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Writing Apprehension, Computer Anxiety and Telecomputing: a pilot study

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ABSTRACT Is network login frequently related to graduate students' writing apprehension, computer anxiety, age, or years of teaching experience? In a correlational pilot study of twenty educational technology students, writing apprehension and computer anxiety levels were measured both before and after eight weeks of using electronic mail, computer conferencing, and remote database searching facilities. Results showed that computer anxiety levels measured after telecomputing experience were significantly correlated with usage statistics, while writing apprehension scores collected before network use were significantly related to login frequency. Graduate students' ages and years of teaching experience were not found to be statistically related to network use.

Introduction

The academic Internet, a collection of more than 3000 computer networks, now offers a wide range of telecomputing services to between two and five million users from educational institutions worldwide (Quarterman, 1991). Recent estimates indicate that approximately 1%, or 30,000, of those with access to academic online resources are K-12 teachers (Clement & Grundner, 1991). Also, another 10-70,000 elementary and secondary teachers use commercial or local telecomputing facilities (Hunter, 1991). An overwhelming majority of these teachers are novice network users.

NSFNET, the Internet 'backbone' network, passes almost 9 billion data packets each month, and is currently growing at a rate of approximately 5% per month (Quarterman, 1991). More than 30% of K-12 schools in the USA now have limited access to telecomputing resources. By 1995, that figure may be in excess of 72% (Itzkan, 1991). Projected growth rates for both network traffic and new users in K-12 environments imply and underscore the immediate need for applicable research results that can guide efforts to introduce and support teachers' use of telecomputing facilities.

The more that we, as teacher educators, know about new network users in K-12 contexts, the better able we will be to help teachers acclimate to, navigate among, and use online resources for educational purposes. Yet there is little rigorous research evidence published about teachers as users of computer-mediated communications. The purpose of this pilot study was therefore to empirically explore possible relationships among four novice user attributes (writing apprehension, computer anxiety, age, and teaching experience) and one behavior pattern (network use frequency).

Writing Apprehension

Writing apprehension is "a situation and subject-specific individual difference concerned with people's general tendencies to approach or avoid writing" (Daly, 1979, p. 11). Daly & Miller (1975a) developed and validated the Writing Apprehension Test (WAT), a questionnaire designed to measure writing apprehension attitudes. Higher scores on the WAT indicate greater writing apprehension. Lower WAT scores have been correlated with better performance on tests of grammar, writing mechanics, and general writing success (Daly, 1979), more positive perceptions of past successes with writing (Daly & Miller, 1975b), better narrative or descriptive essay writing (Faigley, Daly & Witte, 1981), better standardized achievement test scores, both generally and particularly in English (Richmond & Dickson-Markman, 1985), and better grades in undergraduate composition classes (Powell, 1984). Apprehension about speaking, which has been negatively correlated with measures of self-esteem (McCroskey et al, 1977), seems not to be correlated with writing apprehension (Klopf & Cambra, 1979).

Shaver (1990) showed that the WAT can be used reliably and validly with secondary school students, and demonstrated that his Attitudes Toward Writing with the Computer Scale yields concurrently reliable and valid writing apprehension scores when compared with results from the WAT. It would appear, therefore, that attitudes about writing in telecomputing contexts can be measured reliably with the WAT.

Only two studies were found that addressed possible relationships between writing apprehension and network use. In a study of the effects of using computer network technologies on teacher-student and student-student interactions in an undergraduate composition course,

(Hartman et al, 1991) showed that writing apprehension was negatively related to frequency of teacher-student interaction in both traditional and electronic communication modes, although the relationship was weaker for electronic communications. Mabrito's (1991) qualitative study of high-apprehensive and low-apprehensive first-year college writers indicated that "high apprehensives exhibited different strategies than low apprehensives for informing group members about writing during both face-to-face and e-mail sessions" (p. 509). The students with high levels of writing apprehension also participated more frequently in electronic writing revision sessions than in face-to-face sessions. It is clear that much more can be learned about the relationship between network users' writing apprehension levels and their use of electronic tools for which writing is necessary for communication.

