Controlled Factors

For the purposes of this study, a number of assumptions have been made and a number of factors have been controlled in order to reduce confounding factors. These controls and assumptions are identified in order to demonstrate that the research environment was carefully controlled.

Controlled Factors

The skill level of the students for word processing and computer use, in the study, was developed before the treatment procedure, to the point where it did not interfere with the students' ability to compose and revise their text. Each of the treatments had equivalent skill and concept difficulty levels. The curriculum was the same for all the students involved in the study. All students had the same teachers for each of the subject areas (i.e., Science, Social Studies, and English) where word-processing was incorporated. All students worked on similar assignments during each of the treatments.

Assumptions

It was assumed that the sample population was representative of the general population. The time allocated for treatments was sufficient to obtain measurable effects in achievement. The students' use of a microphone and headphones did not interfere with their ability to compose and edit a document. Menus contained items that were available as part of the treatment (i.e., no 'grayed-out' items were displayed). All students had equal computer time. The student texts that were evaluated accurately represented student achievement. Student achievement was not affected when menus for each of the treatments listed different numbers of options. The evaluation methods for student documents provided reliable and valid assessments of writing quality.

Confounding Factors

Limitations are placed upon research by constraints inherent in the methodology and the environment. Research taking place in a working educational environment must conform to guidelines and restrictions within that environment. Also, practical and logistical restrictions prevent ideal research conditions in a school environment.

Participants

The number of participants in this project was limited to the number of grade 7 students attending the participating school. Logistically, it was not possible to include students from other schools.

The small number of students available can affect the generalizability of the study. Confidence in the findings would be much higher if a larger sample had been available.

The skills and strategies that students utilized throughout this project were acquired and practised in a collaborative environment. During the testing sessions, however, the students were required to work individually. Requiring students to receive training in pairs and be tested individually may affect the validity of the collected data. Providing students with the opportunity to complete several assignments individually would have more adequately prepared students for the testing session. Due to the number of computers available it was not possible to allow students the opportunity to work individually unless one of the partners was absent.

Research such as this depends to a large extent upon the students' willingness to participate actively and mindfully. While it may be possible to control many confounding factors it is very difficult to ensure that all students will apply themselves to the assigned tasks. During this research project students worked in pairs to create and edit documents. Students were reminded to take turns at the keyboard so that each student would receive equal time. It is impossible to guarantee that all persons had the same amount of time at the keyboard or that each person participated equally. Students who were more interested or more aggressive may have dominated the sessions. Students who were not mindfully engaged in the revision process

would not reap benefits to the same extent as students who were mindfully engaged.

Students using a particular set of features could not be isolated from students using other sets of features. Discussion between students concerning the features available may have influenced the level at which students were mindfully engaged. If students did not prefer the features to which they had access, they may not have applied the features with the same enthusiasm. As a result, treatment-preference may have been a confounding factor.

Students had the opportunity to use the computers for assignments in three curriculum areas. Both classes of grade 7 students were taught English and Social Studies by the same teacher. Both classes of grade 7 students were taught Science by a second teacher. Although all students received subject area instruction from the same teacher, each teacher taught two classes. Therefore, it is assumed that the subtle differences between the instruction in each class did not have a significant effect upon the quality of student writing.

During treatment phases, all composing and revising activities were done during regular class time. Students were permitted to use the computer lab during lunch time to print their final draft, create cover pages, or use remediation software.

Students who completed the first testing session in the morning had an opportunity to discuss the proceedings with students in

following testing sessions. Even though students were asked not to discuss the sessions, there is no guarantee that discussions did not take place. These discussions may have given students involved with future testing sessions, an unfair advantage.

Evaluators

The four evaluators were selected upon the basis of their experience and reputation as English teachers. Each evaluator had more than 10 years experience marking grade 7 English assignments and were trained to use the marking procedures as described. Given a detailed marking scheme, these evaluators should deliver reliable and valid evaluations of student writing assignments. Allowing the evaluators to score the writing samples at three different times and at their convenience may have increased the variability of the scores.

Data Collection and Scoring Procedures

Data for this thesis were collected from the evaluation of three writing assignments and two questionnaires: the pretest, Posttest #1, Posttest #2, Questionnaire #1 and Questionnaire #2.

Raw data for the writing quality analysis were obtained from a team of evaluators who used a modified scale for evaluating narrative writing to independently score writing samples collected from the pretest, Posttest #1 and Posttest #2. The three writing assignments were evaluated and provided scores representing writing quality. Pretest results contain writing scores for 30 students while, due to

student illness, Posttest #2 results contain writing scores for only 28 students. Each evaluator submitted scores for each of four writing components: General Competence, Focus/organization, Support and Grammar/mechanics (Owston et al., 1990); for every student for the pretest, Posttest #1 and Posttest #2. A mean score representing overall writing quality for each student was calculated from scores of the four writing components. If significant differences between mean writing scores were identified then component scores would be analysed.

Data concerning the students' knowledge of treatment features were obtained from the evaluation of two student questionnaires: Questionnaire #1 and Questionnaire #2. The two questionnaires were dichotomously scored by the researcher. For questions #1, #2, #3 and #4, a score of "1" indicated that the student could correctly describe a specific procedure. A score of "0" indicated that the student could not correctly describe the procedure. Question #5 was negatively worded and was recoded appropriately. A total score, which was calculated by adding the sum of scores on question #1 through #4 plus the recoded score for question #5, was calculated and used to indicate the students' knowledge of features. Question #6 in Questionnaire #1 referred to knowledge about features of treatments that students had not yet been exposed to and therefore was not included in the total score. Question #6 was scored on a four-point scale. A value of "0" indicated a lack of knowledge about the other treatments. A value of "3" indicated a significant level of knowledge about other treatments.

Data Analysis

Data analysis was done during the spring of 1994. The data set consisted of writing scores provided by the evaluation team and questionnaire scores provided by the investigator. The data analysis was done by the investigator using SPSS/PC+ version 3.1 and Excel 4.0 on a personal computer.

Data analysis did not proceed until the integrity of the data was demonstrated. Content validity and criterion-related validity of the writing assignments were verified by the fact that assignment topics were pre-selected by the investigator in consultation with the classroom English teacher. Students completed assignments using the provided topics. The evaluation instrument, Scale for Evaluating Narrative Writing (Quellmalz, 1982), was developed specifically for evaluating narrative writing and has been used in a similar context (Owston et al., 1990). Content validity of the evaluation instrument was suggested by the investigator and the evaluation team and was deemed to be an acceptable instrument for measuring the quality of narrative writing. Content validity of questionnaire items was verified by the investigator. Question 1 responses were verified by the investigator. Questions 2, 3, 4 and 5 were worded directly, requiring students to describe a procedure. Questions 6 and 7 were worded directly and asked for an opinion. The investigator observed each student to ensure that students had acquired the necessary skills. Answers were scored dicotomously by the investigator. Direct

observation by the investigator supported findings from the questionnaires.

Data sets from each evaluator were used to produce a mean writing score for each student for the pretest, Posttest #1 and Posttest #2. A mean score was calculated from the scores from the four evaluators to provide a single score for writing quality for each student. These writing scores were analyzed to determine whether the treatments had had any significant effect upon writing quality. A test-retest coefficient of stability was calculated to determine the predictability of Posttest #2 scores using the pretest scores.

If groups were formed randomly, then it was reasonable to assume that the groups would be essentially the same with respect to their performance on the dependent variable, writing quality. Posttest scores would be compared using the repeated measures analysis of variance.

The purpose of the pretest was to determine whether the groups were equivalent with respect to their performance on the dependent variable, writing quality. One-way analysis of variance was used to determine if there was a significant difference in writing quality between groups in the pretest.

Correlation coefficients between Questionnaire and Posttest results were calculated to determine whether knowledge of features was related to writing quality. Knowledge of features may play some role in determining the effect of the treatments upon the total writing

score. There are two aspects to consider. The first aspect was concerned with whether a lack of knowledge about the features that the students were using for a posttest would have an effect upon the total writing score realized from that posttest. Intuition suggested that students who are not knowledgeable about the features they were required to use, would earn lower total writing scores than students who were knowledgeable about the features. The second aspect was concerned with whether students' knowledge about features in which they have not been formally trained, would affect their total writing score from Posttest #1. If students think that a different set of features is more appealing than the one they are using, they may not try as hard to attain high scores using the "less desirable" set of features.

In order to determine whether the students' knowledge of treatment features had an effect upon their total writing score, a correlation coefficient, was calculated. If the calculation produced a high correlation coefficient then students who received a high score on the questionnaire would also have received a high total writing score. Also, students who received a low score on the questionnaire would be expected to receive a low total writing score.

Summary

This chapter has described the methodology that was used to compare the effects of applying borders, formatting characters and annotating with voice during word processing upon the quality of

writing. This research project employed a four-phase experimental design involving 30 grade 7 students. The pretest and two posttests required students to complete writing assignments. The quality of writing was determined by a team of evaluators who used a modified evaluation instrument to grade student assignments. The subjects, variables, procedures, instruments and materials, and research design have been described in detail. The data analyses procedures used for this study have been described and brief explanations of these procedures are given to provide a rationale for employing such procedures.

Chapter 4 is a detailed description of the raw data, the analysis procedures that were employed and the results that were obtained from the data analysis.

4. RESULTS

This chapter is a presentation of the research findings. The data collected during the study have been analyzed using statistical procedures to determine whether the study supports the hypothesis. Descriptive statistics of the data set is followed by analyses of the pretest data, Posttest #1 data and Posttest #2 data. Finally, knowledge of features is correlated with posttest results.

Results of the analyses from these data indicated no statistically significant differences between the treatment conditions. There is no indication that the quality of student writing was significantly affected by the types of word processor enhancements students use in conjunction with the writing process.

Analysis

The analysis of the holistic scores of the writing assignments as determined by the evaluation team was based on the null hypothesis ($H_0: \mu_1 = \mu_2 = \mu_3$). In other words, there was no significant difference in the quality of student writing as a result of the three treatments.

Table 4 contains descriptive statistics of the writing scores supplied by the four evaluators for the pretest, Posttest #1 and Posttest #2. The four evaluators are identified as E1, E2, E3 and E4.

Table 4

Descriptive Statistics of Test Writing Scores Supplied by Four
Evaluators

	E1	E2	E3	E4
Pretest				
Mean	61.88	64.50	41.63	49.63
Standard Deviation	16.05	14.08	19.70	15.51
Minimum	37.50	41.25	15.00	28.75
Maximum	90.00	90.00	86.25	83.75
Count	30.00	30.00	30.00	30.00
Confidence Level (95%)	5.75	5.04	7.05	5.55
Posttest #1				
Mean	63.00	64.38	47.29	54.25
Standard Deviation	14.42	13.07	16.69	14.93
Minimum	41.25	41.25	23.75	27.50
Maximum	90.00	90.00	82.50	82.50
Count	30.00	30.00	30.00	30.00
Confidence Level (95%)	5.16	4.68	5.97	5.34
Posttest #2				
Mean	64.15	43.66	36.56	49.33
Standard Deviation	13.04	11.96	22.56	17.91
Minimum	37.50	15.00	15.00	23.75
Maximum	90.00	67.50	78.75	86.25
Count	28.00	28.00	28.00	28.00
Confidence Level (95%)	4.83	4.43	8.36	6.63

A mean writing score was calculated for each student's writing sample from the writing scores from the four evaluators. These mean scores were used to determine whether statistically significant differences existed between treatment groups. Table 5 presents descriptive statistics of the mean scores for the Pretest, Posttest #1 and Posttest #2. The mean from Posttest #1 shows a slight increase over the Pretest while the mean from Posttest #2 shows a slight decrease compared to Pretest scores. Also, compared to pretest levels, Posttest #1 scores had a smaller standard deviation while Posttest #2 had a slightly larger standard deviation.

