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ABSTRACT

A study was conducted in spring 1991, spring 1993, and summer 1993 to determine the effect on the writing process of various types of word processing software used by developmental and second-level composition students. Analyses were conducted of developmental students (novice writers) and of composition students (above novice writers) at a Texas community college. The developmental students were divided into two groups, one completed classroom writing exercises with traditional pen and paper and the other or used a simple word processing program. Composition students were divided into three groups, one writing with traditional pen and paper, one using a full computer word processor, and the third using a computer word processor in conjunction to electronic conferencing facilities that allowed students to communicate about the assignments in real time. Results of the study included the following: (1) on the multiple paragraph essays, all developmental students performed similarly, regardless of writing method; (2) developmental students who used computers during the semester wrote significantly more words on the exit exam (a pen and paper assignment) and were more concerned with paper length than the other students; (3) composition students in the computer conferencing class scored significantly higher than the other two groups in all measures; and (4) by cooperatively developing their ideas with other students on-line, students improved the organization, logic, and quality of their writing. (Contains 16 references.) (MAB)

Postsecondary Novice and Better Than Novice Writers:

Effects of Word Processing and a Very Special Computer Assisted Writing Lab

A Study

by

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Postsecondary Novice and Better Than Novice Writers:

Effects of Word Processing and a Very Special Computer Assisted Writing Lab

It almost goes without saying that writing is a complex process (Murry, 1984); that the classroom is a complex place (Good & Brophy, 1987); and that there exist complex internal and external conditions necessary for learning (Gagne, 1977) . Complicating this already complex process is the cognitive gulf between expert and novice writers. "Experts," according to Phye and Andre (1986) "and novices recognize and represent problems in different ways" (p. 179). Whereas novices treat items of information individually, experts organize and classify the information into better representations (Phye & Andre, 1986). Novices can remember whole organized schematics of the problem, while the novice sees no relationship between the parts of the problem.

"Expertise" in writing not only comes from the practice of facing many series of writing problems, but it comes from having a well-developed discourse schemata (Scardamalia & Bereiter). Furthermore, Flower and Hayes (1981) note that experts purposefully move from higher-level writing goals to subgoals, recognize the attainment of goals, restate and reorganize goals and subgoals during the writing process, and use (what amounts to) metacognitive monitoring of the entire iterative process (Flower and Hayes, 1980).

Novice writers, on the other hand, lack this complex set of skills and see the writing process as purely a linear pursuit. They start at the beginning and write to the end with the singular purpose of writing spelling error free and grammar error free sentences and meeting the word limit. Clearly, an important teaching objective is to design effective external conditions that

could help novice writers perform similarly to expert writers. Perhaps computer assisted writing can help novice writers better understand and exploit the complexity of the writing process by helping these new writers ignore the mechanical details that cloud the process.

Most research on computer assisted writing (CAI) has focused on the use of the computer as a "tool," one that can facilitate the writing process by physically making it easier to create, move, delete, and add text (Scardamalia & Bereiter, 1986). However, most practitioners, researchers, and theorists agree that writing and revision are internal processes. These processes may or may not be enhanced by word processing alone, especially since cognitive activities (goal-constructing, monitoring, problem solving, and others) are largely nonobservable. Even though the computer clearly impacts writing by helping students to see the text in a different manner and by helping students to revise more often, the revision often involves surface level changes with the quality of the paper unimpacted by these revisions (Daiute, 1994; Daiute, 1986; Hawisher, 1987).

Because of the power of the machine, it would stand to reason that novice writers can be taught to revise more effectively and to use the computer to help them concentrate on higher level composing and revision strategies. This is especially important since researchers are starting to see greater associations between how a text is physically represented and how this representation is involved with a writer's perception of what he or she has written (Haas & Hayes, 1986). However, it is not the machine that makes the magic; it is design and implementation of the curriculum and instruction associated with the computer.

Researchers have followed these revelations by calling for better writing aids (software that would check for spelling errors, ungrammatical constructions, provide comments on usage

and style, and act as a tutor, helping to focus student writing on the writing task) and by calling for research on those writing aids. Software developers have responded.

