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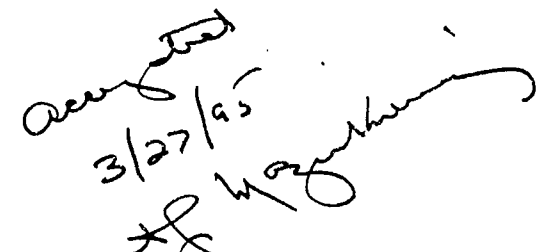
ABSTRACT

A study examined the effect of computer-assested instruction on fourth graders' writing skills. Two fourth grade classes from one elementary school in New Jersey participated in the study. One class (the experimental sample) was taught to use the computer as a writing tool, while the other class (the control sample) used only pencil and paper. Both classes were given a pretest and a posttest. Holistic scoring was used to score the paragraphs. Results indicated a significant improvement in writing skills in the experimental class as compared to that of the control class. (Contains four tables of data and 17 references. Appendixes contain a survey and test scores. (Author/SR)

The Effect of Computer Based Instruction on Writing at the Elementary Level.

by

Geraldine Jackiewicz



Submitted in partial fulfillment
of the requirements for
the Masters of Arts Degree

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Abstract

This study was proposed to determined the effect of Computer Assisted Instruction on writing at the elementary level. It was hypothesized that fourth grade students using the computer to write will improve their writing skills when compared with a sample using pencil and paper for writing activities.

Two fourth grade classes from one elementary school were chosen to participate in the study. The Experimental Sample was taught to use the computer as a tool for writing, while the Control Sample used only pencil and paper. Both Samples were given a pre test and post test. Holistic scoring was used to score the paragraphs.

An analysis of the results indicate a significant improvement in writing skills in the Experimental Sample as compared to that of the Control Sample.

Acknowledgments

For all his encouragement, support, patience and understanding I would like to thank my husband, James, who makes everything worthwhile. To my sons, James and Matthew, thanks for not complaining.

Thanks to my "study buddies" Diane, Fran and Peg for always being there in times of need.

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In the past few years writing skills of students in schools have been declining. Educators are faced with the task of preparing today's students for tomorrow's world, a world filled with technology. Teachers need to use all the resources available to them to encourage and enhance writing skills. Through writing, students intertwine the language arts- reading, writing, speaking, listening, and thinking, as they weave their ideas into stories they create.

It has been shown through standardized test scores that American youth exhibit an impoverished vocabulary, poor comprehension, negative attitudes and lack of motivation to learn.

Using the computer as a tool to teach writing skills will give the students motivation to write. Students enjoy using computers therefore, writing on the computer should enhance their desire to write and improve their attitude towards writing. Writing is considered part of reading instruction, When children write about topics of interest to them, writing becomes an integral part of communication.

One of the four major stages of the writing process is revising. When the students use computers to write, revising or editing is as easy as the touch of a button. When using paper and pencil a whole page might have to be rewritten. Sharing and publishing is also a major stage

of writing. After writing and revising material the computer will print out the work in a neat typewritten form to be shared with others.

Lee VerMulum made the following observations of her new high school writing class where computers were recently installed. 1. Student's time on task increased significantly. 2. The computers greatly facilitate students working at their own pace. 3. Students report an increased ease of writing even though they write and revise more than they did with paper and pencil. 4. Students attitudes toward writing are more openly pleasurable. 5. Increase in collaboration and cooperation in the classroom. 6. Decreased absences.

The use of the computer as a tool to teach writing is a relatively new idea in elementary school. Wepner (1987) states that word processing encourages and motivates students to create and experiment with communication and writing without having to worry about the mechanics of writing. Shaw (1987) states that computers allow students to create, organize, experiment and revise without having to rewrite the whole paper. This makes writing and rewriting easier. Wepner (1990) states that computers allow teachers to use software that helps students see relationships and connections between writing-reading and reading-writing.

Self and Wahlstrom (1989) state that classes that

benefit most from computers are those that involve a good amount of writing. Schwartz (1989) states that word processing encourages students to take risks with writing. It helps the student formulate ideas and to edit and review the work. It helps students organize ideas and to see the structure of the essay before and after the fact. Mittricker (1989) states that the word processor helps in brainstorming, editing, moving text and deleting while still retaining information. The word processor makes revision fun and easy while eliminating poor handwriting skills.