Computer Anxiety

Computer anxiety is an example of a 'concept-specific' anxiety type; anxiousness that regularly occurs in a specific type of situation (Oetting, 1983). Concept-specific anxieties differ from 'state' (transitory) and 'trait' (personality aspect) anxieties. Although there is no general agreement upon an exact definition of computer anxiety, its presence in educational research literature implies that there is tacit agreement as to its existence (Jones & Wall, 1989-90).

Computer anxiety and attitudes toward computers appear to be separate constructs (Rosen, Sears & Weil, 1987; Kernan & Howard, 1990). There is some evidence that computer anxiety correlates with math anxiety (Gressard & Loyd, 1986; Rosen, Sears & Weil, 1987; Kernan & Howard, 1990), but conflicting reports as to whether it is demonstrated to greater extents in women (Gilroy & Harsha, 1986; Jones & Wall, 1989, 1990). Similarly conflicting results have been published concerning correlations between computer anxiety and age (Rosen, Sears & Weil, 1987; Jones & Wall, 1989, 1990). The authors of a recent meta-analysis of 81 research reports on computer phobia concluded that computer anxiety is not significantly related to either age or gender (Rosen & Maguire, 1990).

Computer anxiety levels have been found to be better predictors of success in using computers than is extent of prior computer experience (Marcoulides, 1988), but computer anxiety scores are not related to amounts of computer experience (Rosen, Sears & Weil, 1987; Marcoulides, 1988). Computer experience appears to affect attitudes about computers, rather than computer anxiety (Gressard & Loyd, 1986; Igarria & Chakrabarti, 1990).

Although computer experience alone does not eliminate computer anxiety (Rosen & Maguire, 1990), there is some evidence that computer anxiety does decrease with structured computer use in educational contexts

(Cambre & Cook, 1987; Lambert & Lenthall, 1989). Introductory instruction in word processing has been cited at least twice as an effective way to reduce novices' levels of computer anxiety (Gilroy & Harsha, 1986; Harrington, McElroy & Morrow, 1990), especially when compared to introductory instruction in computer programming (Gilroy & Harsha, 1986). In one of these studies, undergraduates with high levels of computer anxiety were observed to ask more questions during instruction and actively avoid use of the word processor more often than students with lower levels of computer anxiety (Harrington, McElroy & Morrow, 1990). It may be interesting to discover whether highly computer-anxious novices would similarly avoid use of telecomputing services.

Potential relationships between computer anxiety levels and frequency of telecommunications tool use have been addressed in only one located reference. In a study of traditional-mode and electronic communication among undergraduate writers and their teachers, computer anxiety was found to be a significant negative predictor of frequency of electronic teacher-student interaction. Computer anxiety was also negatively related to frequency of traditional-mode interaction about writing (Hartman et al, 1991). Given the relative paucity of research that explores possible relationships between computer anxiety and network use, further investigation of such connections is certainly justifiable.

Subjects

The subjects that participated in this study were 20 graduate students enrolled in an introductory educational technology course taught (by one of this study's researchers) at a comprehensive midwestern public university in the USA during the fall semester of 1991. The majority were K-12 classroom teachers. Sixteen were women; four were men. Students explored social, ethical, and pedagogical issues related to infusion of microcomputer tools into K-12 curricula. They also personally experienced a broad range of instructional computing applications on three different microcomputer platforms in primarily hands-on contexts, including word processing, database and spreadsheet use, computer graphics creation, graphing, Logo programming, educational software evaluation, use of interactive multimedia, and computer-mediated telecommunications.