The conclusions of the research on the use of writing aids point to unexpected findings. For example, in one case, there was a high positive correlation between low level writing problems (mechanics, sentence length, etc.) uncovered by writing aids software and the scores on holistically graded essays (Costanzo, 1989). Holistic scorers may be scoring more traditionally than they think. Generally, the research on computer assisted writing instruction concludes that better designed CAW results in better student performance (Burley 1993). Sitting a student in front of a word processor is an expensive way the get nearly the same results one would find in a traditional classroom.

The computer will be ". . . the pencil of the future, especially in the field of writing" (Saunders p. 37). It follows then that educators have the responsibility of closing the gap between technology and teaching. Therefore, the question addressed by this study was whether the writing process could be facilitated with varying types of word processing software used by novice writers (developmental students) and better than novice writers (composition II students). Specifically, (a) there will be no difference between a control group and a group of students using a simple word processor and a grammar skills improvement program; and (b) there will be no difference between a control group, a group using a full-fledged word processor, and a group using a simple word processor, a discourse enhancer, and a writing prompter. This study is exploratory in nature.

Method

Overview

Study I

This study contrasted the end products of two groups of developmental writers, one using a simple word processor (*Norton Textra Writer*) and one without the computer--a traditionally taught developmental writing course. The comparison was done to explore the impact the computer made on a novice writer's skill development, as evidenced by the scores, word production, and error production of both groups. These are true novice writers. By "simple word processor," I mean one which has only the basic word processing features like text moving and a small spelling dictionary.

Study II

This study contrasted the writing products of three groups of college Composition II students. The control group received traditional instruction, a first treatment group use a word processing program (*WordPerfect*--a full-fledged word processor), and a second treatment group used a computer program (*Daedalus*)that combined word processing; a pre-writing prompter (used several different but traditional writing heuristics to guide writers through the writing process); and an electronic conferencing system that allowed students to interact with each other in real time, just as one would find on an Internet conference or a computerized bulletin board. These students are characterized as better than novice writers, since they have had some formal college training and experience. In comparison to developmental writers, these students exhibit many of the characteristics of experts writers, but for all intents, are still novice writers.

Limitations

Inferences drawn from this study are limited because the students were not randomly assigned to treatments nor were any of the students in either group reassigned to different treatments. Students in the computer class were not screened for keyboarding or other computer experience. Also, this study is biased because pre-test initial differences between groups in Study II may be significantly different. Therefore, the reader is advised to accept the conclusions of this report with caution.

Participants and Setting

The participants in the study were developmental composition students and Composition II students at a community college in Texas. The study was conduced in the spring semesters of 1991 and 1993 and the summer semester of 1993. The students' ages ranged from eighteen to fifty. Eighty percent of the developmental students worked full-time at off campus jobs and had families while few of the Composition II students had jobs or had started their own families. Nearly 50 percent of the developmental students were either Mexican-American or African-American while less than 20 percent could be so classed in the Composition II courses.

The same instructor taught both classes.

Procedures

Developmental Composition--Study I

All the students entered the developmental writing program by making a failing score on a written placement exam. This placement exam (a mirror of the exit exam for the developmental

writing program) required that the student write a 400 word multi-paragraph essay in two hours. The paper was then scored by at least two trained graders, using a scale developed and used by the Texas Academic Skills Program (TASP). On the opening day of class, the instructor confirmed students' placement in the developmental class by an entry diagnostic essay graded by the course instructor. All writing in the course was graded holistically.

Please note the following concerning holistic scoring stated by E. B. White (1988):

> Holistic scoring is able to achieve acceptably high reliability by adding a series of constraints to the economically efficient practice of general impression scoring. Basic to all these constraints is a carefully developed and precise writing assignment (sometimes called a "prompt"), followed by an attempt to reduce unnecessary variability in the scoring process. Six procedures and practices have been developed for scoring, and where all six are observed with sensitivity and care, high reliability of scoring has been achieved with no appreciable sacrifice of economy. p. 23-24.

Those six procedures are (1) controlled essay reading, (2) scoring criteria guide, (3) anchor papers, (4) checks of the reading in progress, (5) multiple independent scoring, and (6) evaluation and record keeping. The limitations of holistic scoring are as following: little meaningful diagnostic information beyond rank ordering of papers and reliabilities can be overestimated (White 1988).