Hypothesis

To provide additional comparative evidence, the following study was undertaken. It was hypothesized that fourth grade students using the computer to write will improve their writing skills when compared with a sample using pencil and paper for writing activities.

Procedure

Two fourth grade classes from one elementary school in an upper middle class neighborhood of New Jersey were used in this study. All students were asked to write a paragraph on the same topic, "What is your favorite place?

Why?". These paragraphs were written with a pencil and paper. The paragraphs were used as the pre-test and graded holistically. Holistic scoring included four basic categories, content and organization, correct word usage, sentences structure and mechanics.

All students receive forty minutes of computer instruction each week. Thirty students from one fourth grade class, the experimental sample, were instructed in the use of the word processing program, Clarisworks. During their regular computer class the experimental sample did creative writing on the word processor, they wrote short stories, newspaper articles and poems. The writing assignments were assigned by their regular classroom teacher.

Twenty eight students from another fourth grade was designated the control sample. The control sample was taught computer skills other than word processing during their computer class. The only writing instruction they received was in their regular classroom and the assignments were completed with pencil and paper.

Before beginning the experiment the experimental sample was instructed how to delete and insert text, change fonts size and style, set tabs, save and print a file. The sample had some knowledge of keyboarding.

After three months all students were asked to write a paragraph on the same topic, "Who is your favorite person?

Why?". The experimental sample used the computer to write their paragraphs while the control sample used pencil and paper. These paragraphs were graded holistically. A student questionnaire was also distributed to both groups at the conclusion of the study to determined the attitude of the students in both groups toward writing.

The scores from both paragraphs were analyzed according to holistic score and by the Fry readability formula. This data was then interpreted and examined for statistical significance using t tests.

Results

Raw scores were determined for each sample by using the Fry readability formula and holistic scoring. In TableI the Mean, Standard Deviation and t of the pre test writing scores of the Control and Experimental Samples are compared.

Table I
Mean, Standard Deviation, and t of
Pre Test Writing Results.

	Mean	Standard Deviation	t
Experimental Sample	3.26	1.26	0.74
Control Sample	3.00	1.21	

NS

According to the results shown, there was no significant difference between the Mean of the Experimental Sample when compared to the Mean of the Control Sample in the pre test. Any change in the scores could not happen because of the differences in abilities before the study. Any change in the post test scores, as shown in Table II, was due to the procedure of the study.

In Table II the Mean, Standard Deviation and t of the post test writing scores of the Control and Experimental Samples are compared. The results indicate there was a

Table II
Mean, Standard Deviation, and t of
Post Test Writing Results.

	Mean	Standard Deviation	t
xperimental Sample	6.56	1.65	6.63
Control Sample	3.31	1.91	

Level of significance < 0.01

significant difference between the Experimental Sample Mean Score and the Mean Score of the Control Sample. The difference is 3.3. According to this data using the t test, the hypothesis, that fourth grade students using the computer to write will improve their writing skills when compared with a simple using pencil and paper for writing, was confirmed. The Experimental Sample increased their mean

score from 3.26 to 6.56, an increase of 3.3. The Control Sample had a slight increase of 0.31. Standard Deviation increased slightly in both samples showing the scores were spread over a broader range.

In Table III the Mean, Standard Deviation, and t of the pre test Readability Scores of the Experimental sample and the Control Sample were compared.

Table III
Mean, Standard Deviation and t of
Pre test Readability Scores.

	Mean	Standard Deviation	t
Experimental Sample	4.59	2.08	-0.37
Control Sample	4.83	2.37	

NS

Table III indicates that there was no significant difference between the Mean Readability score of the Experimental sample as compared to the Mean Readability score of the Control Sample in the pre test. The t shown is a minus because of the larger Mean of the Control Sample than the Experimental Sample.

In Table IV the Mean, Standard Deviation, and t of the post test Readability scores of the Experimental Sample and the Control Sample were compared.

Table IV
Mean, Standard Deviation, and t of
Post Test Readability Scores.

