



## A COMPARATIVE STUDY OF TWO ESL WRITING ENVIRONMENTS: A COMPUTER-ASSISTED CLASSROOM AND A TRADITIONAL ORAL CLASSROOM

NANCY SULLIVAN\* and ELLEN PRATT†

*\*Texas A&M University at Corpus Christi, College of Arts and Humanities,  
6300 Ocean Drive, Corpus Christi, Texas 78412, U.S.A.*

*†University of Puerto Rico at Mayaguez, Mayaguez, PR 00681, U.S.A.*

Networked computer technology has become prevalent in higher education but little research has been conducted to attest to its benefits for the ESL student writer. This study compared students in two ESL writing environments; a networked computer-assisted classroom and a traditional oral classroom. Three measures were used to examine attitudes towards writing with computers, writing apprehension, and writing quality. In addition, data from transcripts (computer-assisted class) and audio/videotapes (oral class) of large group discussions and peer response groups were evaluated for qualitative differences. The results of the quantitative analyses showed that writing environment had no effect on attitudes toward writing with computers or writing apprehension. However, significant at the 0.08 probability level, writing quality did improve in the computer-assisted classroom. A qualitative analysis of the data indicated that types/patterns of discourse in the two writing environments were clearly different. During large group discussions, the teacher's role was minimized in the computer-assisted classroom, while the opposite was found in the oral classroom. During peer response group sessions, the comments made in the computer-assisted classroom were more focused although in the oral classroom, the comments were more numerous. Our findings support previous research showing positive effects for the use of networked computers in writing classrooms. Copyright © 1996 Elsevier Science Ltd

### INTRODUCTION

Recent advances in networked computer technology have made using computers in writing classes a more viable mode through which students can communicate with each other. The collaborative nature of networked computing fits well with the social view of writing (Eldred, 1989; Kaplan, 1991) and with the generally accepted view that interaction and group work facilitate the second language acquisition process (Long and Porter, 1985; McGroarty, 1991).

Many English as a Second Language (ESL) programs have begun to incorporate computers into their curriculum. Indeed, networked computers may have more advantages for the ESL writer than for the native speaker writer. For example, research has found that ESL students have more anxiety toward writing (Chaudron, 1988) and speaking in a second language, and that anxiety can have a negative effect on second language learning (see Horwitz and Young, 1991). Hypothetically, the networked classroom would offer the less proficient speaker more time to think about what to "say," thus reducing anxiety and the probability of error. Computer terminals also offer students an impersonal vehicle through which to practice the target language, especially in English as a Foreign Language situations where all learners are of the same native language background and are apprehensive about speaking the target language with peers (McCrosky *et al.*, 1985). In spite of the hypotheses that related research have generated, few studies have been carried out which attest to the benefits of using networked computers in ESL classrooms.

### RESEARCH ON COMPUTER-ASSISTED LANGUAGE LEARNING

Early research on computers looked at the changes that occurred in writers when pencil and paper were replaced with a computer. In recent years, with the increased usage of networked computers, research has begun to look at how networking creates more equality in the classroom by breaking down the traditional power structures and allowing for more equal participation among class members (Spitzer, 1989; Cooper and Selfe, 1990; Mabrito, 1991).

#### *Native speaker research*

Studies examining native language writers have been numerous and have focused primarily on students' revision strategies (Williamson and Pence, 1989). Studies by Mabrito (1989) and Stroble (1987) are two of the less common comparative type. Both compared students' responses to drafts in two environments; a computer networked classroom and a traditional oral classroom. Mabrito found that high apprehensive writers made more revisions based on comments received electronically (e-mail) than orally and more readily accepted suggestions for improvement on their writing in the computer-networked class than in the oral class. Stroble found that writers in oral classrooms received more positive/substantive remarks than in electronic discussions. This tendency is common in asynchronous discussions which has been attributed to "time lag" i.e. when students are less motivated to respond to messages sent hours or days before (Boothby, 1988; Mabrito, 1989).

Research examining the role of attitudes and apprehension in computer-assisted writing classrooms has been mostly "anecdotal and involves case studies on students' reactions to writing with the computer" (Shaver, 1990: p. 376). According to Hawisher (1989), to date there is a lack of documented "support for the strong feeling of improved writing ability that often accompanies students' positive attitudes." Pennington (1993) analysed various first and second language studies and concluded that "in conjunction with a process orientation...word processing *seems* (our emphasis) to produce positive results in terms of attitudes and writing activity that *may* (our emphasis) bring about improvements in the quality of written products as well" (p. 245).