Even though the instructor taught the "process approach" to writing and encouraged peer conferences and required text revising, the students were required to meet deadlines and were help responsible for producing an acceptable final product. For some students, this could mean revising a paper two or tree times. However, of those papers revised for a higher grade, no time

limit for turning in the revisions was enforced. Both the traditional class and the computer class were taught essentially the same. Accompanying both classes was a once a week lab that focused on knowledge, comprehension, and application of English grammar and usage.

The aim was to successfully guide writers from paragraph writing to multi-paragraph essay writing. During the semester, the students in both groups wrote many papers: six papers were classified as major, and five of this six were multi-paragraph. Generally, the papers were started in class on one day , taken up by the instructor at the end of the class, then finished when students returned to class on the next class day. All the papers in this study were in-class papers. Included in this study were the first essay (Essay 1), the third essay (Essay 3), and the Exit Exam. Essay 1 took two class periods, Essay 3, three class periods, and the Exit Exam, two hours. The Exit Exam was scored in the same fashioned as the placement exam.

In the classroom with the computers, twenty-five IBM PS/2 computers were networked using *Novell Net* software. The students used an inexpensive, stand alone, and easy-to-learn word processing program called *Norton Textra Writer*. The program required only fifteen minutes of formal classroom training. This word processing package has a spell checker and basic text-editing features.

Composition II Courses--Study II

All students in the Composition II course had made a grade of D or higher in college Composition I. Students who had made a D were encouraged to immediately repeat Composition I because admittance to most programs or transference of credits require an average of C in both freshman composition courses. Students' placement in the course was confirmed by an opening

day holistically scored essay that served as a pretest for this study.

For all groups in this study, the instructor focused on the writing process, especially focusing on rewriting and revising that was prompted by peer and instructor critiques. Papers were re-written for a higher grade at the end of the term. During the term, students wrote six essays, including one 2500 word research paper. The papers included in this study were the first paper after the pretest (an in- and out- of class observation paper) and the final exam (an in-class persuasive paper).

The treatment group of interest used a combination of electronic conferencing that allowed students in the same classroom to communicate with each other. Students could ask questions, debate, issues, discuss assignments, get ideas from other students, and test plans and arguments before writing them in a paper. A single student could draw upon ideas from twenty-three other students plus the instructor. This should be compared to the traditional classroom where the discussions consist of a series of dialogues with often a handful of the same students and the instructor.

Analysis of Data

The text production and writing scores for Study I were analyzed with one way and repeated measures analysis of variance (ANOVA). The level of statistical significance was $p<.05$. For Study II error production counts and writing scores one way ANOVA was used. The level.of statistical significance was $p<.05$.

Results

Study I

On all the multi-paragraph essays, the developmental writing students using the computer or using pen wrote about the same number of words and made just about the same grade--on the average--with one notable exception. Students who learned to write the multi-paragraph essay using the computer wrote significantly more words on the Exit Exam than those wo use pen through out the semester.

On Essay 1, as shown in Table 1, the mean score for the group when used pen (GPO1) was 78.4 while the mean for the computer using group (GPO2) was essentially the same--77.7. Those who used the computer to revise received a slightly higher mean score (85) than those who revised in the pen group (84). The difference, however, is not significant. Interestingly, the mean number of errors for Essay 1 were somewhat (but not significantly) different (GPO1)--13.41 and (GPO2)--7.7. However when those students who produced more than 20 errors were thrown out, the means for Essay 1 errors are much closer with (GPO1)--7.6 and (GPO2).--6.6. Of those errors counted, each group had seven papers which exhibited an error in essay or paragraph unity or development.