Table 5

Descriptive Statistics of Mean Test Scores

	Pretest	Posttest #1	Posttest #2
Mean	54.41	57.23	48.43
Standard Deviation	13.68	12.43	14.39
Minimum	32.19	33.44	25.63
Maximum	84.69	81.88	75.00
Count	30.00	30.00	28.00
Confidence Level (95%)	4.90	4.45	5.33

The mean writing scores were used to determine whether pretest scores could be used as a predictor of posttest scores. The

correlation coefficients between the Pretest and Posttest #1 and between the pretest and Posttest #2 were calculated. The Pretest-Posttest #1 coefficient was positive ($r = 0.820$). The Pretest-Posttest #2 coefficient was also positive ($r = 0.824$).

Data from Posttest #1 was analyzed to determine whether there was a statistically significant difference in writing quality between the groups after completing only one treatment. Since the testing groups for Posttest #1 were not the same as testing groups for Posttest #2, it was necessary to determine whether groups used for Posttest #1 were equivalent with respect to writing quality in the pretest. Table 6 presents descriptive statistics of writing scores from the pretest using groupings from Posttest #1. "Voice" has the highest mean score being just slightly ahead of "Borders". "Characters" has the lowest mean score. "Voice" also has the lowest standard deviation.

Table 6

Descriptive Statistics of Pretest Writing Scores for Treatment Groups
(Posttest #1 Grouping)

Pretest	Characters	Borders	Voice
Mean	52.81	54.45	56.33
Standard Deviation	13.82	16.53	9.65
Minimum	32.19	32.81	40.63
Maximum	80.63	84.69	67.81
Count	10.00	12.00	8.00
Confidence Level (95%)	8.56	9.35	6.69

Using the null hypothesis ($H_0: \mu_1 = \mu_2 = \mu_3$), it is hypothesized that there is no significant difference between groups in the pretest using the Posttest #1 grouping, with respect to their performance on the dependent variable, writing quality. Analysis of variance was used to test this hypothesis. Table 7 presents summary results of the analysis of variance of the pretest data using writing quality as the dependent variable and group as the independent variable. An F probability greater than .05 would indicate that there is no evidence of significant difference between the groups with respect to writing quality.

Table 7

Summary of Anova Results of Pretest Writing Scores (Posttest #1 Grouping)

Source of Variation	Sum of Squares	DF	Mean Square	F	F Prob.
Between Groups	54.98	2	27.49	0.14	0.87
Within Groups	5375.56	27	199.09		
Total	5430.54	29			

Results of the analysis of variance using the pretest results revealed no statistically significant difference between groups ($F(2, 29) = 0.14, p = 0.87$) at the .05 level. The null hypothesis is not rejected. The pretest groups are essentially the same with respect to the dependent variable. Repeated measures analysis of variance (group X pretest - posttest 1) can be used to analyze Posttest #1 data to determine if there is a statistically significant difference between or within the groups with respect to the dependent variable. Table 8 provides descriptive statistics of Posttest #1 writing scores. The table shows that "Characters" has the highest mean score. "Borders" has the lowest mean score. "Characters" also has the smallest standard deviation.

Table 8

Descriptive Statistics of Posttest #1 Writing Scores for Treatment Groups

Posttest #1	Characters	Borders	Voice
Mean	58.84	55.36	58.01
Standard Deviation	9.07	15.77	11.54
Minimum	46.25	33.44	40.31
Maximum	73.13	81.88	76.56
Count	10.00	12.00	8.00
Confidence Level (95%)	5.62	8.93	7.99

Using the null hypothesis ($H_0: \mu_1 = \mu_2 = \mu_3$), it is hypothesized that there is no statistically significant difference between groups in Posttest #1 with respect to their performance on the dependent variable, writing quality. In order to test between-subjects effects as well as interaction effects, repeated measures analysis of variance was the preferred method for analyzing Posttest #1 scores. Table 9 presents summary results of the analysis of variance of Posttest #1 data using writing quality as the dependent variable and treatment as the independent variable. The Within-Subjects Effects introduces the variable "Time" which is used to indicate differences which are a result of time (i.e., differences between pretest and posttest). An F probability greater than .05 would indicate that there is no evidence of significant

difference between the groups with respect to the effect being analyzed.

Table 9

Summary Results of Analysis of Variance of Posttest #1 Data.

Source of Variation	Sum of Squares	DF	Mean Square	F	F Prob.
<u>Tests of Between-Subjects Effects</u>					
Within Cells	8953.32	27	331.60		
Constant	182867.49	1	182867.49	551.46	0.00
Group	49.00	2	24.50	0.07	0.93
<u>Tests involving 'Time' Within-Subjects Effects</u>					
Within Cells	831.00	27	30.78		
Time	120.56	1	120.56	3.92	0.06
Group by Time	78.62	2	39.31	1.28	0.30

Results of the repeated measures analysis of variance revealed no statistically significant effects with respect to treatments ($F(2,27) = 0.07, p=0.93$). The null hypothesis is not rejected. There appears to be no statistically significant difference between scores on the pretest and scores on Posttest #1 ($F(2,27) = 1.28, p=0.30$). The lack of an interaction effect indicated that one group failed to show a statistically

significant improvement or degradation of writing quality compared to the other groups, from the pretest to Posttest #1.

The data from Posttest #1 did not reveal any significant differences between or within groups. Therefore the data obtained from Posttest #2 was analysed. Table 10 provides statistical information describing the data that were collected during the pretest. The groupings indicated in this table are identical to the groupings used for Posttest #2. Note that "Borders" has the largest mean score.

Table 10

Descriptive Statistics of Pretest Writing Scores for Treatment Groups
(Posttest #2 Grouping)

	Pretest	Character	Borders	Voice
Mean		48.75	58.41	57.30
Standard Deviation		13.15	14.24	12.37
Minimum		32.19	40.63	47.50
Maximum		67.50	80.93	84.69
Count		9.00	11.00	8.00
Confidence Level (95%)		8.59	8.42	8.57

Using the null hypothesis ($H_0: \mu_1 = \mu_2 = \mu_3$), we assume that there is no statistically significant difference between groups on the pretest with respect to their performance on the dependent variable,

writing quality. An analysis of variance procedure was used to test this hypothesis. Table 11 presents summary results of the analysis of variance of pretest data using writing quality as the dependent variable and treatment groups as the independent variable. An F probability greater than .05 would indicate that there is no evidence of significant difference between the groups with respect to writing quality.

Table 11
Summary of Anova Results of Pretest Data

Source of Variation	Sum of Squares	DF	Mean Square	F	F Prob.
Between Groups	521.89	2	260.95	1.45	0.25
Within Groups	4484.06	25	179.36		
Total	5005.95	27			

Results of the analysis ($F(2,27) = 1.45, p = 0.25$) reveal that at the .05 level there were no statistically significant differences in mean writing quality scores for the treatment groups in the pretest. Groups were statistically equivalent with respect to the dependent variable in the pretest. Repeated measures analysis of variance was conducted on Posttest #2 scores to determine whether treatment groups were statistically equivalent with respect to writing quality.

Table 12 presents descriptive statistics of writing scores for the treatment groups in Posttest #2. "Borders" show the highest mean score for writing quality. "Characters" show the lowest mean score for writing quality.

Table 12

Descriptive Statistics of Posttest #2 Writing Scores for Treatment Groups

Posttest #2	Characters	Borders	Voice
Mean	45.35	51.62	47.50
Standard Deviation	12.20	15.26	16.33
Minimum	33.13	27.50	25.63
Maximum	68.13	73.13	75.00
Count	9.00	11.00	8.00
Confidence Level (95%)	7.97	9.02	11.32

Using the null hypothesis ($H_0: \mu_1 = \mu_2 = \mu_3$), it is assumed that there is no significant difference between groups in Posttest #2 with respect to their performance on the dependent variable, writing quality. Repeated measures analysis of variance was used to test this hypothesis. Table 13 presents summary results of the analysis of variance of Posttest #2 data (group X pretest - posttest #2) using writing quality as the dependent variable and treatment as the

independent variable. An F probability greater than .05 would indicate that there is no evidence of significant difference between the groups with respect to writing quality.

Table 13

Summary of Anova Results of Posttest #2 Writing Scores

Source of Variation	Sum of Squares	DF	Mean Square	F	F Prob.
<u>Tests of Between-Subjects Effects</u>					
Within Cells	8886.21	25	355.45		
Constant	145920.56	1	145920.56	410.53	0.00
Group	638.97	2	319.49	0.90	0.42
<u>Tests involving 'Time' Within-Subjects Effects</u>					
Within Cells	986.18	25	39.45		
Time	611.41	1	611.41	15.50	0.00
Group by Time	87.26	2	43.63	1.11	0.38

Results of the repeated measures analysis of variance on the data revealed no statistically significant treatment effects in writing quality between the treatment groups ($F(2,25) = 0.90$, $p=0.42$). The null hypothesis is not rejected. Results also indicate that there was no

statistically significant difference between scores on the pretest and scores on Posttest #2 ($F(2,25) = 1.11, p=0.38$).

Data from Posttest #1 and Posttest #2 indicate that the null hypothesis cannot be rejected. There was no significant statistical difference between Characters, Borders and Voice annotations on writing quality. Likewise, there was no statistically significant difference between mean writing scores in the pretest and Posttest #2.

Data obtained from Questionnaire #1 and Questionnaire #2 can be analyzed to determine whether students were knowledgeable about the features they were using or about the features that others were using. Table 14 shows descriptive statistics about the total writing score from Questionnaire #1 and Questionnaire #2. Both Questionnaire #1 and Questionnaire #2 show very high mean scores. The highest possible score on both questionnaires is 5.

Table 14

Descriptive Statistics for Questionnaire #1 and Questionnaire #2

	Q1	Q2
Mean	4.73	4.93
Standard Deviation	0.52	0.26
Minimum	3.00	4.00
Maximum	5.00	5.00
Confidence Level 95%	0.19	0.10
Count	30.00	28.00

Figure 4 shows frequency distributions of the total score from Questionnaire #1 and Questionnaire #2. Mastery of the basic skills is evident in 23 out of 30 students in Questionnaire #1. In Questionnaire #2. Only two students did not show mastery of basic skills.