### *Non-native speaker research*

Computer research with non-native speakers has focused mainly on the effects of stand-alone computers on the individual writer (see Pennington, 1993). Studies looking at networked computer-assisted classrooms have had mixed results.

Beauvois (1992) examined the interaction of intermediate French students using a network for synchronous classroom discussion. She found the quantity and quality of discourse to be very high with few instances of code switching and little need for teacher intervention.

However, Dziombak (1990) observed two ESL writing instructors for one semester to determine the characteristics of collaboration in a computer-assisted classroom and an oral classroom. The results showed little collaboration in either setting. In fact, students in the computer-assisted class felt isolated and missed the interaction of the face-to-face classroom. The author found that the teachers didn't exploit the communicative potential of the computer-assisted classroom and recommended that teachers specifically design activities that can be used for collaboration in the computer lab.

The purpose of this study is to investigate the differences in attitudes toward writing with computers, writing apprehension, and growth in writing in two ESL writing environments; a networked computer-assisted classroom and a traditional oral classroom. Our goal is to more completely understand the potential of a computer based writing classroom for ESL students. Therefore, in a comparison of the two classrooms, we asked the following research questions: (1) Are there differences in attitudes toward writing on computers, writing apprehension, and overall quality of writing between the two groups after one semester?; and (2) Is the nature of the participation and discourse in the two modes of communication different?

## METHOD

The study focused on the quantitative differences in attitudes and writing performance, and the qualitative analyses of participatory patterns and discourse in the two classrooms.

### *Participants*

Intermediate ESL students (L1, Spanish) in their second year at the University of Puerto Rico at Mayaguez comprised the population ( $n = 38$ ) of the current study. They were enrolled in their first English writing course, the third course in a sequence of four. The first two courses covered all areas of language learning but emphasized oral communication skills. Previous to this class, most students had had little or no experience writing formal compositions. Students varied in their computer skills (from zero to skilled); however, all students in the computer section reported having been exposed to computers in other classes and could type a minimum of 15 words per minute.

### *Materials*

*Software:* A specific computer software (Daedalus, 1989) was chosen because it supported collaboration and social interaction in the classroom. The software consists of

several modules: a word processor, two heuristic programs (one for invention and one for revision); a message system (Mail); and a real time electronic discussion program (InterChange). Although all were influential in the dynamics of the class, we will focus on the electronic discussion program because it formed the nucleus for collaboration and class discussion.

In InterChange, a student types her message and then "sends" it to the rest of the class. Messages are appended chronologically and appear on every student's screen. The sender's name is automatically attached to the message. Student discourse changes because of non-traditional turn-taking rules, lack of interruptions, and more time to think over and revise before making responses (Cooper and Selfe, 1990). It differs from e-mail because comments are responded to immediately, which resolves the time lag issue—a problem both Stroble (1987) and Mabrito (1989) found in their research. This software was used for peer response groups and large group (whole class) discussions of readings.

*Measurement instruments:* At the start of the semester, both groups were given the adapted version of the Daly-Miller Writing Apprehension Scale (Gungle and Taylor, 1989) and the Attitudes toward Writing with the Computer Scale (Shaver, 1990). The Writing Apprehension Scale is a 26-item Likert-type instrument that assesses anxiety and attitudes toward writing on a six-point scale. The Attitudes toward Writing with the Computer Scale is a nine-item instrument assessing attitudes toward using computers for writing on a five-point Likert-type scale. In addition, students provided writing samples based on a prompt from the teacher. These were scored holistically on a five point scale by two trained raters. At the end of the semester all three were again administered.

### *Procedures*

This study was conducted over a fifteen week period. The participants were from two classes taught by the same teacher to avoid any effect for style of teaching and materials used. Process methodology was employed in both classes which emphasized multiple drafts, peer and teacher responses to drafts, and dialogue learning logs. Students in both classes were given a seminar on how to respond to writing using techniques adapted by Spear (1988).

The oral class met in a regular classroom except once when the class met in the computer lab to learn how to use a word processing program. This group could write their papers on the computer outside of class if they chose. Both classes met two times a week for one and a half hours. The computer-assisted class met at least once and sometimes twice a week in the computer lab where they carried out all of their in-class discussions and writing assignments on the computer.