Those students who failed or received a marginal score (75 or lower) on Essay 1 were

Table 1

Study I

Group Means and Standard Deviations

		Score	No. of Words	No. of Errors
Essay 1				
Control	Mean	78.4	398	13.41
(n=12)	SD	11.5	143	14.19
Computer	Mean	77.7	351	7.7
(n=14)	SD	15.3	101	6.32
Essay 3				
Control	Mean	84	503	7.83
(n=12)	SD	15.2	130	10.33
Computer	Mean	85	509	7.57
(n=14)	SD	10.3	108	6.39
Exit Exam				
Control	Mean	5.66	335	
(n=12)	SD	1.15	61	
Computer	Mean	5.36	422	
(n=14)	SD	1.33	96	

required to revise their papers and received individualized instruction from the instructor (sometimes quite intensive individualized instruction).

In comparing Essay 1 scores with exit scores for this group, the results were essentially the same; two of the seven in (GPO1) who failed or received a marginal score on Essay 1 fai'ed the Exit Exam, and two of six in (GPO2) who failed or received a marginal score on Essay 1

failed the exit exam. On the opposite end of the distribution, of those students who received a near average or above average score (85 or better) on Essay 1 (GPO1)--5, (GPO2)--5, four in each group made seven out a possible eight points on the Exit Exam.

For Essay 3, the computer group had slight higher scores (GPO1)--84 and (GPO2)---85, a slightly higher mean number of words (GPO1)--503 (GPO2)--509, and slightly fewer mean number of errors (GPO1)--7,83 and (GPO2)--7.57.

The Exit Exam had at least two scorers. Passing papers received scores five, six, seven, or eight. The Exit Exam mean scores indicate the same lack of significant difference (GPO1)--5.66 and (GPO2)--5.33. Two in the control group failed (16%) versus four in the computer group who failed (28%). However, one of the two in the control who failed would have failed the course despite the Exit Exam score, and two of the four who failed in the treatment group would have failed the course despite the Exit Exam score. Both groups have the same number of sevens on the exit exam (4), sixes (2), and fives (4). The students in the computer group did produce significantly more words on the exit exam: control--335 and treatment 422.

Though the computer class tended to generate more words, the significance found for the exit exam is inexplicable, other the that fact that students were responding to new medium (Exit Exam was written with pen). The instructor advised both classes not to waste time counting words and that the student should know ahead of time the approximate number words his or her handwritten page. The students in the CAW class were inordinately concerned with making sure that their exit papers would be long enough, especially since using a word processor allowed them to count words with only two keystrokes. Also, the students who learned to write using the computer claimed to be able to write more fluently; also, the instructor rarely observed these

students staring at a blank computer screen. Students using pen and paper relied more heavily on peer and teacher prompts. The instructor noted more heavy sighs, glassy-eyed starring into space, and noisy balling up of paper in frustration in the pen and paper class.

There were no significant effects across time between he two groups or within the two groups, except for the number of words within the groups (See Table 2). This is the result of three extraneous variables uncontrolled by the study: 1) the time allotted for writing change for all three essays 2) many student were overly concerned about word limits 3) students knew beforehand that they could revise Essay 1, so they man have written fewer words in anticipation of this. Novice writers tend to see a correlation between better grades and longer papers. This is far from the case in this study. In fact, the correlation in this study between number of words and exit exam score is a low +.08. Clearly, the Exit Exam graders were looking for something other than number of words. Even though students were apprised of this fact, they still seemed to be overly concerned with producing longer papers.

Table 2

Study I

Results of Repeated Measures ANOVA

Exit Exam Number of Words

significance level .05

	df	F Value	p value
Exit Exam	24	7.23	.0123

Study II

To check the initial group comparability, a one-way ANOVA was performed on the pretest, using holistic scoring. As Tables 3 and Table 4 indicate there were no significant differences between the groups. As noted earlier, this pre-test comparison is problematic.

For Essay 1, students in the computer conferencing class (mean=89) clearly outpaced students in the word processing class (mean= 77) only or those in the control group (77.13). As Table 6 and Table 7 indicate, the computer conferencing scored significantly better than the other groups on Essay 1: ($F[52]= 9.505$), and significantly better on all other measures, for that matter. This is especially notable because of the larger sample size of the computer conferencing class (n=22). The computer conferencing class scored significantly fewer errors (7.04 versus. 16.8, word processing,; 15.6 , control) for Essay 1: ($F[52]=8.1039$). The computer conferencing course performed equally impressively on the Final Exam. The computer conferencing average score was 90.04 ($F[52]=6.7153$, $p<0.0026$) compared to 82.67 for the simple word processing class 80.31 for the control group. The students in the computer conferencing class scored significantly fewer errors (2.4 versus 8.93, word processing; 6.31, control). A Scheffe post hoc analysis pinpointed the computer conferencing class as significantly different.