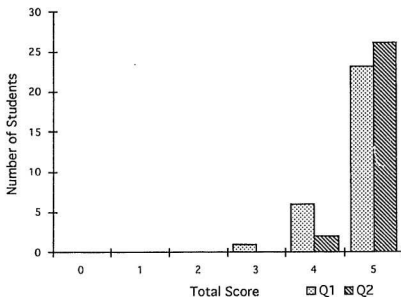


Figure 4. Frequency distribution for scores on Questionnaire #1 and Questionnaire #2.

The frequency distribution shows that most of the students were knowledgeable about the features they had used.

Calculation of a correlation coefficient between knowledge of learned features and Posttest #2 writing score produced a low positive correlation coefficient ($r = 0.34$). Students who have a good knowledge of the features do not necessarily attain high total writing scores.

Data concerning knowledge of other features can be gained from Question #6 of Questionnaire #1. A value of "0" indicates a lack of knowledge about the other treatments. In other words, students have not discussed the other treatments with other students. A value of "3" indicates a significant level of knowledge about other treatments.

Figure 5 shows the frequency distribution for Question #6 from Questionnaire #1. Only four students indicated significant knowledge concerning features that they had not used. This indicates that most students had not discussed other treatments with classmates.

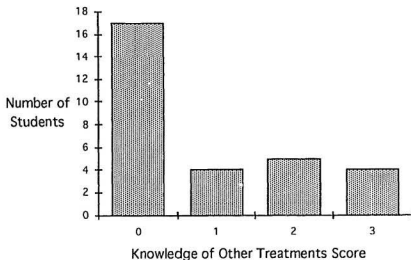


Figure 5. Frequency distribution for knowledge of other treatments question.

There may be some correlation between knowledge about other features and total writing score. For example, students who were knowledgeable about other treatments may not have worked as diligently with the features to which they were assigned. Calculation of the correlation coefficient produced a value of 0.49 with a level of significance of 0.01. There is a weak but positive relationship. Figure 6 shows a scatterplot with the Total Writing Score plotted against the level of Knowledge for Other Treatments. Students with the higher Knowledge of Other Features score tended to have high Writing scores.

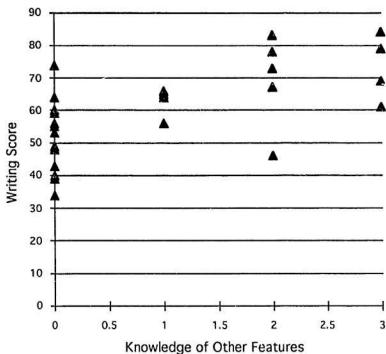


Figure 6. Scatterplot of writing score versus knowledge of other features.

It appears from Figure 6 that the relationship between knowledge about other features and total writing score is positive. Knowledge about other features did not have a detrimental effect upon total writing scores. Cross-referencing students with high writing scores with students who demonstrated high overall academic

achievement indicated that students who received high writing scores tended to perform well in most subject areas.

Summary

This chapter is a presentation of the research findings. The data collected during the study have been analyzed using statistical procedures to determine whether the results of the study support the hypothesis. Data sets provided by evaluators were used to calculate mean writing scores. These scores were analyzed using analysis of variance and repeated measures analysis of variance to determine whether the quality of student writing was significantly affected by the types of word processor enhancements students used in conjunction with the writing process. Posttest #1 and Posttest #2 results indicated that there was no statistically significant difference in writing quality between treatment groups. The results indicate that there was no statistically significant difference in the quality of writing samples done by students enhancing with "Borders", enhancing with "Characters" and annotating with "Voice". Analysis also revealed that there was no statistically significant difference between mean writing scores from the pretest, Posttest #1 and Posttest #2.

Chapter 5 is a summary and discussion of the research findings. A statement of the conclusions is followed by a discussion of contributing factors, implications, limitations, suggested improvements and future directions for research.

DISCUSSION

Conclusion

The conclusion of this study is that the quality of writing produced by these junior high school students was not affected by the type of word processor enhancements used during the composing and revision processes.

Implications of the Study

Implications of this finding are related to the content and nature of this study and the student's work, and may not be completely generalizable. The first implication of the study is that inexperienced writers such as these did not possess sufficient knowledge of what could be expected from using these enhancements during the composing and revision processes. Moreover, these writers did not have the requisite skills with these enhancements to adequately affect their compositions and revisions. Inexperienced writers such as these may, therefore, require direct instruction in how to apply word processor enhancements during composing and revision to affect the quality of their writing. For example, the latest procedures for digitizing and applying speech could be taught separately and directly (Mann, 1996).

A second implication of this study is that the model of instruction that was used was inappropriate with this particular group of writers. The constructivist writing model suggested in the literature

(Collins et al., 1989) as well as the associated generative strategies required for successful constructivist writing were likely insufficient for this group. Constructivism in writing assumes that a writer's cognitive strategies for writing are already in place. This does not appear to have been the case with the subjects involved in this study. Cognitive strategy instruction may have been a better instructional model to use with these writers. Cognitive strategy instruction is more supportive than constructivism. Cognitive strategy instruction would not presume that writers could engage in proper writing simply as a consequence of using features of a graphical word processor to help them focus their attention on a particular aspect of writing (i.e., revision). Instead, cognitive strategy instruction would directly supplant the writers' own deficient writing strategies with "expert writer" strategies. The cognitive strategies approach to writing would require these writers to master discreet stages of writing as defined by the model (Erickson, 1992), namely; prewriting, writing the first draft, editing the revised draft, and publishing the final document.

Combining these first two implications then, would suggest that voice annotation, for example could be taught during each stage of the writing process. This approach could be considered to be "cognitive strategy instruction with voice annotation in a writing task". Student writers would create a draft of voice annotations that correspond to the meanings derived from their textual inputs. They might annotate for: Locale, Atmosphere, Feeling or Mood (Mann, 1995). Using the

cognitive strategy instruction approach in this way; that is, at each stage of the writing process, would likely improve their revisions and compositions, and ultimately the quality of their writing. This remains to be tested.

The third implication of this research is that the choice of evaluation design was inappropriate. This finding was not uncommon; especially in controlled thesis research. Shilling (1991), Weiner (1989), and Zender (1990) all reported negative or equivalent outcomes for computer-based speech with text. The problem with accessing bordering in writing appears to have a lot more to do with coding processes reported in Paivio (1986) than previously assumed. Students in the bordering condition would stay in that condition and be shown representational and referential connections in meaning between the logogens (i.e., border) and the imagens (i.e., text). This is known as imagen and logogen association in Paivio, where a focus and emphasis is placed on particular aspects of the context to the exclusion of other aspects. The same argument can be applied to formatting text. Concerning speech annotation, writers could be oriented to the separate streams approach to writing with a word processor (Penney, 1989). The separate streams hypothesis and research cited earlier on listening and reading (Hildyard & Olson, 1982) should be applied in this treatment. Student writers would be shown and practiced in "Listening-to-write", "Reading-to-write" and "Reading-while-listening-before/as-you-write".

Writers assigned to one of the above treatments (formatting, bordering, and annotation) would remain there throughout the study and learn only that feature for improving composition and revision. Counterbalanced or repeated measures-by-treatment assessments should not have been applied in this study. The problem appears to reside in the contamination of traces of aural memory in the annotation treatment to subsequent visual-only treatments; sometimes called “innoculations” (Brainerd, 1993) or “reminiscences” (Martin & Briggs, 1986). One solution suggested in Mann (1993) is to invoke a repeated measures-by-occasion design to control for the contamination of aural memory traces from speech conditions to visual conditions.

Limitations of the Study

There were several limitations associated with this study. First, the lack of a research base. The implementation of formatting, bordering and voice annotating during revision and composing is a relatively unexplored research area. A second limitation of the study was related to the first, namely: the constructivist writing model has not been implemented with these attributes during composing and revising. Constructivist learning has focused on metacognition as the dependent variable (Salomon et al., 1989). More frequently however, writing quality is the dependent variable and constructivism as the independent variable. Published guidelines for applying these features during constructivist writing would likely have yielded better

treatment conditions in this study. The third limitation of this study was methodological. Operating within the confines of an educational institution placed restrictions upon project operations and timelines. The goals of this study had to be closely aligned to curriculum objectives. Only a specific portion of each school day could be used for writing instruction. Project operations were modified to take advantage of available time within the school year. The final posttest for the study was conducted toward the end of the school year and within the constraints of the regular school day. Hardware restrictions placed limitations upon the number of schools eligible for inclusion in the study. Other schools in the area were unable provide a computer facility that would allow students to use voice annotations or graphical wordprocessing software. Low enrollment in the school contributed to the reduced number of eligible and accessible student writers. It was assumed that the sample population was representative of the general population.

Suggested Improvements

The first suggested improvement to the study would be to implement the latest procedures for digitizing and applying speech, borders and text formatting attributes. Second, these attributes need to be applied within each stage of the writing process, a cognitive strategy instruction approach to writing. Third, a more suitable evaluation plan is suggested to gain an accurate measure of the impact

of each attribute during the composing and revising processes. A more detailed account of student progress in writing could then be hypothesized and tested through long term study. Case studies of graphical word processor enhancements in current use should be used as platforms for assessing related issues such as writing strategy retention over several months, and knowledge-transfer of writing strategies to non-computer writing tasks. The idea that computing attributes may be different in the future is not diminished by the way readers and listeners attend to the information they generate during the composing and revision process. Clearly these are separate challenges that require a much larger educational context in which to begin research. In any context, treatments should be kept distinct; this means that students would practice revision strategies using a particular attribute over an extended time period and posttested thereafter. Collaboration would be reduced to afford more mental effort by the individual and the requirement to "partner-up" with the word-processor enhancements instead of another's vocal remarks.

Also related to methodology, the sufficient hardware and software would alleviate logistical problems in the school. Corporate and government financial support may be what is needed to ensure an adequate setting for these students to learn, and for the investigator to observe student composition and revision.

Summary

This thesis began with a discussion of the quality of writing, and three word processor enhancements that could be made to affect student composition and revision. This study found that the quality of student writing was not affected by the type of word processor enhancement used during composition and revision. This research extends our understanding of student interaction with word processor enhancements in several ways. First, it introduces a relatively new technology for writing, (i.e., formatting, bordering and voice annotation) into the educational literature. Second, it presents a method of using this technology (i.e., constructivism) and suggests an equally feasible method (i.e., cognitive strategy instruction) to compose and revise student documents. Third, this study suggests one method (i.e., repeated measures-by-occasion) to measure student writing without inoculation effects. Finally, this study demonstrates the need to extend this research to larger groups and to other tasks and populations of student writers.

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APPENDICES

Appendix A: Student Booklets

Student Booklets

Characters

You will be using the computer to help you write. Up until now you have used the computer for typing up your final draft. Now you will begin using the computer for all the stages of your writing. The computer could be a great help as you write because you can use the computer to help you organize your ideas and to think about what you have written.

1. First you must come up with an idea that you want to write about. Your teacher will often help you with this. Sometimes you are given an idea for your story. Then you type all your ideas and the details about your ideas.
2. Next you fix up your ideas, arrange them in order and carefully read what you have written, fixing any mistakes that you find.
3. Then you are ready to print your first draft.

You will be using a program called Word for writing your stories. Find the document called A Characters (it should be on the first page of the document list) and use the mouse to click on it. In a minute you should see a blank screen.