Each class completed four compositions during the semester. Students could choose their own topics for compositions although they were asked that the last paper be argumentative/persuasive. Learning logs in both classes were handwritten for homework and were read by partners during the first ten minutes of each class. Topics were daily responses to their classroom experiences. The only difference between the two classes was the students' use of networked computers in one class.

The two types of activities we examined for our study were large group discussions on readings related to composition assignments and peer response groups where classmates' essays were discussed in small groups. Work done in the computer-assisted class was saved on the network and printed out for an analysis of the discourse and participation patterns. In the oral class, students were video- and audio-taped in large group discussions and in peer response groups. The tapes were transcribed for analysis.

## RESULTS AND DISCUSSION

The results of the two types of data analyses (quantitative and qualitative) are described and discussed separately in order to adequately address the issues that emerge from each type of analysis.

### *Quantitative data*

The descriptive statistics of the pre- and post-test scores are shown in Table 1. Independent *t*-tests were used to compare means firstly *within* class ("Change" indicates the difference between the pre- and post-tests). They were also used to compare means *between* classes ("Difference" indicates the difference between the means of each class for both the pre- and post-tests). The results indicate that the changes within each class for the three measurements are all significant (below the 0.05 probability level). The computer-assisted classroom had a greater overall improvement for each of the three measurements than the oral classroom.

The results of the Writing Apprehension Scale (WAS) indicate that the students' apprehension decreased significantly ( $P < 0.01$ ) in both classes during the fifteen weeks (the scores are reversed to show more positive attitudes with the higher numbers). The differences in writing apprehension between the two classes were not statistically

Table 1. Descriptive statistics for the pre- and post-tests of the measurement instruments

Instrument	Oral class	Computer-assisted class	(Difference)
	Mean (SD)	Mean (SD)	
WAS1 <sup>a</sup>	3.35 (0.77)	3.27 (0.68)	0.08
WAS2 <sup>a</sup>	3.88 (0.69)	3.95 (0.72)	0.07
(Change)	+0.53 <sup>†</sup>	+0.66 <sup>†</sup>	
ATWCS1	3.66 (0.46)	4.02 (0.39)	0.39 <sup>†</sup>
ATWCS2	3.82 (0.52)	4.36 (0.48)	0.44 <sup>†</sup>
(Change)	+0.16 <sup>†</sup>	+0.34 <sup>†</sup>	
WS1	3.41 (0.77)	3.19 (0.77)	0.22
WS2	2.95 (0.84)	3.26 (0.70)	0.31
(Change)	-0.46 <sup>†</sup>	+0.07*	

<sup>a</sup>Scores were reversed to show more positive attitudes rather than apprehension.

\* $P < 0.05$ .

<sup>†</sup> $P < 0.01$ .

significant at the beginning of the study nor at the end, i.e. the two classes had similar levels of apprehension.

The students' attitudes towards writing with computers (ATWCS) were significantly more positive in both classes at the end of the semester. However, when comparing the means of the two classrooms (*t*-tests), the results indicate that the computer-assisted class began with significantly more positive attitudes than the oral class, and that these positive attitudes continued to be significantly higher at the end of the fifteen weeks.

The writing scores (WS) indicate that within each class there was a significant change between the pre- and post writing scores. The mean score in the oral class *decreased* significantly at the end of the fifteen weeks while the mean of the computer-assisted class *increased* significantly. The students in the two classes did not differ significantly (below the 0.05 probability level) at the beginning nor at the end of the semester. However, some evidence was found for improved writing in the computer-assisted class by comparing the writing score changes of the two classes (computer-assisted classroom's gain (+0.07) to oral classroom's loss (-0.46)). A *t*-test showed the difference to be significant at the 0.08 probability level. Because of the small number of subjects, the 0.08 probability level should be considered an important finding.

Our first research question addresses the issue of whether using networked computers in a writing class would change writing apprehension, attitudes towards writing with the computer and growth in writing. The statistical analyses of the three measurements show a lack of strong evidence weighing one learning environment over the other—the oral classroom versus the computer-assisted classroom. Given the limited time period we are not overly surprised about the lack of strong support for the use of computers in the writing classroom; however, the qualitative analysis provided below gives us good reason to believe that this study, conducted over a longer period of time, might have given us stronger statistical evidence.