Table 3

Study II

Pretest Means and Standard Deviations

Holistic Scores Only

Control	Mean	67.93
	SD	7.32
Word Processing		
	Mean	68.69
	SD	10.98
Computer Conferencing	Mean	73.09
	SD	9.0022

Table 4

Study II

Pretest ANOVA

significance level .05

	df	F Value	p value	
	52	1.742	.1855	not significant

Table 5

Study II

Summary Means and Standard Deviations

		Scores	No. of Errors
Essay 1			
Control	Mean	77.13	15.6
(n=16)	SD	11.02	10.3
Word Processing	Mean	77.0	16.8
(n=15)	SD	12.55	9.08
Computer Conferencing	Mean	89.0	7.04
(n=22)	SD	6.14	5.21
Final Exam			
Control	Mean	80.31	6.31
(n=16)	SD	9.89	3.11
Word Processing	Mean	82.67	8.93
(n=15)	SD	11.51	6.0
Computer Conferencing	Mean	90.04	2.4
(n=22)	SD	4.22	1.7

Table 6

Study II

One Way ANOVA

significance level .05

		df	F Value	p value
Essay 1				

	Score	52	9.505	0.0003
	Errors	52	8.1039	0.0009
Final				
	Score	52	6.7153	0.0026
	Errors	52	14.0362	.0000

Table 7

Study II

Results of Scheffe's Test

significance level .05

		Control	WordProcessing	Computer Conf.
	Control			
	WordProcessing			
	Computer Conf.	**********	**********	

*** indicates significance

Conclusions

Study I

Do novice composition students write significantly more and better using a word processor? Probably not. Do novice composition students write significantly worse when using the word processor? A clear no. The results of this study confirm the hypothesis that there is not significant difference between groups who learn to write with pin and those who learn to write with a computer word processor only. In the first papers written in the semester (not included in this study), students learning to write on the computer wrote significantly more than those who wrote with pen: control averaged 55 words and treatment averaged 125 words for the longest

body paragraph. However, the papers written on computer were unwieldy and rambling, lacking focus and adequate coherence. The first papers written with pen were short, usually with severe development problems. The treatment group wrote more (and actually performed worse) probably because of the novelty effect of using a medium for composing which was new for nearly all of them. The same is true for the treatment group during the Exit Exam. The novelty effect of writing in a new medium (pen in this case) seems to have caused them to write more words than the control group, but to perform at about the same level as this group.

There is, then, far more to learning to write than just manipulation of the writing medium. That is, whether one uses a stick in the sand: a hammer, chisel and stone; a quill and parchment; a pen and paper; or a word processor, writing is first a cognitive process that is only minimally bound by the physical aspects of "drawing letters"--however one chooses to do it. However, unlike other writing media, the computer is an amazingly facile tool; for example, the instructor noted that the papers written on the computer usually had few to no spelling errors because of the use of the spell checker. This aspect of the word processor made keeping a personal spelling dictionary and simple project for students.

The treatment could be enhanced with the an on-line thesaurus, style editor, grammar drill and practice program that addressed the needs of beginning college writers. Instruction could be improved with an improved physical layout of the computer classroom, LCD panel display with the overhead projector, and remote capturing of student terminals.

It is paramount, then that the computer be shaped to fit the needs of the student and the instructor, if it is to have the possibility of real value in the learning/instruction process. When one finds oneself reshaping the learner to fit the fixed nature of a static computer writing or

learning medium, the computer looses its chief asset to the computer writer--its flexibility.

I agree with Costanzo when he states that the strongest effect of word processing appears to be in its general effect on student attitudes (102). The students like learning to write on the computer--even though all papers were timed. Many students in the computer group lamented the fact that papers had to be written in class within a strict time frame.