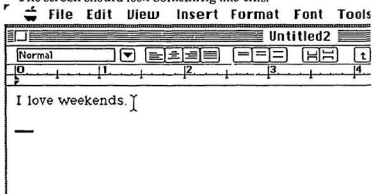
As you read through this booklet you will be asked to type several things on computer using the word processor. If you have any problems be sure to ask your teacher.

Now, it's time to begin. Let's say you were asked to write a story about your favorite things. The first thing you want to do is to write some of the ideas that you want to include in your story. One of your favorite things could be weekends. So type the following sentence:

I love weekends.

Press return.

The screen should look something like this:



Another of your favorite things is eating pizza so, type

Pizza is definitely my favorite food.

Press return. Now, type two reasons why pizza is your favorite food. (Put the reasons on different lines.)

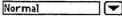
Type something that you could use for a topic sentence. Remember, you are writing about your favorite things. (Make sure you start on a new line.)

Type another of your favorite things. (Make sure you start on a new line.)

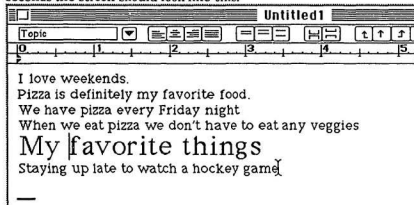
You should now have 6 sentences typed. It is time to begin using the special features that you have access to.

Use the up arrow or use the mouse to move the cursor back to the line that you could use for your topic sentence.

This sentence is special so it would be good if you could make it look different from everything else that you have typed in. Then you would know at a glance that it is your topic.

Now, notice that just below the menus at the top of the screen there is a style menu that looks like this , Move

the mouse on top of the triangle in the style menu. Press on the mouse button and a short menu should appear. The menu has 5 items, **Fix this paragraph**, **Main idea**, **Normal**, **This paragraph is not needed** and **Topic**. If you want your sentence to be the **Topic sentence** for your story, you drag the mouse down until **Topic sentence** is highlighted then let go the mouse button. In a few seconds the screen should look like this:



So now you know how to change the style of the sentence. Notice that your **Topic sentence** is larger than the rest of the text.

You would normally only have one topic sentence in a story so now you need to read what you have written and decide which of the sentences would be your main ideas. You have three main ideas in what you have written. What are they? The first one says "I love weekends". Put the cursor somewhere in that sentence. Use the mouse to move the cursor up to the style menu. Select **Main idea** from the

list that appears. You will notice that the letters in that sentence are now in outline print. You will use a outline print to show that an idea is a **Main idea**.

Change the style of the other two main ideas so that they are in outline print. (Put the cursor somewhere in the sentence and select **Main idea** from the style menu. Do the same thing for the other sentence.)

Now move the cursor to the end of the first sentence and press return. Type one reason why you love weekends. Press return then type another reason why you love weekends. You have just added some details about one of your **Main idea**. Notice that the details are just in plain text.

Your story should now look like this:



Print out what you have written

Below you can see 4 different types of letters. You will be using these types of letters as you write, to help you organize your ideas.

- ✱ The text below uses larger text. This is a good way to indicate the topic sentence for a story.

The quick brown fox jumps over
 the lazy dog. The quick brown fox
 jumps over the lazy dog.

- ✎ The text below uses outline text. You can use this to show the main ideas for your story.

The quick brown fox jumps over the lazy dog. The quick brown fox jumps over the lazy dog.

- ✎ The text below has been underlined. Use this to show that something needs to be added or fixed up.

The quick brown jumps. The quick brown jumps.

- ✎ The text below has been crossed out. Use this when you want to cross out a some text because it doesn't fit very well with the rest of what you have written. We could delete the sentences but at this stage we don't want to delete anything. We might be able to use them some other place if we change them. So for now we will just cross them out.

~~The lazy dog is lying down by the tree. The lazy dog is lying down by the tree.~~

Remember, the cursor must be in the line of text if you want to change the style of the text. If the cursor is where you want it then pick the style of the text you want to use from the style menu.

Type the following sentences about bees. Then you will try to figure out which style of text is appropriate for each sentence.

How do bees make honey?

Bees visit flowers to collect food.

One of these nectar.

The bees suck the nectar with their tongues and carry it home inside their bodies, in special honey stomachs.

Young bees help to unload the nectar and begin turning it into honey.

The bees store the nectar in wax cells in their nest.

Bees have six legs.

Many bees beat their wings to make a breeze that dries out the nectar until it becomes honey.

Now, let's go through the sentences and decide which style of letters to use.

If you want to change the style of text of any of the sentences just put the cursor in that sentence and select a different style from the style menu.

Bees visit flowers to collect food.

The second sentence is one of the main ideas so use the mouse to go to the style menu and change the style to **Main idea**.

Young bees help to unload the nectar and begin turning it into honey.

This sentence is another of the main ideas so change the style of this sentence, too.

One of these nectar.

This sentence needs to be fixed. Select **Fix this paragraph** from the style menu.

Bees have six legs.

This sentence doesn't really fit in the story so we can cross it out.
(Select **This paragraph is not needed** from the style menu)

Finally you remember that honey is fed to young bees. So you can add a new line to your story. Move to a blank line and type "**Honey is fed to young bees**".

Now, the story should look like this:

How do bees make honey?

~~Bees visit flowers to collect food.~~

One of these nectar.

The bees suck the nectar with their tongues and carry it home inside their bodies, in special honey stomachs.
~~Young bees help to unload the nectar and begin turning it into honey.~~

The bees store the nectar in wax cells in their nest.
~~Bees have six legs.~~

Many bees beat their wings to make a breeze that dries out the nectar until it becomes honey.

Honey is fed to young bees.

How did you do?

Now you can see that you have two main ideas and a couple of details about each idea. This should make two nice paragraphs.

There is one sentence to fix and one to delete. Everything is in the right order so it should only take a few minutes to make the changes before we can have our first draft. If we change all the styles to **Normal** and make paragraphs out of the sentences, this is what it might look like.

How do bees make honey?

Bees visit flowers to collect food. One of these foods is nectar. The bees suck the nectar with their tongues and carry it home inside their bodies, in special honey stomachs.

Young bees help to unload the nectar and begin turning it into honey. The bees store the nectar in wax cells in their nest. Bees have six legs. Many bees beat their wings to make a breeze that dries out the nectar until it becomes honey. Honey is fed to young bees.

[illegible]

Now that you know what to do, it's time for some practice. Remember, when you have written some of your ideas, you will use different text styles to help you organize your work.

You should use different text styles for:

1. **the topic,**
2. ~~main ideas about a topic,~~
3. ideas that need to be fixed up and
4. ~~ideas that might not belong in the story,~~
5. details about a main idea

Here are the steps again.

- 1. First of all write down the main idea or the starting sentence of your story.
- 2. Then list down the main things you would like to say. Press return after each main idea so that each idea is on a different line. Don't stop to fuss over or correct anything at this stage. Let your thoughts flow freely-these are just jot notes.
- 3. Read what you have written.
 - ✎ Which sentence is the topic sentence? Choose the style for that sentence.
 - ✎ Which sentences are your main ideas? Choose the appropriate style.
 - ✎ Did you leave out necessary details? Add any new details that might help your story.

- ✎ Which sentences need to be fixed up?
- ✎ Did you stick to your topic? Change the style of any sentences that don't seem to belong-Don't delete them, they might be OK in a different paragraph.
- ✎ Are your ideas in the right order? If not, select the ideas and drag them to where they belong.
- ✎ Is your topic sentence strong and interesting?
- ✎ Is each word the right word?
- ✎ Add some details where ever you can.
- ✎ Did you include everything you wanted to?
- ✎ Add any new ideas you think would help.
- ✎ Use the spelling checker.

Borders

You will be using the computer to help you write. Up until now you have used the computer for typing up your final draft. Now you will begin using the computer for all the stages of your writing. The computer could be a great help as you write because you use the computer to help you organize your ideas and to think about what you have written.

1. First you must come up with an idea that you want to write about. Your teacher will often help you with this. Sometimes you are given an idea for your story. Then you type all your ideas and the details about your ideas.
2. Next you fix up your ideas, arrange them in order and carefully read what you have written, fixing any mistakes that you find.
3. Then you are ready to print your first draft.

You will be using a program called Word for writing your stories. Find the document called A Borders (it should be on the first page of the document list) and use the mouse to click on it. In a minute you should see a blank screen.

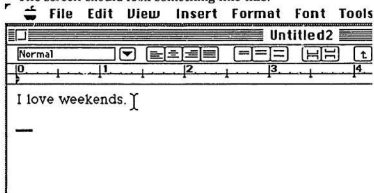
As you read through this booklet you will be asked to type several things on computer using the word processor. If you have any problems be sure to ask your teacher.

Now, it's time to begin. Let's say you were asked to write a story about your favorite things. One of your favorite things could be weekends. So type the following sentence:

I love weekends.

Press return.

The screen should look something like this:



Another of your favorite things is eating pizza so, type

Pizza is definitely my favorite food.

Press return. Now, type two reasons why pizza is your favorite food. (Put the reasons on different lines.)

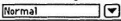
Type something that you could use for a topic sentence. Remember, you are writing about your favorite things. (Make sure you start on a new line.)

Type another of your favorite things. (Make sure you start on a new line.)

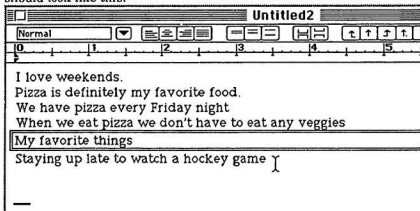
You should now have 6 sentences typed. It is time to begin using the special features that you have access to.

Use the up arrow or use the mouse to move the cursor back to the line that you could use for your topic sentence.

This sentence is special so it would be good if you could make it look different from everything else that you have typed in. Then you would know at a glance that it is your topic.

Now, notice that just below the menus at the top of the screen there is a style menu that looks like this . Move the mouse on top of the triangle in the style menu. Press on the mouse

button and a short menu should appear. The menu has 5 items, **Fix this paragraph**, **Main idea**, **Normal**, **This paragraph is not needed** and **Topic**. If you want your sentence to be the Topic sentence for your story, you drag the mouse down until **Topic sentence** is highlighted then let go the mouse button. In a few seconds the screen should look like this:



So now you know how to change the style of the sentence. Notice that your **Topic sentence** has a double border around it.

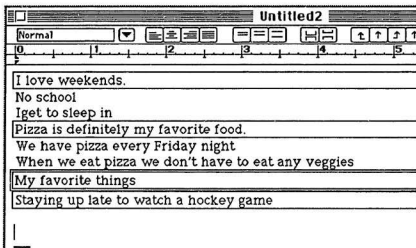
You would normally only have one topic sentence in a story so now you need to read what you have written and decide which of the sentences would be your main ideas. You should have three main ideas in what you have written. What are they? The first one says "I love weekends". Put the cursor somewhere in that sentence. Use the mouse to move the cursor up to the style menu. Select **Main idea** from the list that appears. You will notice that the sentence now has a single

border around it. You will use a single border to show that an idea is a **Main idea**.

