DOCUMENT RESUME

ED 423 830 IR 019 051

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TITLE Computer Conferencing and Multiple Intelligences: Effects on Expository Writing.
PUB DATE 1998-02-00
NOTE 7p.; In: Proceedings of Selected Research and Development Presentations at the National Convention of the Association for Educational Communications and Technology (AECT) Sponsored by the Research and Theory Division (20th, St. Louis, MO, February 18-22, 1998); see IR 019 040.
PUB TYPE Reports - Research (143) -- Speeches/Meeting Papers (150)
EDRS PRICE MF01/PC01 Plus Postage.
DESCRIPTORS Aptitude Treatment Interaction; Cognitive Style; *Computer Mediated Communication; Computer Uses in Education; Correlation; Educational Technology; Essays; *Expository Writing; Higher Education; Instructional Design; *Intelligence Differences; *Learning Modalities; *Multiple Intelligences; Student Characteristics; Tables (Data); *Teleconferencing; Undergraduate Students
IDENTIFIERS Face to Face Communication

ABSTRACT

The purpose of this study was to examine the differential effects of computer conferencing on expository writing for undergraduate students (n=109) of seven intelligence types (linguistic, logical/mathematical, spatial, bodily/kinesthetic, musical, interpersonal, and intrapersonal). Students were assigned to four treatment groups that provided controlled exposure to a writing-prompt: i.e., unstructured exposure, computer conferencing, face-to-face discussion, and computer conferencing combined with face-to-face discussion. Following treatment, all students wrote an essay on the writing-prompt. MANOVA (multivariate analysis of variance) indicated that participation in computer conferencing did not significantly improve scores on essays. However, some interactions between treatments and intelligence type were significant. Results indicated that intelligence type is an important instructional variable when implementing computer conferencing. Four tables present data on: activity in computer conferences by groups; mean scores on multiple intelligence inventory by groups; scores on content, organization, and composition by groups; and MANOVA of scores on content, organization, and overall composition by multiple intelligence. (Author/DLS)

Computer Conferencing and Multiple Intelligences: Effects on Expository Writing

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Abstract

The purpose of this study was to examine the differential effects of computer conferencing on expository writing for students (n = 109) of seven intelligence types. Students were assigned to four treatment groups that provided controlled exposure to a writing-prompt: unstructured exposure, computer conferencing, face-to-face discussion, and computer conferencing combined with face-to-face discussion. Following treatment all students wrote an essay on the writing-prompt. MANOVA indicated that participation in computer conferences did not significantly improve scores on essays. However some interactions between treatments and intelligence type were significant. Results indicate that intelligence type is an important instructional variable when implementing computer conferences.

Background

The application of computer conferencing as a teaching/learning tool is increasing dramatically as more educational institutions gain access to the Internet. Several researchers have found that computer conferencing (CC) can be a powerful force for facilitating discussion and for encouraging writing (Kiesler, Siegel, & McGuire, 1984; Rafaeli & Sudweeks, 1996; Tagg & Dickinson, 1995). Research on computer conferencing has been based largely on analysis of conference transcripts and results of attitude surveys. For instance, in one study discourse analysis revealed that CC contributed to preservice teaching apprenticeship and learning of educational psychology by providing for positive communication during early field experiences: "students were heavily involved in electronic learning....and teachers electronically scaffolded or apprenticed learning ...without giving away answers" (Bonk, Malikowski, Angeli, & East, 1997). There has been, however, little investigation of external outcomes of computer conferencing. In this study we investigated the effects of CC on expository writing beyond the CC.

The researchers' assumptions about the postitive effects of CC on learning as reflected in expository writing were based upon constructivist learning theory which indicates that providing learners with opportunities for written reflection, interaction, shared perspectives, and mentorship each contribute positively to knowledge construction (Driscoll, 1994). In CC participants grapple with their ideas and think through their entries before carefully constructing messages and replies to others' messages. They read each others' ideas and responses to their entries. On-line dialog that results provides students with the opportunity to test and refine their understandings in an ongoing process.

Multiple Intelligences

In addition to investigating the comparative effects of face-to-face (f-f) discussion, CC, and a combination of CC and f-f discussion, we included a second facet to our study: investigation of the interactive effects of CC and multiple intelligences on student learning. In a similar study, Brenner and Hill (1997) explored the comparative effects of asynchronous distance learning on acheivement for field dependent versus field independent learners and found no interaction. However, the theory of multiple intelligences indicates that students' individual intelligence types must be addressed through varied strategies (Gardner, 1993). Therefore, multiple intelligences have become important variables to instructional designers and have implications for the use of CC for learning. The seven intelligences identified by Gardner are-- linguistic, logical/mathematical, spatial, bodily/kinesthetic, musical, interpersonal, and intrapersonal. Interactions between type of intelligence and instructional media applications need to be identified so that alternative teaching strategies can be applied to learners according to their type(s) of intelligence. Because CC provides for linguistic, interpersonal learning we expected learners of different intelligences to be differentially effected by CC.