	Mean	Standard Deviation	t
Experimental Sample	4.52	1.55	2.06
Control Sample	3.61	1.56	

Level of significance < 0.05

The mean of the Experimental Sample when compared to the Control Sample is significant below 5% level. While the test for readability may not be an accurate representation of skill level of writing, it is suggestive of changes in performance.

The student survey (Appendix A) was administered at the conclusion of the study to give the researcher an indication of the students attitudes towards writing. The results are as follows.

1. Do you like to write?

	Yes	No
Experimental	100%	
Control	80%	20%

2. Do you write for pleasure?

	Yes	No
Experimental	93%	7%
Control	42%	48%

3. Do you think writing is only a school activity?

	Yes	No
Experimental	3%	97%
Control	12%	88%

4. How often do you write?

	often	sometimes	never
Experimental	34%	66%	
Control	46%	54%	

5. What do you write?

a.

	short stories	poems
Experimental	83%	14%
Control	75%	21%

b.

	non fiction	fiction	both
Experimental	3%	52%	41%
Control	8%	33%	21%

6. What tools do you use to write?

	Computer	Pencil and paper	Both
Experimental	7%	41%	52%
Control	4%	63%	33%

7. If given a choice of writing tools what would use?

	Computer	Pencil and paper	Both
Experimental	66%	34%	
Control	67%	29%	4%

8. How do you rate yourself as a writer?

	above average	average	below average
Experimental	28%	72%	
Control	25%	71%	4%

Conclusions

The results of this study indicate there is a significant difference in the writing skills of fourth grade students using a computer to write when compared with a sample using pencil and paper for writing.

The validity of the results of the Fry Readability on immature writers work is questionable. Immature writers often have a paragraph of only one run-on sentence. The Fry Readability determines readability based on the average number of sentences and the average number of syllables in one hundred words, for this reason immature writers have a high readability and the results would suggest that the experimental sample became significantly less mature in their written performance.

Computer Based Instruction and Writing: Related Literature

The word processor is the major computer tool for writers. What should be emphasized is that it also teaches people about the composing process. Words are no longer "carved in stone" but written light, sometimes flashing, disappearing, reappearing, sliding, or rippling. New metaphors for the "look and feel" of writing are not trivial things. They suggest that the technology is teaching people a new set of reactions to associate with the composing process. (Marcus 1990). Word processors can help to make writing less traumatic by letting the writer be in control of the various skills of writing, while allowing a writer an opportunity to view his writing objectively. (Crozier 1986)

The computer is a powerful and flexible writing tool with certain physical characteristics and information processing capabilities that may affect the writing process and facilitate certain types of writing instruction. Computers can support the cognitive processes involved in planning, writing and revising text. (MacArthur 1988) All stages of writing are facilitated by the use of the word processor. During the drafting stage, the word processor's ability for text expansion from anywhere is that the text lends itself to trial and error experiments with style, chronology and mode of narration. Writers are prepared to make these tests using a word processor because of the ease with which they can be carried out and, if necessary,

reversed. (Croizer 1986) The computer invites the students to produce a written record of their exploratory writing activities. According to Luchte(1987) the availability of hard copy printouts in the initial composing stage allows students to feel they have accomplished something substantial at a point in the process during which they feel tentative about getting something down.

Word processing may influence the writing process because of the ease of editing and revising. The ease of revision on the computer may encourage writers to make more revisions and improve their texts. It has been suggested that the editing capability can affect the entire composing process by encouraging authors to write freely, without concern for errors and awkward spots because it is so easy to make changes later. (MacArthur 1988.) Students appear to be more willing to consider revision and changes because they don't have to recopy the whole paper. Moore (1989) states one students view, "Instead of having to write reports freehand and getting writer's cramp, you can use the computer and save a lot of time, paper, and not have to scrub away spongy little eraser marks." Broad (1983) found that a word processor was most valuable in the revision process. The word processor made it easier to "delete, add, or move punctuation, words, sentences, paragraphs, or pages anywhere in the text. (Broad 1983:25) As a result of these features, the writer may be

encouraged to revise more often and more adventurously."