Change the style of the other two main ideas so that they have a single border around them. (Put the cursor somewhere in the sentence and select **Main idea** from the style menu. Do the same thing for the other sentence.)

Now move the cursor to the end of the first sentence and press return. Type one reason why you love weekends. Press return then type another reason why you love weekends. You have just added some details about one of your **Main idea**. Notice that the details are just in plain text.

Your story should now look like this:



Print out what you have written

Below you can see 4 different types of borders. You will be using these borders as you write to help you organize your ideas.

- The text below uses a double border. This is a good way to indicate the topic sentence for a story.

The quick brown fox jumps over the lazy dog. The quick brown fox jumps over the lazy dog.

- The text below uses a single border. You can use this to show the main ideas for your story.

<p>The quick brown fox jumps over the lazy dog. The quick brown fox jumps over the lazy dog.</p>
--

- ✎ The text below uses a line under the paragraph. Use this to show that something needs to be added or fixed up.

The quick brown jumps. The quick brown jumps.

- ✎ The text below uses shading. Use shading when you want to cross out some text because it doesn't fit very well with the rest of what you have written. We could delete the sentences but at this stage we don't want to delete anything. We might be able to use the ideas some other place if we change them. So for now we will just cross them out.

~~The lazy dog is lying down by the tree. The lazy dog is lying down by the tree.~~

Remember, the cursor must be in the line of text if you want to change the style of the text. If the cursor is where you want it then pick the border you want to use from the style menu.

Type the following sentences about bees. Then you will try to figure out which border is appropriate for each sentence.

How do bees make honey?

Bees visit flowers to collect food.

One of these nectar.

The bees suck the nectar with their tongues and carry it home inside their bodies, in special honey stomachs.

Young bees help to unload the nectar and begin turning it into honey.

The bees store the nectar in wax cells in their nest.

Bees have six legs.

Many bees beat their wings to make a breeze that dries out the nectar until it becomes honey.

Now, let's go through the sentences and decide which borders to use.

If you want to change the border of any of the sentences just put the cursor in that sentence and select a different style from the style menu.

Bees visit flowers to collect food.

The second sentence is one of the main ideas so use the mouse to go to the style menu and change the style to **Main idea**.

Young bees help to unload the nectar and begin turning it into honey.

This sentence is another of the main ideas so change the style of this sentence, too.

One of these nectar.

This sentence needs to be fixed. Select **Fix this paragraph** from the style menu.

Bees have six legs.

This sentence doesn't really fit in the story so we can cross it out. (Select **This paragraph is not needed** from the style menu)

Finally you remember that honey is fed to young bees. So you can add a new line to your story. Move to a blank line and type "**Honey is fed to young bees**".

Now, the story should look like this:

How do bees make honey?

Bees visit flowers to collect food.

One of these nectar.

The bees suck the nectar with their tongues and carry it home inside their bodies, in special honey stomachs.

Young bees help to unload the nectar and begin turning it into honey.

The bees store the nectar in wax cells in their nest.

Bees have six legs.

Many bees beat their wings to make a breeze that dries out the nectar until it becomes honey.

Honey is fed to young bees.

How did you do?

Now you can see that you have two main ideas and a couple of details about each idea. This should make two nice paragraphs.

There is one sentence to fix and one to delete. Everything is in the right order so it should only take a few minutes to make the changes before we can have our first draft. If we change all the styles to **Normal** and make paragraphs out of the sentences, this is what it might look like.

How do bees make honey?

Bees visit flowers to collect food. One of these foods is nectar. The bees suck the nectar with their tongues and carry it home inside their bodies, in special honey stomachs.

Young bees help to unload the nectar and begin turning it into honey. The bees store the nectar in wax cells in their nest. Bees have six legs. Many bees beat their wings to make a breeze that dries out

the nectar until it becomes honey. The honey is used to feed the young bees.



Now that you know what to do, it's time for some practice. Remember, when you have written some of your ideas, you will use different borders to help organize your work.

You should use different borders for:

1. the topic,

2. main ideas about a topic,

3. ideas that need to be fixed up and

4. ideas that might not belong in the story.

5. details about a main idea

Here are the steps again.

- 1. First of all write down the main idea or the starting sentence of your story.
- 2. Then list down the main things you would like to say. Press return after each main idea so that each idea is on a different line. Don't stop to fuss over or correct anything at this stage. Let your thoughts flow freely-these are just jot notes.
- 3. Read what you have written.
 - Which sentence is the topic sentence? Choose the style for that sentence.
 - Which sentences are your main ideas? Choose the appropriate style.

- ✎ Did you leave out necessary details? Add any new details that might help your story.
- ✎ Which sentences need to be fixed up?
- ✎ Did you stick to your topic? Change the style of any sentences that don't seem to belong-Don't delete them, they might be OK in a different paragraph.
- ✎ Are your ideas in the right order? If not, select the ideas and drag them to where they belong.
- ✎ Is your topic sentence strong and interesting?
- ✎ Is each word the right word?
- ✎ Add some details where ever you can.
- ✎ Did you include everything you wanted to?
- ✎ Add any new ideas you think would help.
- ✎ Use the spelling checker.

Voice

You will be using the computer to help you write. Up until now you have used the computer for typing up your final draft. Now you will begin using the computer for all the stages of your writing. The computer could be a great help as you write because you use the computer to help you organize your ideas and to think about what you have written.

1. First you must come up with an idea that you want to write about. Your teacher will often help you with this. Sometimes you are given an idea for your story. Then you type all your ideas and the details about your ideas.
2. Next you fix up your ideas, arrange them in order and carefully read what you have written, fixing any mistakes that you find.
3. Then you are ready to print your first draft.

You will be using a program called Word for writing your stories. Find the document called A Voice (it should be on the first page of the document list) and use the mouse to click on it. In a minute you should see a blank screen.

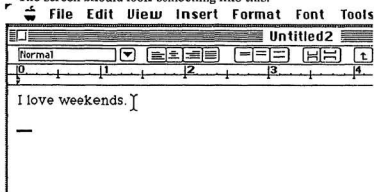
As you read through this booklet you will be asked to type several things on computer using the word processor. If you have any problems be sure to ask your teacher.

Now, it's time to begin. Let's say you were asked to write a story about your favorite things. One of your favorite things could be weekends. So type the following sentence:

I love weekends.

Press return.

The screen should look something like this:



Another of your favorite things is eating pizza so, type

Pizza is definitely my favorite food.

Press return. Now, type two reasons why pizza is your favorite food. (Put the reasons on different lines.)

Type something that you could use for a topic sentence. Remember, you are writing about your favorite things. (Make sure you start on a new line.)

Type another of your favorite things. (Make sure you start on a new line.)

You should now have 6 sentences typed. It is time to begin using the special features that you have access to.

Use the up arrow or use the mouse to move the cursor back to the beginning of the line that you could use for your topic sentence.

This sentence is special so it would be good if you could remind yourself that this sentence is the topic sentence

Now you are going to get a chance to make comments about what you have written so when you come back you can hear what you said. That should help you organize your work. Notice the word **Insert** at the top of the screen. Move the mouse so the cursor is on the word

Insert. Press the mouse button and hold it down. You will notice that a menu appears. Slide the mouse down until **Voice Annotation** is highlighted. Now, release the button. A new window appears on your screen. It should look like this:




Notice the buttons that say **Record**, **Stop**, **Pause** and **Play**. You will use them to record your own voice on your story. The circle in the middle shows a pie chart to show you how much time you have left in your message. The little bar under the record button shows the level of your voice as you talk into the microphone. Make sure you speak loud enough and close enough to the microphone so the black bar that appears in the level meter is half to three quarters of the way to the right. Don't worry, it's easy. If you have a problem be sure to ask your teacher. Remember, you'll have lots of time to practice.

Let's try it. First put on the headphones so you will be able to hear yourself clearly.

1. Hold the mic in your hand,

2. When you are ready to speak, use the mouse to press the **Record** button. When you are finished press the **Stop** button.
3. Press the **Record** button and say "This is my topic sentence."
4. Press **Stop**.

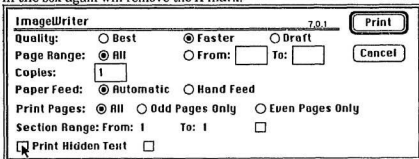
To hear the message press **Play**. When you are finished use the mouse to press **OK**. You will notice that the window disappears and a small symbol of a speaker  appears at the beginning of the sentence. This symbol shows you where a voice annotation is. If you want to hear the annotation again just use the mouse to click twice on the symbol. A window with some tape recorder or VCR buttons appears. Press the play button to hear your annotation. Press **OK** when you are finished.

You would normally only have one topic sentence in a story so now you need to read what you have written and decide which of the sentences would be your main ideas. You should have three main ideas in what you have written. What are they? The first one says "I love weekends". Put the cursor at the beginning of that sentence. Use the mouse to move the cursor up to the **Insert** menu. Select **Voice annotation** from the list that appears. You will now get a chance to say something about that sentence being a main idea. Say "This is one of my main ideas".

Now find the other two main ideas and add a voice annotation saying that they are main ideas. (Remember, use **Voice annotation** from the **Insert** menu.)

You should now have four voice annotations. Can you see them? They show you where your main ideas and your topic sentence are on the screen.

Print out what you have written. You can print the little symbols if you want to show you where you made some comments. To print the symbols choose print from the file menu. You will see a normal print window. In the bottom left hand corner is a small box that says **Print Hidden Text**. Use the mouse to click that box. An X in the box means that the symbols (hidden text) will be printed. Clicking in the box again will remove the X mark.



If you are going to use voice annotations as you write to help you organize your ideas then there are four places you should the annotations.

- ✱ You should use them to indicate the topic sentence for a story. You could say "This is the topic for my story".
- ✱ You should use them to indicate the main ideas for your story. You could say "This is one of the main ideas for my story".
- ✱ You should use them to indicate that something needs to be added or fixed up. You could say "This sentence needs to be fixed up". Or, you could say what is missing or how you should fix it so that next time you are working at your story you can listen to your suggestion for fixing it up.
- ✱ You should use them to indicate that a sentence doesn't fit very well with the rest of what you have written. We could delete these sentences but at this stage we don't want to delete anything. If we change them we might be able to use these sentences some other place. So for now we will just add a voice annotation. You could say "I think I will delete this sentence". Or, "Delete this sentence" or "Tell more about....."

- ☛ You should use them when you want to record your ideas quickly. You can go back, listen to what you said and type the ideas in later, when you get time. It would be a good idea to just record the highlights of your new ideas. When you are recording your voice you don't need to use perfect sentences-you just want to quickly record what you are thinking.

Remember to put the cursor in front of the line of text if you want to add a voice annotation. Actually you can put it anywhere but it will be easier to find if it is at the beginning of a sentence.

Type the following sentences about bees. Then you will try to figure out which voice annotation you should add. You will also practise adding the annotations.

How do bees make honey?

Bees visit flowers to collect food.

One of these nectar.

The bees suck the nectar with their tongues and carry it home inside their bodies, in special honey stomachs.

Young bees help to unload the nectar and begin turning it into honey.

The bees store the nectar in wax cells in their nest.