#### *Qualitative data*

The discourse patterns in two types of discussions, large group and peer-response group, are examined below for participation and discourse characteristics.

*Discourse patterns:* In addition to examining the results of the measurement instruments, we also looked at the participation patterns of the two groups. When the discourse of large group discussions—one from each class— were compared, the patterns of participation differed dramatically. The oral class had only 50% student participation where the computer-assisted class had 100%. Furthermore, as illustrated in Fig. 1, 65% of the turn taking was attributed to the *teacher* in the oral class, whereas the teacher took only 15% of the total turns in the computer-assisted class.

*Large group discussion:* A breakdown of the oral class teacher's discourse (from Fig. 1) in the large group discussion is shown in Fig. 2.

Sixty-five percent of the teacher turn-taking focused on asking questions, many of which were answered by the teacher herself. For the rest of her turns, she responded to students,

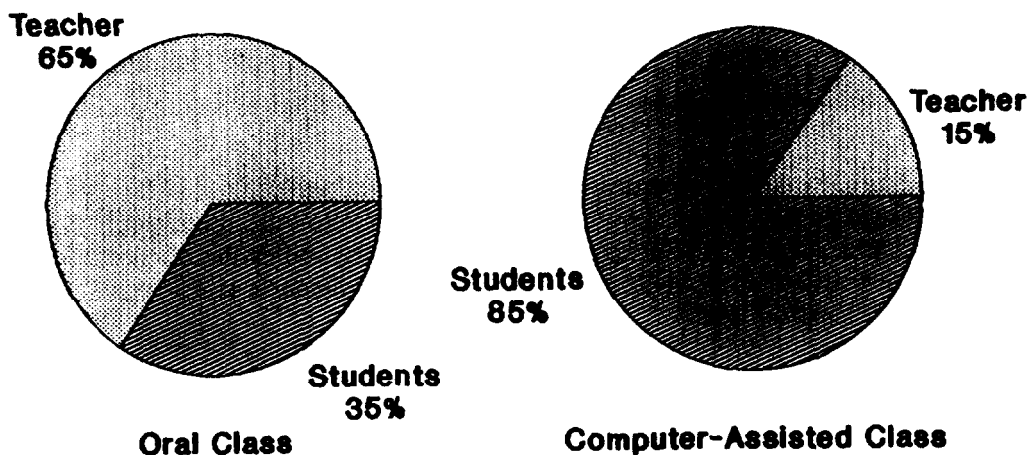


Fig. 1. Percent of turn-taking by teacher and students in oral and computer-assisted classrooms during large group discussions.

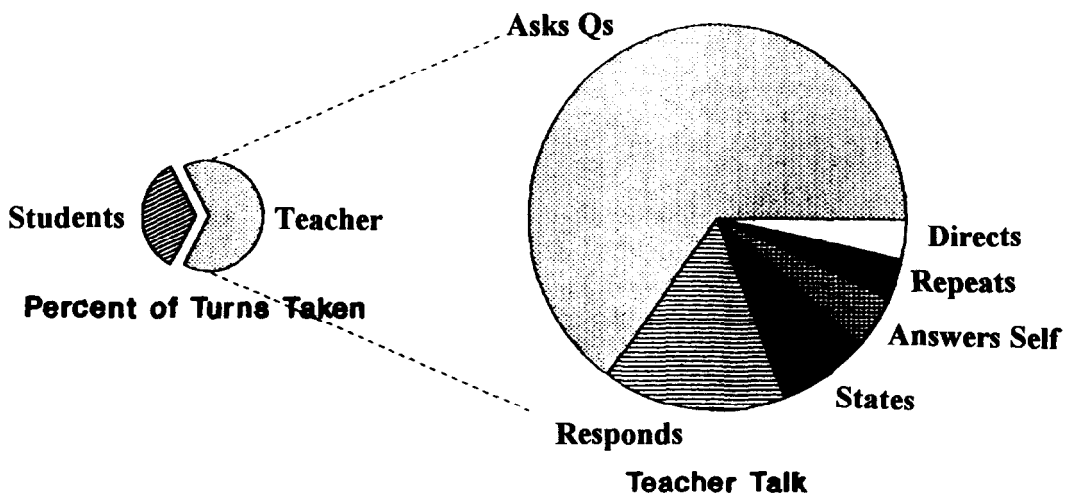


Fig. 2. Breakdown of teacher discourse in oral classroom during large group discussions.

made statements, repeated students' statements, and directed the discussion. Below is a transcript from an oral classroom's discussion of a reading on animal rights.