The students learned to use three different types of telecomputing services: mainframe-based electronic mail (VAX Mail), computer conferencing (Usenet NEWS) at both local and international levels, and direct (Telnet) access to remotely-located online resources. The subjects were required to complete two short telecommunications assignments to demonstrate comfort and competence with electronic mail and computer conferencing, as partial fulfillment of course requirements. In both of the assignments, a minimum number of logins were required, but students were encouraged to further

use the services according to their own interests, informational needs, and preferences. Students had unlimited access to network resources for 12 weeks during the semester, the first 8 of which were studied in the context of this research.

Methodology and Instrumentation

The study was exploratory in nature, and sought to investigate statistical relationships between subject network usage, and the subject attribute variables of age, teaching experience, computer anxiety level, and writing apprehension level. Evidence of network use was collected as three separate sets of student login statistics over the 8 week period, with numbers of logins drawn from Campus Computing usage records. These usage statistics are identified within the study by individual monthly totals and across-month totals. 'September Usage' represents a total of student logins for the first week of network use, 'October Usage' represents the total for the next 4.5 weeks, and 'November Usage' represents a total for the last 2.5 weeks of study. All three of these figures are combined into an overall total usage figure for the 8 weeks, which is identified in the study as 'Total Usage'.

Subject attribute data were collected both before and after 8 weeks of network use. Age and teaching experience were collected before network use began. Computer anxiety and writing apprehension were measured before network use began as well, but were also measured upon conclusion of 8 weeks of student network activity. Investigated variables then consisted of four variables associated with individual subject network use (September Use, October Use, November Use, and Total Use), and six variables associated with subject attributes (age, teaching experience, computer anxiety pretest score, computer anxiety posttest score, writing apprehension pretest score, and writing apprehension posttest score). All data were collected with assurances of student anonymity.

Computer anxiety levels were measured using the Computer Opinion Survey, developed at Iowa State University (Mauer & Simonson, 1984), and subsequently standardized with high reliability and validity coefficients, including concurrent validity (Simonson et al, 1987). This instrument produces a score that can range from 26 to 156, with larger numbers reflecting greater levels of computer anxiety. It consists of 26 statements that reflect personal anxiety with computers and their use. Respondents indicate their level of agreement/disagreement with each statement using a six-point forced choice Likert scale.

Writing apprehension was measured by use of the Daly-Miller Writing Apprehension Test, developed by Daly & Miller (1975a). This instrument produces a score that can range from 26 to 130, with larger numbers reflecting greater levels of writing apprehension. The test consists of 26 statements that reflect feelings of apprehension toward the writing process,

and asks respondents to mark their levels of agreement with each statement on a 5-point Likert scale.

Results

Analysis of statistical relationships between variables was facilitated by computing correlation coefficients (Pearson Product Moment), among all six subject attribute variables with each of the four usage variables. Individual correlation coefficients, and corresponding significance levels are provided in Figure 1.

	Age	Computer Anxiety Pretest	Computer Anxiety Posttest	Writing Apprehension Pretest	Writing Apprehension Posttest	Teaching Experience
Total Usage	-.1747 (<i>p</i> <.461)	-.2715 (<i>p</i> <.247)	-.5815 (<i>p</i> <.007)**	-.4235 (<i>p</i> <.063)*	-.3700 (<i>p</i> <.108)	.0057 (<i>p</i> <.982)
September Usage	-.2649 (<i>p</i> <.259)	-.1785 (<i>p</i> <.451)	-.5597 (<i>p</i> <.010)**	-.4403 (<i>p</i> <.052)*	-.3968 (<i>p</i> <.083)*	.1054 (<i>p</i> <.668)
October Usage	.0089 (<i>p</i> <.970)	-.2151 (<i>p</i> <.362)	-.3539 (<i>p</i> <.126)	-.6607 (<i>p</i> <.005)**	-.3883 (<i>p</i> <.091)*	.2191 (<i>p</i> <.367)
November Usage	.0150 (<i>p</i> <.950)	-.3333 (<i>p</i> <.151)	-.4425 (<i>p</i> <.051)*	-.2723 (<i>p</i> <.245)	-.2193 (<i>p</i> <.353)*	-.1479 (<i>p</i> <.546)

Note: * represents correlations approaching significance at the *p*< 0.05 (*p*<.1).