Bees have six legs.

Many bees beat their wings to make a breeze that dries out the nectar until it becomes honey.

Now, let's go through the sentences and decide where to add voice annotations.

If you want to add a voice annotation to any of the sentences just put the cursor in front of that sentence, go to the **Insert** menu and select **Voice Annotation**.

Bees visit flowers to collect food.

The second sentence is one of the **main ideas** so add a voice annotation saying that it is a main idea.

Young bees help to unload the nectar and begin turning it into honey.

This sentence is another of the **main ideas** so say that in the voice annotation.

One of these nectar.


Say **“Something is left out here”** in your voice annotation.

Bees have six legs.


Say **“This doesn’t have any thing to do with my story”** in your voice annotation.

Finally, you remember that the honey is fed to young bees so you can add a voice annotation to record that idea. Move to a blank line and insert a voice annotation that says **“honey is fed to young bees”**.


Now, the story should look like this:

 How do bees make honey?


 Bees visit flowers to collect food.

 One of these nectar.

The bees suck the nectar with their tongues and carry it home inside their bodies, in special honey stomachs.

 Young bees help to unload the nectar and begin turning it into honey.

The bees store the nectar in wax cells in their nest.

 Bees have six legs.

Many bees beat their wings to make a breeze that dries out the nectar until it becomes honey.



How did you do?

Try going through, listening to your annotations.

Now that you know what to do, it's time for some practice.

Remember, when you have written some of your ideas, you will use different annotations to help you organize your work or to add the highlights of new ideas.

You should use different voice annotations for:

1. the topic,
2. main ideas about a topic,
3. ideas that need to be fixed up,
4. ideas that might not belong in the story and
5. new ideas

Here are the steps again.

- 1. First of all type the main idea or the starting sentence of your story.
- 2. Then type in the main things you would like to say. Press return after each main idea so that each idea is on a different line. Don't stop to fuss over or correct anything at this stage. Let your thoughts flow freely-these are just jot notes.
- 3. Read what you have written.
 - ✎ Which sentence is the topic sentence? Add an appropriate voice annotation.
 - ✎ Did you leave out important ideas? Add an appropriate voice annotation.
 - ✎ Did you stick to your topic? Add an appropriate voice annotation to any sentences that don't seem to belong-Don't delete them, they might be OK in a different paragraph.
 - ✎ Are your ideas in the right order? If not, select the ideas and drag them to where they belong.
 - ✎ Is your topic sentence strong and interesting?
 - ✎ Is each word the right word?
 - ✎ Add some details where ever you can.
 - ✎ Did you include everything you wanted to?
 - ✎ Add any new ideas you think would help.
 - ✎ Use the spelling checker.

Appendix B: Story Ideas

Story Ideas

On the next page you can see three ideas for stories. Select one of these ideas to write your story. Use the six steps listed below to help you plan and revise your story. Also, be sure to use the special features (borders, characters or voice) that you have been assigned to, to help you organize your ideas.

1. Select a Topic
 - select a topic
 - type a statement that describes the topic
2. Brainstorm
 - list as many main ideas as possible
 - list details about the main ideas
 - make statements brief
 - begin each statement on a separate line

- | | |
|---|--|
| 3. Apply Features | <ul style="list-style-type: none">• read through each statement• decide whether each statement is a topic sentence, a main idea, a detail about one of the main ideas or an idea or detail that needs to be fixed up or changed.• use the special word processing features to show topic sentences, main ideas, paragraphs that need to be fixed and paragraphs that aren't needed |
| 4. Organize Ideas | <ul style="list-style-type: none">• read through the statements• move the ideas and the details around so that each main idea and the details that go with it are in a paragraph together. |
| 5. Add or Modify
Details about the
Main Ideas | <ul style="list-style-type: none">• read through the ideas and details• fix any sentences that don't use proper English• check the spelling• add details to improve the story. |
| 6. Print the First
Draft | <ul style="list-style-type: none">• save your work then print a copy of the first draft. |

Story Ideas #1a

1. My Proudest Moment

What was the proudest moment in your life? Did you accomplish some difficult task or pass some special test? Did you show you could control your temper or behave sensibly when it would have been very easy to do otherwise? Did you have some experience or receive some gift that made you envied by your friends?

2. The Minute That Seemed Like A Year

Did you ever say or do anything that made you wish you could “sink through the floor” in your embarrassment? Were you ever caught doing something foolish or forbidden?

3. Mischief

Alone or in company with a friend or two, have you ever been in a scrape or played some prank that had rather unexpected or unpleasant results? Where? When? Who?

Story Ideas #1b

1. Lost

Imagine being lost in the woods or in some large empty building when you were only eight years old. How did you come to wander off or be left behind? What was frightening or menacing about the place? Did you become hungry, thirsty, tired or cold? Did you hurt yourself or get dirty in your wandering and scrambling around? What did you do when it started to get dark? How were you found?

2. The Visit

Imagine you were a grandparent and your grandchildren were coming to visit you for two weeks during summer holidays. What will you do to make sure your grandchildren have a pleasant visit? What special trips and treats will you plan for them? How late will you let them stay up? Are you afraid you might spoil them?

3. Chance of a Lifetime

Suppose you had a chance to help the manager of a professional sports team during a playoff series. What would you do? What would your friends think? Would your parents let you go? What would happen during the "big" game?

Story Ideas #2a

1. The Lost Pup

What time of the year was it? Where did you find him? How could you tell that he was lost? Where was he? Did you have trouble making friends with him? How did you find his owner? How did you feel when his owner came to pick him up?

2. Little Accident

Were you doing something that you shouldn't have been doing? What was damaged? Were you hurt? Did anyone else get hurt? What did you do to fix things up? Did you get in trouble? Did anyone find out about what happened?

3. Nightmare Alice Rides Again

The old witch calls her cat, straddles her broom and is off for her Halloween ride. Describe two or three of her experiences as she skims over your neighborhood. Why does she finally decide to return home?

Story Ideas #2b

1. Poor Little Witch

While you are out Trick-or-Treating on Halloween you come upon a pretty little witch crying on the porch of an empty house. It appears that she is a complete failure as a witch. She has practised and practised and tried every sort of charm, but she still remains beautiful and unfrightening. You solve her problem for her and take her along with you on your rounds. She has a marvelous time before flying home on her broomstick.

2. Miniature Me

When and where did you spy the strange blue mushroom that led to this amazing adventure? Why did you take a nibble? What sensations did you feel as you began to get smaller and smaller? What delightful or frightening experiences did you have in your tiny state? How did you return to your proper size? Did you ever find the magic mushroom again?

3. Magic Clean-up

Early one morning in May you notice that the garden is looking unusually neat and clean. When you look by the fence you notice a tiny wand with a tag on it that reads, *Wave-It, the Clean-up Wand*. You discover that it works? How? You go up and down the road making all the changes and improvements you wish. What do

you do? Are the neighbors surprised? What do you do with the wand when you are finished?

Story Ideas #3a

1. A Good Place to Sleep

This is the first winter that the young bear is about to experience. Where does he look for a den? What does he eat? What does he do when the first snow comes?

2. First Snow

The little rabbit hates her first November. It is bleak and cold and she has no one to play with. Some of the animals she has played with have hidden away to hibernate for the winter. Others are collecting food and storing it for the winter. When the snow begins to fall she loves it. She thinks it is the best season of the whole year.

3. Lonely Scarecrow

The poor scarecrow has been left out in the fields by the farmer. As the trees begin to lose their leaves and the grass begins to die, the scarecrow starts to feel very lonely and forgotten. Then one day.....

Story Ideas #3b

1. Horror

The tiny bird sniffed the air again and listened carefully. She felt scared but she didn't know why. She had never smelled anything like this before. All the animals in the woods seemed to be running away and the sky was getting darker.

2. The Great Escape

At last the sparrow/mouse managed to escape from the classroom. How had he come to be there? Was he frightened or did he enjoy swooping/scurrying to make the children squeal? Would he know the names of blackboards, desks and lights? What would he call them? What was that tall lady doing?

3. A Secret for Two

Only one other person in the whole wide world knew what I knew and they certainly wouldn't tell!

Appendix C: Final Draft

Final Draft

Name: _____

Use this paper to write your final draft.

[illegible]

Appendix D: Pretest

Pretest

Choose one of the following topic sentences (reword them if you wish). Then, using your imagination or personal experience (or a little of both), develop the sentence into a first person narrative paragraph. Be sure to include specific details that will help to make the experience come alive for the reader.

Your paragraph must be done on your own, with no help from your teacher or from other students. Your final draft should be written in pen.

You have been given several pieces of paper. Use the pages labeled DRAFT to write your ideas and then revise what you have written.

When you are ready to write the final version of your paragraph use the piece of paper labeled FINAL VERSION. Give the FINAL VERSION to your teacher when you are finished.

You will be given two periods to complete the paragraph. Take your time and do your best.

Here are your topics:

1. After I went to school yesterday afternoon, things really began to go wrong.
2. It was our family's first visit to a big city.
3. I finally decided to have my hair cut.
4. At last I found a path through the woods.
5. It was the hardest job I ever had to do.

Appendix E: Posttest #1

Posttest #1

Choose one of the following topic sentences (reword them if you wish). Then, using your imagination or personal experience (or a little of both), develop the sentence into a first person narrative paragraph. Be sure to include specific details that will help to make the experience come alive for the reader.

Your paragraph must be done on your own, with no help from your teacher or from other students. Your final draft should be written in pen.

You will use the computer to write your ideas and then revise what you have written. You should use voice/borders/character formatting to help you revise your story on the computer.

When you are ready to write the final version of your paragraph use the piece of paper labeled FINAL VERSION. Give the FINAL VERSION to your teacher when you are finished.

You will be given two periods to complete the paragraph. Take your time and do your best.

Here are your topics:

1. I had a good excuse for being late.
2. I was alone in the dark old house.
3. It was my first try at skiing, and I was scared.
4. One event taught me never to fight again.
5. Yesterday I learned that Pete is a coward.

Appendix F: Posttest #2

Posttest #2

Choose one of the following topic sentences (reword them if you wish). Then, using your imagination or personal experience (or a little of both), develop the sentence into a first person narrative paragraph. Be sure to include specific details that will help to make the experience come alive for the reader.

Your paragraph must be done on your own, with no help from your teacher or from other students. Your final draft should be written in pen.

You will use the computer to write your ideas and then revise what you have written. You have been told whether you will use voice annotating, borders or character formatting to help you revise your story on the computer. Your computer has been set up with the features that you will use.

When you are ready to write the final version of your paragraph use the piece of paper labeled FINAL VERSION. Give the FINAL VERSION to your teacher when you are finished.

You will be given two periods to complete the paragraph. Take your time and do your best.

Here are your topics:

1. I never thought I'd be this scared.
2. I don't remember how I got in but I had to find a way out.
3. If only I could remember where I put that key.
4. As soon as I picked up the phone I knew I was in trouble.
5. You will never believe how I got all this money.

Appendix G: Questionnaire #1

Questionnaire #1

Name: _____

During the first part of this project did you use (use a x in the correct box)

- ☐ **CHARACTERS,**
☐ **BORDERS** or
☐ **VOICE.**

Let's say that you had just spent some time typing in the ideas that you wanted to use on your first draft of a story.