Margaret Moore (1989) cites a pilot program used in a large Southeastern U.S. school district. The school district integrated the use of word processing technology with its developmental writing program. The forth and fifth grade students of this district used this program. In the fall, students and teachers were trained in the use of word processing technology. The pre-writing stage began in the classroom, the students had two days to brainstorm and organize their ideas. After students thoughts were organized, on day three, the students used the word processor the enter the story on the computer. The students worked with partners to assist one another with punctuation and spelling during this stage. Partners also conferred with one another about content on text. The teacher held mini conferences with the students to monitor their work. After 15 minutes the roles were reversed and the writer became the reader and the reader became the writer. On the 4th day, students shared neat, legible copies of their stories with their peers editors. As the students shared their papers with others, they recognized the strengths of their stories identified problems within their stories,considered possible revision for their stories, or proofed their final version of their stories. Similar transactions between readers and writers continued until the writing piece was published.

Students appear to be more willing to consider revision and changes because they don't have to recopy the whole paper. Moore (1989) states one students view, "Instead of having to write reports freehand and getting writer's cramp, you can use the computer and save a lot of time, paper, and not have to scrub away spongy little eraser marks."

The findings of the pilot program indicated that students using word processors significantly improved the quality of their writing compared with students not using word processors. The computer screen facilitated discussions, editing, and revising. The neat, clean typed text made many students feel that they were good writers. "The powerful editing tools of the word processor enabled students to explore and experiment with the spelling of words, the arrangement of words or sentences within a story. Language learning seemed to evolve naturally through delighted experiences of discovery."(Moore)

Crozier (1986) states that a child who has trouble spelling will cover up what he knows is bad spelling by sloppy handwriting or, if he is given enough negative reinforcement, write less. By using a word processor the writer is forced to be objective, there is more chance to recognize a mistake and even if wrong can continually change the text without leaving marks of correction to ruin the presentation. The use of spell checkers give the writer the final decision

as to the correctness of the spelling of a word. At the very least, Marcus (1990) states, spell checkers aid good writer who are bad spellers.

Getting responses from other readers is an important part of the composing process. The upright monitor and clear print make a student's writing accessible to peers and teacher and can promote social interaction around writing tasks. (MacArthur 1988) Computers contribute to the ease of peer collaboration as shown in a study done by Ruth Kurth and Lila Kurth. The subjects of the study were 46 kindergarten and first grade elementary students in a three week summer enrichment program for teaching writing and other fin arts. Each group was taught basic writing process skills, one with the word processor, one with word processor with voice synthesizer, and one with no word processor. Students using word processing were taught keyboarding and simple word processing commands. Each student was asked to write six stories, and collaboration was encouraged. Children using pencil and paper wrote significantly shorter compositions than either word processing group, but those with voice synthesizers wrote significantly shorter compositions than word processor only groups. Holistic scoring showed no significant difference in quality of written products: all scores were high. Collaboration did occur more frequently in the word processor groups, especially with the synthesizer.

Word processing does not make the process of writing any easier, but it does break it up into manageable chunks which permits skills to develop in an integrated manner rather than in isolation. (Crozier 1986) Traditional methods of teaching writing tend to focus on the end product or completed text, rather than the process through which it is created. With word processing, however, students never have to recopy an entire draft. This means teachers can set higher standards and they can respond to the development and presentation of students of students' ideas. Word processing can facilitate your teaching not only the mechanics of writing, but also the process as a whole (Wheeler 1985). Marcus (1990) states that computers are now regularly seen as a significant means for acquiring language arts skills, for developing students abilities to express what they know and feel. Word processing technology according to Moore (1989) appears to be an efficient w y to address the needs of a language learning curriculum. In particular, the word processor and its powerful editing tool may provide a natural way for students to explore oral and written language in an environment which does not separate reading, writing, language, and real life experiences. (Moore, 1989:609)

A project to increase readability grade levels in tenth graders using computers was undertaken by Sally Hague and George Mason in a middle sized suburban high school. The

project also had a hidden agenda, to make reluctant revisers take a second look at their writing. Could student be lured into revision activities under the pretense of trying to raise the readability levels of their compositions. The students were taught the mechanics of the fry readability and given a survey about attitudes toward writing at the first session. Students were taught to use the computer program to calculated the readability of their stories. The students learned to enter their writing samples, edit it for spelling errors and print out the results. Each student wrote a draft copy, inserted it onto the computer, checked the readability of the composition, revised it and determined the readability grade level of the revised paper. Each student saw an increase in the readability grade level from the original draft to the revision. Two students raised their readability by two grade levels; 5 students raised it by three levels; 3 raise it by five levels; and 1 raised it by eight levels. The use of a readability measure and writing with the aid of a computer can indeed cause students not only to take a second look at their writing but also to revise their work.