*Teacher:* What is the author's argument? (asks question)

Silence

*Teacher:* How does she support her argument? What does she want us as readers to do? What is her aim or her reason for writing this? (asks series of questions)

Silence

*Teacher:* What does she do to support her argument? What are the points that she tells us about in the essay? (asks series of questions)

Silence

*Teacher:* How does she start the essay? Did you understand that first part? (asks more questions)

Silence

*Teacher:* She says could you imagine someone outside a building with a fishing hook...(teacher continues with long statement). What comparison is she making here? (sets up question by referring to text)

*Teacher:* She gives us examples, situations (answers self). What are some of them she uses? (asks question)  
Silence

*Teacher:* Animals in different places. (answers self). Where? (asks question)

*Student:* The circus. (student answers teacher)

In her effort to get students to participate, the teacher ultimately dominated the class discussion. This pattern is typical of what is found in most oral classrooms, both native speaker and ESL. Mehan (1979) found that in regular classrooms the teacher initiates 81% of the discussion. Even in ESL classrooms, teacher discourse is 65–75% of classroom speech (Chaudron, 1988).

The teacher in the computer-assisted class, less dominating than in the oral class as shown in Fig. 1 above, was also less authoritative. The following is an unedited sample from the computer-assisted classroom's discussion of the same reading using InterChange.

*Teacher:* What are some of the examples she gives us to support her argument? I liked the first one where she has us imagine ourselves being hooked like a fish and how it must feel to have a big hook in the side of our cheek. (asks question and provides one possible answer)

*Student 1:* In the reading the author argue about something that she is gainst and she express in a way to convince us or make us aware of this. His purspose is to fight for the rights of the animals. (responds)

*Student 2:* The author in her argumentation is defending animal rights. I think that it is a convincing argument because she support very well her ideas. She gives good evidence of what she is saying and she presented both sides: "Their Side" and "Her Side". Also she don't hold animals superior or even equal to humans. I think that it gives credivility to the argument. (responds and gives opinion).

*Student 3:* The author wants to do is that the people recognize the rights of the animals, these rights aren't a consideration from us to they, it are a natural law because they feel and suffer like us. (responds)

*Student 4:* The athor in the way to say that the humans have to be more consience with th animals treatment because, if you don't like to feel the suffer of something like abuse the animals either because they feel and suffer too. (responds)

*Student 5:* The author argument is that we don't have to kill others animals or make them suffer because of our needs. For example food, entertainment, health, etc. (responds)

The discussion engaged four more students before the teacher sent another message asking the students if the argument convinced them to stop eating meat. At that point the teacher was engaged solely as another voice in the discussion—subsequent messages from her were not necessary as the students actively controlled the discussion. Compared to the oral class, the teacher's role was drastically minimized in the computer-assisted class.

*Peer-response groups:* Further examination of the discourse is based on the comparison of four small group discussions (four students in each group) from the oral class and the computer-assisted class. Analyses of the turn-taking patterns in discussions of classmates' papers show that the turns per group were greater for the oral class (40–70) than the computer-assisted class (14–25). Typed comments take longer to produce than oral responses, so the above results are not unexpected. However, although more talk occurred in the oral class groups, the talk was less focused, as illustrated below in a discussion about Student 2's paper on AIDS.

*Student 1:* I think that nobody is responsible, for if they get infected with other people AIDS. You know, I don't think that that's nobody's fault. It your fault, you know. (gives personal opinion about topic)



*Student 2:* Ok what I really think is systems are partially responsible of that, but your ever under the system and if that system let you do other things perhaps you'll never get infected, if you responsible with yourself. (author argues for point of view)

*Student 3:* Do you mean like the family deterioration or something? (asks for clarification)

*Student 2:* All that problems, all social problems are due to the systems and perhaps that's what I say here, we and the United States are responsible. (author clarifies point)

*Student 3:* I think that you can't...you know...I like the example where you talk about all the young girls having boyfriends uh or having sexual partners, I think that you can give more specific examples like that you now. Maybe uh, don't talk alot about politics and about, you know, like young people, like we. (make specific suggestion)