Research Questions

In this study researchers investigated the effects of CC on student expository writing. We asked whether or not students learned from their on-line discussions, above and beyond f-f discussions. Specifically-- 1) did students who participated in a computer conference on a particular topic write better essays on that topic than students who did not participate in a computer conference on that topic, and 2) did students who participated in the combination of a f-f discussion and a computer conference on a particular topic write better essays on that topic than students who did not participate in a computer conference and f-f discussion on that topic? In addition we asked, 3) did computer conferences differentially affect writing for students of different intelligence types. We also attempted to identify process variables that contributed to effective on-line and f-f discussions.

Based upon constructivist theory we expected CCs and f-f discussion to positively affect writing above and beyond the effects of unstructured study or f-f discussion alone. In addition, multiple intelligence theory connoted that unstructured study time, CC, and f-f discussion would have differential effects on learning as reflected in expository writing. Specifically, we expected that students with linguistic, logico-mathematical, spatial, and interpersonal intelligence types would be positively effected by CC while students with musical, bodily-kinesthetic, and intrapersonal intelligence types would be unaffected or negatively affected by CC. We made these hypotheses because CC is a print-based, linguistic, writing activity that involves collaborative construction of meaning.

Methods

Ninety-nine undergraduate students enrolled in an introductory educational technology course in spring 1997 at Texas A&M University were divided into four, 11 day CCs in which they discussed different topics on educational technology. They used FirstClass™ software to conduct CCs which were moderated by the instructor who also led classes in their f-f discussions of the topics.

The moderator's role in both CCs and F-F discussions was to provide structure, keep students on topic, and weave threads of the discussion (Berge, 1995; Eastmond, 1992).The CC structure was such that the instructor entered the questions in FirstClass for the writing-prompt for the CC group and CC/F-F groups. With the exception of brief comments from the moderator and weaving in each of the groups, students had free reign to discuss what ever topics emerged. The moderator attempted to control for extended tangential discussions by creating new folders for those discussions.

The CCs in this study involved reading a discussion topic that was entered by the instructor, entering a response to that topic in the CC, reading other's responses, and replying to those responses. In contrast to experiences in face-to-face (f-f), participants had opportunities to reflect upon their ideas. As a result, responses were likely to be less spontaneous and more deliberate than in f-f discussion. They were also likely to demonstrate deeper understanding and be more clearly stated.

Study Design

In this study we used quantitative and qualitative methods to answer the research questions. A "Posttest-Only Control Group Design" with four treatment groups was used to explore the comparative effectiveness of unstructured study time (control group), f-f discussion only, CC discussion only, and both f-f and CC discussion. Participants were not randomly assigned to groups. Instead they received treatment within their lab sections. The writing-prompt discussion topic was-- What impact might the combination of instructional design, media, and computing have on learning? A placebo discussion topic was used in CCs and f-f discussions for treatments that did not include CC or f-f discussion of the writing-prompt. The placebo writing-prompt was-- What classroom management strategies might you use for integrating technology in the curriculum?

Students were assigned to four treatment groups:

1) Control Received no exposure to the writing-prompt discussion topic via CC or f-f discussion. However, they did receive exposure to the writing-prompt discussion topic through readings, lecture, assignments, and unstructured study time.

2) F-F Participated in a 20 minute f-f discussion on the writing-prompt discussion topic and received exposure to the writing-prompt discussion topic through readings, lecture, and assignments.

3) CC Participated in a discussion of the writing-prompt in a moderated 11 day computer conference and received exposure to the writing-prompt discussion topic through readings, lecture, and assignments.

4) F-F/CC Participated in a discussion of the writing-prompt topic in a moderated 11 day computer conference, participated in a 20 minute class discussion on the writing-prompt discussion topic, and received exposure to the discussion topic through readings, lecture, and assignments.

Data Sources

The data sources included contents of CCs, the essay scores, and multiple intelligences inventories. Average number of entries and sittings to make entries were determined for each treatment group. Scores on essays written about the writing-prompt following treatment were determined using the instrument, The Composition Profile (Hughey, J.B. & Wormuth, D.R. 1985, r=.98). The dependent variables were scores on the quality of the contents, organization, and overall composition of essays on the writing-prompt discussion topic. Students' essays were scored independently by three readers trained in the use of the instrument. Face, content, and construct validity have been established for the instrument.

We established rater reliability for the essays by having two readers assess each paper according to content, organization, and composition score (a composite of content and organization). We assessed the reliability using Pearson Product Moment formula. Reader reliability was .92 for content, .78 for organization, and .91 for composition with a 7% discrepency rate.

The self-report Multiple Intelligences Inventory (MII) was administered and participants' types of intelligences were identified through scoring this instrument (Armstrong, 1993). Students were classified as having one of the seven intelligences if they selected six or more of the ten possible behaviors used to describe each intelligence.