Four sixth grade classes were the focus of research on the effect of computer assisted instruction on student revision of writing assignment. Two classes were heterogeneous with one using CAI: two classes were in a gifted program

with one using CAI. Each class received process approach writing instruction by a teacher trained in the National Writing Project. All student were asked to revise a prewritten story containing "target flaws". Intensive case studies using "stimulated recall" were done with 8 students' revising strategies. While the increased length and higher holistic scores of computer student's papers were statistically significant. The most significant finding was the relationship on the focus of instruction in each class with the type of revision coded: fluency, word choice, and mechanics. The study suggests that revision is driven by instructional emphasis, not computer interaction.

The results of a study done by Emily T. Schanck had quite different result from those of the previous studies. The subjects of the study were twenty two students from one fourth grade classroom. The students were randomly assigned to the experimental and control groups. The experimental group did all creative writing on the word processor and the control group used pencil and paper. The study concluded that there was no significant difference in the number of revision done by fourth grade student regardless of the tool they used.

Wheeler(1985) states that many teachers report that students have an improved attitude toward writing even when they're not using the computer. Word processors can help

students improve their writing at least as low as the fourth grade. Attitudes towards writing improve with the use of computers. Taggart (1994) states that her students write longer papers, spend more time revising them and turn in better work. She also found they enjoy using high-tech devices, work independently and enthusiastically to complete assignments and take pride in their creations. According to Moore (1989) using computers appeared to alleviate students concerns about messy papers or poor handwriting. One student stated, "I like the word processor because you don't make many mistakes and when you erase you can't mess up your paper." Others reported, "using the computer I can read what I type better than what I write." Word processors give students the power to produce neat, printed work, and to correct errors without damaging the appearance of the paper. (MacArthur 1988) He feels this aspect of word processing may be especially motivating for those exceptional students whose written work is typically characterized by poor handwriting and numerous mechanical errors.

In contrast, a study was undertaken by the Educational Testing Service, to determine the effects on essay scores of handwritten and word-processed versions of students essays. Nearly 500 students produced at least two essays, one in handwritten form and the other one on the computer. The essays was then scored. The essays were then transcribed,

the hand written essays typed on a word processor and the word processed essays hand written. These same essays were then rescored by trained readers who had not been involved in the initial scoring of the essays. When original hand written essays were word processed and rescored the average score decreased significantly. When original computer produced essays were handwritten and rescored the score increased slightly In analyzing the discrepancies of the converted essay scores the researchers made these observations. 1. The word processed version appeared to be considerably shorter than the corresponding handwritten versions, even though they contained the exactly same number of words. The single spacing of the printouts highlighted this feature. 2. Poor handwriting hides a multitude of sins. In the word processed essays grammatical mistakes and inappropriate paragraphing tend to be more apparent. 3.It was evident from the strikeouts on the handwritten essays that the students made serious efforts to revise their essays. This was not visible on the word process versions of the essays. There is a possibility that the readers may have rewarded the effort that was implied by the revisions in the handwritten essays. This is plausible because the readers, being teachers of writing are often trained to encourage students to revise their work.

Training has an impact on essay scoring therefore, a

second study was undertaken. The readers were trained and the first study was repeated. The readers received modified training in the following 1. The results of the first study were discussed and the readers were encouraged to get beyond the different impressions made by the presentation of the essays. 2. The influence of the perceived length on the essay scoring. 3. Using both handwritten and word processed essays in training. 4.Checking for differences in the standards applied to scoring essay in the two modes. The discrepancy favoring handwritten essays was greater in the first study for essays that were originally handwritten and then converted to word processed versions than for word processed essays that were converted to a handwritten format. The transcribers produced neater and more legible versions than that of the original handwritten essay. There were probably fewer instances of unreadable words among the transcribed handwritten essays than among the original handwritten essays therefore less opportunity to give writers the benefit of the doubt. This pattern was not detected in the second study but may have resulted from the standards of the readers.