** represents correlations found to be significant at *p*< 0.05 level.

FIGURE 1. Correlations of Attribute Variables with Network Usage.

Three pairs of variables were found to have correlations considered to be statistically significant (*p*< 0.05). These were:

- (1) the writing apprehension pretest score with October network use (-.6607, *p*< 0.005);
- (2) the computer anxiety posttest score with total network use (-.5815, *p*<0.007); and
- (3) the computer anxiety posttest score with September use (-.5597, *p*< 0.010).

Due to the exploratory nature of the study, five correlations between variables were also identified as 'approaching significance' (*p*< 0.1). These were:

WRITING APPREHENSION AND COMPUTER ANXIETY

- (1) the writing apprehension pretest score with total use (-.4235, $p < 0.063$);
- (2) the writing apprehension pretest score with September use (-.4403, $p < 0.52$);
- (3) the computer anxiety posttest score with November use (-.4425, $p < 0.051$);
- (4) the writing apprehension posttest score with September use (-.3968, $p < 0.083$); and
- (5) the writing apprehension posttest score with October use (-.3883, $p < 0.091$).

A summary of these significant and approaching significance statistical relationships is provided in Figure 2.

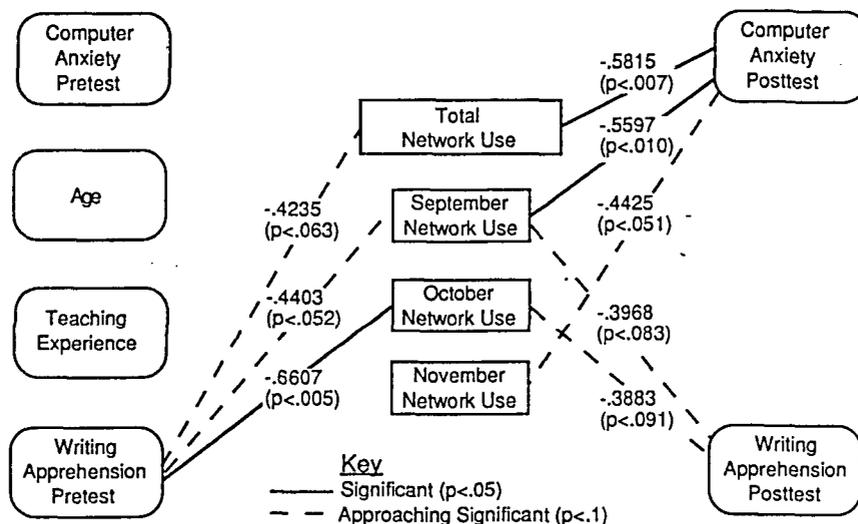


FIGURE 2. Factors Related to Network Usage.

Three of the six attribute variables were found to have no significant or approaching significance relationships with any of the four usage variables. These variables were:

- (1) the computer anxiety pretest score;
- (2) the subject's age; and
- (3) the subject's teaching experience.

Thus only the writing apprehension pretest scores, the computer anxiety posttest scores, and the writing apprehension posttest scores were

considered to be statistically related to student network use. All the correlations associated with these three variables were negative in sign, suggesting that in general, lower levels of writing apprehension and computer anxiety were associated with a greater use of telecomputing facilities.

Discussion

Although the study was exploratory in nature, and therefore cause and effect cannot be determined, some interesting implications related to teacher training in telecomputing can be posited from the observed statistical relationships, and used as bases for future research. Perhaps what is most interesting is the contrast between observed relationships of network use with computer anxiety pretest and posttest scores. No significant relationship was found between computer anxiety pretest scores and any of the usage variables, suggesting that for this group of teachers, a student's initial level of computer anxiety had no relationship to their eventual use of telecomputing resources. It should be noted, however, that this finding was in direct opposition to one aspect of the results of another recent study with a similar sample size (37 subjects), in which computer anxiety levels measured with a different scale did, in fact, significantly predict subsequent numbers of electronic interactions (Hartman et al, 1991). Additional research with larger respondent samples and identical instruments is necessary to determine whether computer anxiety scores can reliably predict eventual telecomputing usage patterns.