Briefly describe how you would use the computer to show that a sentence was a **main idea**.

Briefly describe how you would use the computer to show that a sentence was a **topic sentence**.

Briefly describe how you would use the computer to show that a sentence **needed to be fixed**.

Briefly describe how you would use the computer to show that a sentence **didn't really fit in your story**.

Do you have any trouble when you try to use BORDERS, CHARACTERS or VOICE on the computer? _____. Please describe any trouble that you have.

Have you talked to people in the other groups about the features that they are using? _____. How much do you know about the other features?

Appendix H: Questionnaire #2

Questionnaire #2

Name: _____

During the last part of this project did you use (use a x in the correct box)

- | | |
|--------------------------|--------------------|
| <input type="checkbox"/> | CHARACTERS, |
| <input type="checkbox"/> | BORDERS or |
| <input type="checkbox"/> | VOICE. |

Let's say that you had just spent some time typing in the ideas that you wanted to use on your first draft of a story.

Briefly describe how you would use the computer to show that a sentence was a **main idea**.

Briefly describe how you would use the computer to show that a sentence was a **topic sentence**.

Briefly describe how you would use the computer to show that a sentence **needed to be fixed**.

Briefly describe how you would use the computer to show that a sentence **didn't really fit in your story**.

Do you have any trouble when you try to use BORDERS, CHARACTERS or VOICE on the computer? _____ Please describe any trouble that you have.

Appendix I: Project Time Frames

Project Time Frames

Week	Task
1	<u>Beginning Phase 1</u>
	Meet with principal to discuss procedures and test scheduling
	Meet with teachers re: procedures
2	Give out permission form
	Begin word processing
3	Collect permission form on or before Friday
4	Meet with evaluation team
5	
6	
7	
8	
9	
10	
11	
12	
13	
14	
15	
16	<u>End Phase 1 On Friday</u>
17	<u>Begin Phase 2</u>
	Pretest Tuesday and Wednesday
	Explain procedures on Thursday
18	Give Pretest to evaluators on Monday
19	Collect Pretest from evaluators on Monday
20	
21	
22	
23	
24	Posttest 1 on Tuesday and Wednesday
	Administer Questionnaire #1 on Thursday
	<u>End phase 2 on Friday</u>
25	<u>Begin Phase 3</u>
	Give Posttest #1 to evaluators on Monday
26	Collect Posttest #1 from evaluators on Monday
27	

28

29

30 End Phase 3 on Friday31 Begin phase 4

32

33

34

35

36

37 Posttest 2 on Tuesday and Wednesday

Administer Questionnaire #2 on Thursday

End Phase 4 on Friday

38 Give Posttest #2 to evaluators on Monday

39 Collect Posttest #2 from evaluators on Monday

The following figure is a Gantt chart that displays project timelines. The project began in September 1992 and was completed in June 1993. Figure 6 displays tasks that were student related. Spaces between vertical lines represent three month periods.

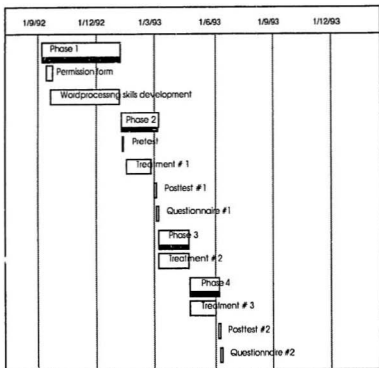


Figure 7. Gantt chart of project timelines.

Appendix J: Self Instruction Booklets-Skills Development Outline

Self Instruction Booklets-Skills Development Outline

Borders

- Select stationery document: A Borders
- Type ideas
- Read statement
 - Apply Formatting
 - Decide if statement is
 - Topic Sentence
 - Main Idea
 - A paragraph that needs improvements
 - A paragraph that is not relevant
 - Normal sentence
 - Find Style Menu
 - Select appropriate format
 - Next Sentence
- Identify story components
 - Topic Sentence
 - double border
 - Main Idea
 - single border
 - A paragraph that needs improvements
 - underline
 - A paragraph that is not relevant
 - shaded
 - Normal sentence
 - none
- Rearrange ideas if necessary
- Add new ideas/details
- Improve grammar/fix spelling
- Print story

Character

- Select stationery document: A Characters
- Type ideas
- Read statement

- Apply Formatting
 - Decide if statement is
 - Topic Sentence
 - Main Idea
 - A paragraph that needs improvements
 - A paragraph that is not relevant
 - Normal sentence
 - Find Style Menu
 - Select appropriate format
- Next Sentence
- Identify story components
 - Topic Sentence
 - Large letters
 - Main Idea
 - Outline style
 - A paragraph that needs improvements
 - underline
 - A paragraph that is not relevant
 - crossed out
 - Normal sentence
 - none
- Rearrange ideas if necessary
- Add new ideas/details
- Improve grammar/fix spelling
- Print story

Voice

- Select stationery document: A Voice
- Type/record ideas
- Read statement
 - Apply Formatting
 - Decide if statement is
 - Topic Sentence
 - Main Idea
 - A paragraph that needs improvements
 - A paragraph that is not relevant
 - Normal sentence
 - Find Insert Menu
 - Think about what you want to say
 - Record the annotation
 - Listen to the annotation
 - Select OK
 - Next Sentence
- Identify significant statements
 - Find speaker icons
 - Read sentence/type recorded ideas
 - Double click icon to hear annotation
 - Topic Sentence
 - Main Idea
 - A paragraph that needs improvements
 - A paragraph that is not relevant
 - Normal sentence
- Rearrange ideas if necessary
- Add new ideas/details
- Improve grammar/fix spelling
- Print story

Appendix K: Group Assignment Chart

Group Assignment Chart

The following chart shows which students will be working together as partners. The # symbol shows which computer each person will use. People at the same computer will be partners. The chart also shows the features that you will be using and in what order you will use those features.

Class	Name	#	Part 1	Part 2	Part 3
701		1	Borders	Characters	Voice
701		1	Borders	Characters	Voice
701		2	Borders	Characters	Voice
701		2	Borders	Characters	Voice
701		3	Borders	Characters	Voice
701		3	Borders	Characters	Voice
701		4	Characters	Voice	Borders
701		4	Characters	Voice	Borders
701		5	Characters	Voice	Borders
701		5	Characters	Voice	Borders
701		7	Voice	Borders	Characters
701		7	Voice	Borders	Characters
701		8	Voice	Borders	Characters
701		8	Voice	Borders	Characters

Class	Name	#	Part 1	Part 2	Part 3
702		1	Borders	Characters	Voice
702		1	Borders	Characters	Voice
702		2	Borders	Characters	Voice
702		2	Borders	Characters	Voice
702		3	Borders	Characters	Voice
702		3	Borders	Characters	Voice
702		4	Characters	Voice	Borders
702		4	Characters	Voice	Borders
702		5	Characters	Voice	Borders
702		5	Characters	Voice	Borders
702		6	Characters	Voice	Borders
702		6	Characters	Voice	Borders
702		7	Voice	Borders	Characters
702		7	Voice	Borders	Characters
702		8	Voice	Borders	Characters
702		8	Voice	Borders	Characters

Appendix L: Teacher Dialog

Teacher Dialog

Dialog for students Phase 1

Instructions: Read sections of text that are underlined. Sections that are in italics should not be read. These describe things to do.

Introduction and small talk for a few minutes. Talk about how they have used computers in grade 6, if they have computers at home, if they like using computers etc.

I have been talking to the principal and some of your teachers about the chances of doing an experiment with our computers this year. We talked about which grades in the school should take part in the experiment and we decided that we would give the grade 7s a chance to take part. Would you like that?

There are some special things that our computers can do that you probably haven't seen on computers before. We want to know if grade 7s can learn to use these features because if you can then we might be able to figure out a way that we could use the computers to help you get better marks. In this experiment we will show you how to use the special features and then you can use the features when you

use the computers to write assignments. Every now and then we will give you a special assignment and a questionnaire so that we can see how you are doing. Before we really get into the experiment part we want you to learn how to do word-processing on the computer. Does any one know what word processing is? (discussion about word processing)

Until about Christmas you will be learning to use a word processor for typing up your assignments. After that we will begin the experiment. Before we start, I would like for everyone to bring a copy of this sheet (permission form) home, show it to your parents and ask them to sign it. (hand it out and read it with them) The sheet simply asks your parents if they mind if you take part in this experiment. If your parents don't want you to part then that's OK. You'll still have a chance to use the special features. So, I would like you to bring this sheet home, show it to your parents so that they can sign it if they want and then bring the sheet back to me. I read all the sheets returned as soon as you can whether or not your parents want you to take part. If you can bring them back later today or tomorrow then that would be great. I'll remind you again tomorrow in case some of you forget.

If your parents have any questions about this experiment then they can come into school or phone sometime and talk to me about it. My phone number and the school number is on the bottom of this sheet.

Dialog with Students-Phase 2

Meet with each class and read the following.

So far this year you have only been using computers for typing the final draft of your assignments. Once you typed in your assignment, you made some minor changes, if they were necessary, and then you printed out the final copy. We are going to start doing things a little differently from now on. You will be using the computers for all of the steps in writing your assignments. You will be able to use three sets of special features to help you write your assignments. This is part of an experiment that we are doing to test the features of the computer to see how well they work and to see if grade 7 students have any trouble using the features.

In Science class we have been talking about experiments and some of the things that go on in experiments. Well, in this experiment we will need to set up different computers so that you will be able to use the different sets of features. In order to make sure that everyone gets a chance to use all of the features and to make sure everyone gets to use the computer for the same amount of time, I have divided you up into groups. I have also put everyone with a partner that you will work with on computer for the rest of the year. As you know, when we do experiments we have to try to be careful that we don't change too many things at one time. In this experiment we want to keep everything the

same all year except which features you are using. Because you will be working in pairs, you will be able to help each other. That means that all your computer assignments will have both your names on them. You will have to take turns when you are using the computer so it's a good idea to switch with your partner about every 10 minutes.

In the computer room I'll put up this poster (hold it up so the students can see it) so you will know what group you are in, who your partner is and when your group will be using each of the sets of features. The features you will be using are:

-first group- you will be able to draw borders, made up of lines around certain things in your story.

-second group - you will be able to change the size of the print on the screen for certain things in your story.

-The third group -you will be able to add comments using your own voice to certain parts of your story.

Here is the list of people who will be using borders; (read down through the list)

Here is the list of people who will be using different sizes of letters; (read down through the list)

Here is the list of people who will be using their voice; (read down through the list)

To help you learn how to use the different features you will work through booklets that show you exactly what you do, step by step (show the booklets to the students). The booklets will be given out the next

time you go to the computer room. We will take a few periods to let you work through the booklets to make sure you know how to use the features. Then you will get a couple of assignments so that you can get used to using the features. Your teacher will help you with any problems you might have. After that, any time you are using the computers to work on an assignment you can use the features to help you.