For beginning writers, this positive attitude can go a long way towards improving writing and learning to write. The instructor noted that on the whole, the students in the control group exhibited better student behaviors--fewer absences; less tardiness; heightened attentiveness in class; heightened focus on class discussion, lecture, and any special instructional strategy; better diligence in turning in homework and revisions, and prompt addressing of problems highlighted by the instructor. Yet, the students in the treatment performed just well as those the control group. Intuitively, then, one must conclude that the computer does bring a powerful positive effect on writing if one considers the fact that the computer groups' messy enthusiasm but lack of disciplined student behavior did not hinder the leaning effect of the computer. One could predict that simultaneously reducing the problems of learning the new writing medium (make it easy to use) and increasing the facility of the tool (take full advantage of the power of the machine), could turn students' enthusiasm for writing on the computer irto real learning gains--that is helping novice writers to behave more like experts by seeing the writing problem symbolically.

Study II

Study II seems to confirm the idea that well thought-out and innovative interactive design of the computer writing lab should lead to significant learning gains. In fact, "electronic conferencing" as it is applied to CAW may hint upon a new metaphor for students and teachers to

use when conceptualizing the writing classroom. The students in the conferencing class all entered the discussion of a topic or an essay together. Students could immediately and at any time draw upon numerous examples of fellow students using inappropriate logic, logical fallacies, too much emotion, not enough emotion, poor ethical reasoning, poor development of ideas, and the list goes on. Good examples of precise logic and effective writing and thinking were available too. All of these examples could be pointed out by the instructor to all students in the class at the same time. Students could break off into sub-conferences, or they could send messages directly to one another. At the end of the period, the entire conference session could be downloaded to disk in several formats to be reviewed by the student or printed out. A week's worth of sessions could easily be forty to fifty pages in length.

The most important intangible, however, was a difficult to describe "intense but playful" learning atmosphere. For example, students became so enthusiastic about this class that groups of students would cluster into competing groups around two or more terminals, with their gathered notes and sources debating the issues, laughing at obvious logical errors (in this interactive medium, petty attacks on spelling, typos, and basic grammar were consider to be *ad hominem*), and asking questions. Often, students wanted to come back after class to add one more point to the discussion. Several students had to be reminded that the purpose of the conference was to help them generate clear ideas about their writing assignments; for many, performing well on the conference became an end onto itself.

The papers sparkled with the results. Arguments developed in the conferencing class had a complexity and richness and depth unseen in the control or the word processing only classes. Word choice was better, and sentence structures were routinely excellent.

Unfortunately, this study is only exploratory and limited by certain educational realities. First, the students in Study II were not randomly assigned to treatment. A survey found that an unusually high number of the students (80%) in the computer conferencing class were enrolled at the community college for transfer of credits to mainly three schools where they had been enrolled--Baylor, Texas A&M-- College Station, and University of Texas--Austin. Roughly the same number in the control and the word processing classes were planning to transfer credits; however, few had been admitted to their respective transfer institutions. The students in the conferencing class were enrolled during a summer term while the control and the word processing students were enrolled during a spring semester. This may be the most problematic of errors. Additionally, the pretest results may have been invalidated by a poor writing prompt that many students found confusing, so many of the papers were incomplete or rushed. Finally, even though all classes wrote the same papers, the curriculum for electronic conferencing often would veer in response to what was occurring on the conference bulletin board, allowing for a much more in depth study of writing problems. Simply, this was a vastly more interesting class.

However, the purpose of this study was simply to explore. In a since, the researcher asks the ex post facto question, "did anything happening there?" " Yes" is the *qualified* answer. What appears to be happening is that the students in the computer conferencing class bought into the metaphor of "electronic computer conferencing." Like experts in the writing field, students no longer saw the writing process as a linear series of steps, but saw the writing problem in a new way. Suddenly, the audience was real, and the rules of logic were genuinely attended to--like the rules of a game. In short, these students behaved more like expert writers.

The electronic conference as a writing aid deserves further study. It appears to be the

freshest innovation in the teaching of writing that is on the horizon. This researcher could find no studies of this classroom technique. A study, much better designed than this one, is necessary. This new metaphor could help could be a way of helping all types of writers, novices and better than novices, become better writers by getting all involved to rethink what the writing process is.

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