Interestingly, there was a significant relationship calculated between student use of network resources and computer anxiety posttest scores. The negative correlation observed suggests that greater network use was associated with lower computer anxiety. Such a relationship implies that use of electronic mail, computer conferencing, and online database facilities may help to lower student computer anxiety. Later studies will need to incorporate a control group which does not use telecommunications tools to determine if there is indeed a cause and effect relationship. This study suggests that the potential of a such a relationship exists. Perhaps a beneficial outcome to using telecomputing tools with students is their increased comfort with general computer use.

Writing apprehension, in contrast to computer anxiety, was primarily related to network use through the pretest writing apprehension score. The negative correlations observed with this variable suggest that higher levels of writing apprehension were associated with lesser login frequency. Such a result implies that students' initial writing apprehensions may work to hinder their use of network resources, although a study using a control group would be needed to determine this for certain. To encourage active network use, an instructor may want to address any initial student

WRITING APPREHENSION AND COMPUTER ANXIETY

apprehensions related to the writing process before introducing telecomputing tools. Although Daly & Miller (1975a) called for research into reducing writing apprehension with behavior therapies such as systematic desensitization and/or counseling when the WAT was first released, no published evidence of systematic study in these areas was found. Although the writing apprehension posttest score was not significantly related to network usage, two correlations did approach significance. Such a result suggests that there may be some potential benefits in using telecommunications tools in dealing with general student writing apprehension. This may be a worthy area for further investigation.

There were not enough subjects of both genders participating in this study (16 female, 4 male) to statistically determine whether writing apprehension, computer anxiety, and/or network usage were significantly correlated with gender. Considering the results of a recent meta-analysis of 81 empirical studies in which computer anxiety was not judged to be significantly correlated with sex (Rosen & Maguire, 1990), further investigation of this particular question may prove to be interesting, but is probably not a priority at this time.

It was particularly encouraging to find that there was not a significant relationship observed between pretest or posttest computer anxiety and writing apprehension levels (pretests: $- .2467$, $p < 0.260$; posttests: $-.3226$, $p < 0.160$). This evidence would support the conjecture that computer anxiety and writing apprehension are indeed separate constructs within the study, and were not simply indications of student state or trait anxiety. This implies corroboration with at least two other studies in which computer anxiety was related to state and trait anxiety, but with very low predictive validity (Rosen, Sears & Weil, 1987; Kernan & Howard, 1990). It is also interesting to note that neither subject age nor amount of teaching experience were found to be significantly correlated with network use, implying that teacher age and teaching experience could be minor concerns when planning K-12 telecomputing infusion.

The results of this pilot study of user attributes' relationships to novice network login frequency suggest, in our opinion, that future research should focus upon anxiety level outcomes of computer-mediated telecommunications, rather than upon usage predictions. If it can be established that use of telecomputing tools does indeed cause significant change in either/both computer anxiety and/or writing apprehension, methods and contexts with/within which these changes occur should be empirically explored and shared.

Predictions based upon current statistics indicate that telecomputing in teacher education is here to stay (Clement & Grundner, 1991; Hunter, 1991; Itzkan, 1991). Eventual use of network resources for a majority of computer-using teachers and teacher educators is not a matter of choice; it is a matter of imminence. We must now concentrate upon how best to assist

JUDITH HARRIS & NEAL GRANDGENETT

novice telecommunicating teachers in their networking exploits. Such research should begin with study of the users themselves.

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WRITING APPREHENSION AND COMPUTER ANXIETY

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