*Student 1:* But it is in some cases, but in my specific case I grow up alone. My mother work. I walk to school since I have seven years. I have boyfriend since I have ten years. (gives personal narrative)

*Student 3:* Ten years, maybe! (repeats)

*Student 1:* And I am too responsible that I think that, is people. I went to the university alone. I have boyfriend and I, in my mind, never pass that I was infected. I know what I'm doing. (continues personal narrative)

*Student 2:* I have to give more examples about the problems. (author agrees with Student 3's suggestion)

The discussions were often filled with personal narratives (students focusing on themselves rather than the task at hand) and short interjections of agreement (uh-huh) or repetition.

In the computer-assisted class, the responses followed a pattern that consisted of a positive comment about the essay followed by one or more suggestions for revision. The writers focused more clearly on the task of criticizing the writing rather than conversing with their fellow students while on the network. The following are typical examples of the computer-assisted classroom pattern:

I think your essay is good (makes evaluative comment), but you used terminology guided to a specific group of people (gives general suggestion)

I think that the theme is good (makes evaluative comment) but you are including information of new products in the market, effects of exercise in women's body, aerobics, etc. Maybe you have to direct your essay to only one of these points. (makes specific suggestion)

Another characteristic of the responses given to authors in the computer-assisted class was that many times the suggestions for revision were repetitive. Students would electronically "send" their responses at about the same time with similar comments, thus giving the author advice about an aspect of the paper two or three times. This repetitiveness made the problem more visible to the writer. In face-to-face conversations, usually if a topic has been discussed by one member, it is agreed upon with a few short statements such as "yeah" and "uh-huh" and then dropped for another one. The effectiveness of these comments on subsequent revisions was not investigated.

The data above clearly show that the types/patterns of discourse in the computer-assisted class and oral class are quite different thus answering our second research question (whether the nature of discourse is different in the two learning environments). In large group discussions the student participation patterns differed greatly. The 100% participation rate in the computer-assisted class versus a 50% participation rate in the oral class would indicate dramatically different language learning experiences for students in the two writing classes. Not only were all students participating, the teacher's role was minimized—the students controlled the flow of the discourse in their classroom. The opposite pattern was found in the oral class where the teacher dominated the discussion

(unwillingly in this case). Our findings on teacher/student interaction are consistent with other studies (e.g. Cooper and Selfe, 1990; Sullivan, 1993).

In peer response groups we found differences in patterns and types of interaction. For example, the author spoke less in the groups on the computer, equalizing participation among all members while in the oral classroom, the author often dominated the discussion of her paper. And while there were fewer turns taken in the computer-assisted class (less discourse), the suggestions were more specific and focused. Students may have been more focused on the task in the computer-assisted class because they had "Mail" (a program that is similar to e-mail for within class communication)—another place where they could converse with classmates freely about any topic on a one to one basis. The oral class groups had no such forum and thus used their group to bring in personal issues as well. Students in the computer-assisted class had time to read and reflect before responding, and this "slowing down" of the process seemed to be beneficial for ESL student writers.

### CONCLUDING REMARKS

We have established from our research that over fifteen weeks students in the computer-assisted classroom showed a significant gain in writing due to the networked computers. However, no significant differences were found for attitudes toward writing with the computer or writing apprehension. Students in the computer-assisted classroom demonstrated not only more interest in discussions, and, subsequently, more practice writing English, they were also more focused on the task at hand than students in the oral classroom. These findings support other studies which have noted the advantages of using networked computers for writing (e.g. Cooper and Selfe, 1990; Spitzer, 1989).

Some questions remain which should be addressed in future studies. One important factor that must be explored is time. As noted above, a small but significant ( $P = 0.08$ ) increase in writing ability was found for the computer-assisted class. However, with the data indicating that students in the computer-assisted classroom spent much more time engaging in discussions than those students in the oral classroom, even more growth would be expected over a longer time period for those students using computers. And, not only were the students more engaged in the computer-assisted class, they were also using the written medium as their vehicle for discussion—more time spent writing increases writing skills. However, studies should follow students for longer periods to measure growth more precisely.