Researchers have not been able to document support for the strong feeling of improved writing ability that often accompanies students positive attitudes. Lack of evidence regarding improved writing ability may be attributed to the

fact that most research has been done over a short period of time, which may not be long enough to show measurable differences of growth in writing ability: writing proficiency may not be influenced by the tools used to write: appropriate teaching strategies have not been developed in using word processors to teach writing.

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Appendix

Survey

Circle your answer:

1. Do you like to write?

   yes no

2. Do you write for pleasure?

   yes no

3. Do you think writing is only a school activity?

   yes no

4. How often do you write?

   often sometimes never

5. What do you write? (circle as many as needed)

   a. short stories poems

   b. non fiction fiction both

6. What tools do you use to write?

   Computer Pencil and paper Both

7. If given a choice of writing tools what would use?

   Computer Pencil and paper Both

8. How do you rate yourself as a writer?

   above average average below average

Writing Results - Experimental Sample

	A	B Pre-test	C Post-test
1	Student 1	4	9
2	Student 2	4	8
3	Student 3	2	5
4	Student 4	5	6
5	Student 5	3	6
6	Student 6	2	5
7	Student 7	2	10
8	Student 8	2	7
9	Student 9	5	7
10	Student 10	3	7
11	Student 11	4	5
12	Student 12	4	5
13	Student 13	4	10
14	Student 14	3	6
15	Student 15	4	8
16	Student 16	3	6
17	Student 17	2	8
18	Student 18	3	6
19	Student 19	4	6
20	Student 20	2	8
21	Student 21	1	7
22	Student 22	1	7
23	Student 23	6	4
24	Student 24	3	3
25	Student 25	4	6
26	Student 26	4	6
27	Student 27	4	6

Writing Results - Control Sample

	A	B Pre-test	C Post-test
1	Student 1	3	4
2	Student 2	2	4
3	Student 3	2	4
4	Student 4	3	2
5	Student 5	1	2
6	Student 6	2	2
7	Student 7	2	2
8	Student 8	2	4
9	Student 9	6	2
10	Student 10	3	4
11	Student 11	4	2
12	Student 12	5	4
13	Student 13	2	3
14	Student 14	4	7
15	Student 15	3	5
16	Student 16	2	5
17	Student 17	2	4
18	Student 18	4	2
19	Student 19	4	4
20	Student 20	4	8
21	Student 21	4	4
22	Student 22	2	4
23	Student 23	3	4

Readability - Experimental Sample

	A	B Pre-test	C Post-test
1	Student 1	3	7
2	Student 2	4	5
3	Student 3	3	4
4	Student 4	5	6
5	Student 5	6	5
6	Student 6	5	4
7	Student 7	1	4
8	Student 8	8	6
9	Student 9	4	2
10	Student 10	3	7
11	Student 11	4	3
12	Student 12	7	4
13	Student 13	2	4
14	Student 14	6	7
15	Student 15	7	7
16	Student 16	7	3
17	Student 17	3	6
18	Student 18	4	5
19	Student 19	7	3
20	Student 20	9	4
21	Student 21	2	1
22	Student 22	7	5
23	Student 23	4	4
24	Student 24	2	4
25	Student 25	3	5
26	Student 26	4	4
27	Student 27	4	3

Readability - Control Sample

	A	B Pre-test	C Post-test
1	Student 1	3	1
2	Student 2	1	2
3	Student 3	7	5
4	Student 4	6	4
5	Student 5	6	4
6	Student 6	1	2
7	Student 7	8	7
8	Student 8	6	3
9	Student 9	4	3
10	Student 10	4	3
11	Student 11	1	3
12	Student 12	6	4
13	Student 13	2	4
14	Student 14	7	4
15	Student 15	3	3
16	Student 16	6	2
17	Student 17	6	2
18	Student 18	7	6
19	Student 19	9	2
20	Student 20	2	4
21	Student 21	5	6
22	Student 22	4	3
23	Student 23	7	6