You will get a chance to use the computers for most of your english, social studies and science assignments. If you want to use the computers for working on your assignments during lunch time then the computer room will be open every day from 12:30 to 1:20.

After about 6 weeks you will learn a new set of features and finally after another six weeks you will learn the last set of features.

Appendix M: Consent Form

Consent Form

Inglis Memorial High School
P. O. Box 460
Bishop's Falls, Nf
A0H 1C0
September 14, 1992

Dear parents/guardians,

This year at Inglis Memorial High School I hope to complete a study that will give us more information about the best way to use computers with students in grade 7. I am specifically interested in ways that students can use computers to improve their work. I hope this study will give us some important information about what we can do to give your child the best possible education.

I would like for all our grade 7 students to be involved in this study so I am asking for permission so that your child can participate in this study. If you consent to letting your child participate in this study, your child be trained to use a computer for typing during regular school hours. Your child will also be asked to write two short assignments as part of the study. I will use these assignments to try to find out if using the computer will help students in their studies.

Your child needs no experience to take part in this study. Participation in this study is voluntary and your child can withdraw from the study at any time. Your child's name will not be used in any way in the study. In fact, except for these two special assignments, the school year will continue as usual.

If you consent to letting your child participate in this study please provide the information below and return this form to the homeroom teacher.

Thank you for your cooperation,
David Stoodley
Teacher, Inglis Memorial High School
MUN student # 7203680

Student's name (please print): _____

Address: _____

Phone number: _____

Date: _____

I give my consent so that my child can participate in the study described above.

Parent's/Guardian's signature: _____

For more information concerning this study please contact David Stoodley (home 489-9562/school 258-6311) or Mr. Bruce Mann, Faculty of Education, Memorial University of Newfoundland (ph. 737-8587).

Appendix N: Evaluator's Scoring Sheet

Evaluator's Scoring Sheet

Name: _____

Student #	General Competence	Focus/ Organization	Support	Grammar/ Mechanics
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				
11				
12				
13				
14				
15				
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24				
25				
26				
27				
28				
29				
30				

Appendix O: Categories for Writing Evaluation

Categories for Writing Evaluation

Category	Definition
General Competence	The overall, or holistic, impression of a piece of writing as to how clearly it communicates a message to the reader.
Focus/Organization	The extent to which the topic is clearly indicated and developed in an organized manner.
Support	The quality (specificity and amount) of the support provided for the paper's theme both within each paragraph and throughout the paper.
Grammar/Mechanics	The extent to which errors interfere with the writer's effectiveness in communicating.

General Competence

Score	Characteristics
90	Excellent example
75	Good
60	Adequate
45	Developing
30	Rudimentary
15	Unfocused, poor

Focus/Organization

Score	Characteristics
90	Subject clear, subject developed, events logical, no digressions, transitions
75	Slight digression, most transitions logical
60	Most events logical, some over or under elaboration, some digression, most transitions smooth
45	Subject clear, some unclear development, most events logical, some digression or excessive elaboration, some transitions not smooth or logical (and, so, but, then)
30	Main point not clear, some events not logical, no attempt to limit topic, few smooth transitions
15	subject unclear, main point unclear, no clear organization plan, no attempt to limit topic

Support

Score	Characteristics
90	All events, characters, setting developed, in depth description, support more specific than general statements
75	most developed by detail, some detail uneven, in one or two instances detail lacks depth
60	some detail lacks depth
45	uneven detail, several statements lack detail, some support not specific, some support not relevant
30	Many details lack specificity, depth, relevance
15	No support or vague, confusing, irrelevant support

Grammar/Mechanics

Score	Characteristics
90	One or two minor errors, no gross errors
75	A few minor errors, may be one gross, usage + mechanics still not a problem
60	a few common errors, one or two gross + no more than three minor, total of five minor
45	Some errors interfere, some gross and minor
30	many gross and minor, some detract from clarity of communication
15	Difficult to read, many gross varied

Appendix P: Steps for Writing

Steps for Writing

Details - Phase 1	Details - Phase 2, 3 and 4
<ol style="list-style-type: none">1. Select a Topic<ul style="list-style-type: none">• select a topic• write a statement describing that topic2. Brainstorm<ul style="list-style-type: none">• list as many main ideas as possible• list details about the main ideas• make statements brief• begin each statement on a separate line3. Organize Ideas<ul style="list-style-type: none">• read through the statements• rearrange the ideas and the details to improve the sequencing.	<ol style="list-style-type: none">1. Select a Topic<ul style="list-style-type: none">• select a topic• type a statement describing that topic2. Brainstorm<ul style="list-style-type: none">• list as many main ideas as possible• list details about the main ideas• make statements brief• begin each statement on a separate line3. Apply Features<ul style="list-style-type: none">• read through each statement• evaluate the ideas• classify each statement as a topic sentence, a main idea, a detail about one of the main ideas or an incomplete or inappropriate idea• apply the special word processing features.

4. Write First Draft

- use ideas to write a first draft on paper

5. Add or Modify Details

- read through the first draft
- modify the sentence structure
- improve the grammar and spelling
- add details to improve the story

6. Write Second Draft

- write second draft on paper

7. Print Final Copy on computer

- Type second draft on computer
- Print out Final Copy

4. Organize Ideas

- read through the statements
- rearrange the ideas and the details to improve the sequencing.

5. Add or Modify Details about the Main Ideas

- read through the ideas and details
- modify the sentence structure
- improve the grammar and spelling
- add details to improve the story.

6. Print the First Draft

- print a hard copy of the first draft.

Appendix Q: Descriptive Statistics for Writing Components

Descriptive Statistics for Writing Components

General Competence

	E1	E2	E3	E4
<u>Pretest</u>				
Mean	58.50	64.50	51.50	47.00
Standard Deviation	17.33	15.83	16.20	22.54
Minimum	30.00	30.00	30.00	15.00
Maximum	90.00	90.00	85.00	90.00
Count	30.00	30.00	30.00	30.00
Confidence Level (95%)	6.20	5.67	5.80	8.07
<u>Posttest #1</u>				
Mean	60.50	66.50	53.17	51.00
Standard Deviation	16.47	14.57	16.11	20.36
Minimum	30.00	45.00	20.00	20.00
Maximum	90.00	90.00	80.00	85.00
Count	30.00	30.00	30.00	30.00
Confidence Level (95%)	5.89	5.21	5.76	7.29
<u>Posttest #2</u>				
Mean	60.54	39.64	50.18	39.64
Standard Deviation	14.42	12.39	20.25	23.88
Minimum	30.00	15.00	20.00	15.00

Maximum	90.00	60.00	90.00	90.00
Count	28.00	28.00	28.00	28.00
Confidence Level (95%)	5.34	4.59	7.50	8.85

	Pretest	Posttest #1	Posttest #2
Mean	55.38	57.79	44.33
Standard Deviation	15.10	14.21	18.96
Minimum	26.25	28.75	0.00
Maximum	88.75	82.50	75.00
Count	30.00	30.00	30.00
Confidence Level (95%)	5.40	5.08	6.78

Focus and Organization

	E1	E2	E3	E4
Pretest				
Mean	59.50	32.00	50.83	40.50
Standard Deviation	16.47	16.11	16.40	20.53
Minimum	45.00	30.00	30.00	15.00
Maximum	90.00	90.00	85.00	90.00
Count	30.00	30.00	30.00	30.00
Confidence Level (95%)	5.89	5.77	5.87	7.35
Posttest #1				
Mean	59.50	61.00	51.67	45.67
Standard Deviation	15.99	17.14	18.35	18.51
Minimum	30.00	30.00	20.00	20.00
Maximum	90.00	90.00	95.00	80.00
Count	30.00	30.00	30.00	30.00
Confidence Level (95%)	5.72	6.13	6.57	6.62
Posttest #2				
Mean	61.07	40.71	48.39	36.96
Standard Deviation	14.10	14.06	18.00	23.62
Minimum	45.00	15.00	15.00	15.00
Maximum	90.00	60.00	80.00	75.00
Count	28.00	28.00	28.00	28.00
Confidence Level (95%)	5.22	5.21	6.67	8.75

	Pretest	Posttest #1	Posttest #2
Mean	53.21	54.46	43.67
Standard Deviation	13.51	14.04	18.52
Minimum	33.75	30.00	0.00
Maximum	85.00	80.00	75.00
Count	30.00	30.00	30.00
Confidence Level (95%)	4.83	5.02	6.63

Support

	E1	E2	E3	E4
<u>Pretest</u>				
Mean	63.00	67.50	47.83	39.00
Standard Deviation	15.46	12.30	15.68	18.73
Minimum	30.00	45.00	25.00	15.00
Maximum	90.00	90.00	85.00	90.00
Count	30.00	30.00	30.00	30.00
Confidence Level (95%)	5.53	4.40	5.61	6.70
<u>Posttest #1</u>				
Mean	59.00	64.00	50.50	41.83
Standard Deviation	13.61	16.68	17.04	16.53
Minimum	30.00	30.00	20.00	15.00
Maximum	90.00	90.00	80.00	90.00
Count	30.00	30.00	30.00	30.00
Confidence Level (95%)	4.87	5.97	6.10	5.92
<u>Posttest #2</u>				
Mean	40.18	66.96	47.50	36.96
Standard Deviation	14.17	15.54	18.83	22.54
Minimum	15.00	30.00	20.00	15.00
Maximum	75.00	90.00	85.00	75.00
Count	28.00	28.00	28.00	28.00
Confidence Level (95%)	5.25	5.76	6.98	8.35

	Pretest	Posttest #1	Posttest #2
Mean	54.33	53.83	44.71
Standard Deviation	11.64	11.82	18.70
Minimum	32.50	30.00	0.00
Maximum	81.25	81.25	77.50
Count	30.00	30.00	30.00
Confidence Level (95%)	4.16	4.23	6.69

Grammar and Mechanics

	E1	E2	E3	E4
Pretest				
Mean	62.00	68.50	40.00	48.33
Standard Deviation	23.55	19.17	20.21	17.83
Minimum	15.00	30.00	15.00	20.00
Maximum	90.00	90.00	75.00	90.00
Count	30.00	30.00	30.00	30.00
Confidence Level (95%)	8.43	6.86	7.23	6.38
Posttest #1				
Mean	68.00	71.00	50.67	61.67
Standard Deviation	16.59	16.21	16.65	15.72
Minimum	45.00	30.00	25.00	30.00
Maximum	90.00	90.00	85.00	90.00
Count	30.00	30.00	30.00	30.00
Confidence Level (95%)	5.94	5.80	5.96	5.63
Posttest #2				
Mean	68.04	54.11	32.68	51.25
Standard Deviation	16.06	15.99	22.38	18.64
Minimum	45.00	15.00	15.00	20.00
Maximum	90.00	75.00	75.00	90.00
Count	28.00	28.00	28.00	28.00
Confidence Level (95%)	5.95	5.92	8.29	6.90

	Pretest	Posttest #1	Posttest #2
Mean	54.71	62.83	48.08
Standard Deviation	16.42	12.83	19.60
Minimum	25.00	40.00	0.00
Maximum	86.25	86.25	80.00
Count	30.00	30.00	30.00
Confidence Level (95%)	5.87	4.59	7.01