This study showed that students in the computer-assisted class gave more suggestions for revision than students in the oral class. However, the number of revisions students incorporated into their writing and whether students benefited as a result of these suggestions was not examined. A more in-depth study of those responses should be undertaken to more fully elaborate on the differences that may exist between computer-assisted and oral peer response groups. We hope that this study will be replicated in the future (with the time factor adjusted) and that more comparative studies will be conducted to help fill in the many gaps that exists in this area of research.

## REFERENCES

- BEAUVOIS, M. (1992) Computer-assisted classroom discussion in French using networked computers. Unpublished Ph.D. dissertation. University of Texas at Austin.
- BOOTHBY, W. S. (1988) The influence of computer-mediated writing conferences on revision: case studies of college students. Unpublished Ph.D. dissertation. Harvard University.
- CHAUDRON, C. (1988) *Second Language Classrooms: Research on Teaching and Learning*. Cambridge: Cambridge University Press.
- COOPER, M. and SELFE, C. (1990) Computer conferences and learning: Authority, resistance, and internally persuasive discourse. *College English* 52, 847-869.
- DAEDALUS INC. (1989) Daedalus integrated writing environment [computer program] Austin, Texas.
- DZIOMBAK, C. (1990) Searching for collaboration in the ESL computer lab and the ESL classroom. Unpublished Ph.D. dissertation. Columbia University Teachers College.
- ELDRED, J. (1989) Computers, composition pedagogy, and the social view. In Hawisher, G and Selfe, C. (eds), *Critical Perspectives on Computers and Composition Instruction*, pp. 201-218. New York, NY: Teachers CP.
- GUNGLE, B. and TAYLOR, V. (1989) Writing apprehension and second language writers. In Johnson, D. and Roen, D. (eds), *Richness in Writing: Empowering ESL Students*, pp. 235-249. NY: Longman.
- HAWISHER, G. (1989) Computers and writing: Where's the research? *English Journal* 78, 89-91.
- HORWITZ, E. and YOUNG, D. (1991) *Language anxiety: From Theory and Research to Classroom Implications*. Englewood Cliffs: Prentice Hall.
- KAPLAN, N. (1991) Ideology, technology, and the future of writing instruction. In Hawisher, G. and Selfe, C. (eds), *Evolving Perspectives on Computers and Composition Studies*, pp. 11-42. Urbana, IL: NCTE.
- LONG, M. and PORTER, P. (1985) Group work, interlanguage talk and second language acquisition. *TESOL Quarterly* 19, 207-227.
- MABRITO, M. (1989) Writing apprehension and computer-mediated peer-response groups: A case study of four high and four low-apprehensive writers. Unpublished Ph.D. dissertation. Illinois State University.
- MABRITO, M. (1991) Electronic mail as a vehicle for peer response. *Written Communication* 8, 509-532.
- McCROSKY, J., FAYER, J. and RICHMOND, V. (1985) Don't speak to me in English: Communication apprehension in Puerto Rico. *Communication Quarterly* 33, 184-192.
- McGROARTY, M. (1991) What can peers provide? In Alatis, J. (ed.), *Georgetown University Roundtable on Language and Linguistics*. Washington, DC: Georgetown UP.
- MEHAN, H. (1979) *Learning lessons. Social organization in the Classroom*. Cambridge, MA: Harvard UP.
- PENNINGTON, M. (1993) A critical examination of word processing effects in relation to L2 writers. *Journal of Second Language Writing* 2, 227-256.
- SHAVER, J. (1990) Reliability and validity of measures of attitudes toward writing and toward writing with the computer. *Written Communication* 7, 375-392.
- SPEAR, K. (1988) *Sharing writing: Peer Response groups in English classes*. Portsmouth, NH: Heineman.
- SPITZER, M. (1989) Computer conferencing: An emerging technology. In Selfe, C. and Hawisher, G. (eds), *Critical Perspectives on Computers and Composition*, pp. 187-200. New York, NY: Teachers CP.
- STROBLE, E. (1987) Use of electronic mail to facilitate peer group response during the writing process. Unpublished Ph.D. dissertation. University of Virginia.
- SULLIVAN, N. (1993) Teaching writing on a computer network. *TESOL Journal* 3, 34-35.
- WILLIAMSON, M. and PENCE, P. (1989) Word processing and student writers. In Britton, B. and Glynn, S. (eds), *Computer Writing Environments. Theory, Research, and Design*, pp. 93-127. Hillsdale, NJ: Erlbaum.