Results

The CCs contained 344 messages from participants and 24 moderator messages. Participants and moderators differed in their degree of participation in the CC across groups. The group that computer conferenced without a f-f discussion on the writing prompt participated slightly more than the other groups. The moderator appears to have been most active in the CC & F-F group making nine entries in eight sittings (see Table 1).

Table 1. Activity in Computer Conferences by Groups

Participants	N	# of entries/ ave. # per person	# of sittings/ ave. per person	Mod. entries	Mod. sittings	Nonparticipation in CC
Control	17	66/4	54/3	3	3	1
F-F	28	75/3	63/2	6	6	1
CC	28	115/4	93/3	6	6	0
CC & F-F	26	88/3	65/4	9	8	2

Although participants were not assigned to groups according to their types of intelligence, the types dispersed across groups fairly evenly. However, the control group is the only group with strength in linguistic intelligence and they are stronger overall in the intelligences. Table 2 shows that the control group had linguistic, spatial, bodily-kinesthitic, musical, and interpersonal intelligences. The other three treatment groups had bodily-kinesthitic, musical, and interpersonal intelligences.

Table 2. Mean Scores on Multiple Intelligence Inventory by Groups

MI	Control		F-F		CC		CC&F-F	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD
L	5.8	2.2	4.1	1.9	4.5	2.4	4.7	2.2
LM	3.9	2.6	4.4	2.8	4.1	3.2	4.2	2.0
S	5.5	2.5	4.6	2.2	5.4	2.1	4.5	1.8
BK	5.6	2.9	5.8	1.9	5.9	2.2	5.7	2.4
M	6.7	2.9	5.5	2.8	7.0	2.4	6.0	2.4
TER	6.1	2.6	5.6	2.4	6.1	2.3	5.5	2.4
TRA	4.9	2.2	3.9	1.5	4.5	2.0	4.6	2.0
Total	38.5		33.9		37.5		35.2	

A MANOVA was used to determine if differences between treatment groups existed and if the treatments interacted with intelligence types. Follow-up correlations indicated how treatments interacted with intelligence types. The independent variables of treatment group and intelligence type were tested across the three dependent variables: content of essay, organization of essay, and overall composition of essay. Treatment groups did not differ significantly on expository writing. Students who discussed the writing-prompt in their CC and/or f-f discussion did not perform significantly better on the three measures than those who did not discuss the writing-prompt in a CC and/or f-f discussion (see Table 3).

Table 3. Scores on Content, Organization, and Composition by Groups

GR	N	Mean Content	SD Content	Mean Organization	SD Organization	Mean Comp.	SD Comp.
Control	17	21.32	4.03	14.85	2.78	36.18	6.55
F-F	28	20.08	3.93	13.67	2.42	33.78	6.11
CC	28	21.75	3.70	14.93	1.95	36.68	5.15
CC&F-F	26	22.71	3.92	15.17	2.55	37.88	6.18

Computer conferences and f-f discussions differentially affected learning for students with different intelligence types. Students with interpersonal intelligence who participated in f-f discussions but did not computer conference on the writing-prompt benefited from such treatment. They out performed other students in writing content, organization, and overall composition. Students with intrapersonal intelligence were negatively affected by CC and f-f discussion on both writing content and overall composition. However, CC alone and f-f alone did not

negatively affect intrapersonal intelligence types' writing. Students with bodily-kinesthetic intelligence were negatively affected on overall composition by CC without f-f discussion (see Table 4).

Given the control group's linguistic and spatial intelligence we would expect them to perform well on an essay. Differences between groups' intelligences may provide an explanation for the lack of difference between the control group and the other groups, particularly the CC & f-f group. Much to our surprise, students with linguistic intelligence appear to be unaffected by the treatment. We can hypothesize that the control group did well on their content, organization and overall composition because of their strong multiple intelligence and because they were less needy of CC and f-f discussion to support their learning of the writing prompt during unstructured study time.

Table 4. Multivariate Analysis of Variance of Scores on Content, Organization, and Overall Composition by Multiple Intellegence

Source	Variable	SS	df	MS	F	Sig.
Group(GP)	Content	96.00	3	32.00	2.12	.102
	Organization	36.35	3	12.11	2.10	.105
	Composition	244.54	3	81.51	2.29	.082
GP*L	Content	26.20	4	6.55	.52	.716
	Organization	32.22	4	8.05	1.62	.177
	Compostition	83.53	4	20.88	.727	.577
GP*LM	Content	54.55	4	13.63	1.09	.365
	Organization	17.05	4	4.26	.86	.492
	Compostition	118.7	4	29.6	1.03	.396
GP*S	Content	88.02	4	22.00	1.77	.144
	Organization	15.01	4	3.75	.758	.556
	Compostition	170.91	4	42.73	1.48	.216
GP*BK	Content	123.23	4	30.80	2.48	.052
	Organization	45.45	4	11.36	2.29	.068
	Compostition	308.17	4	77.04	2.68	.039*
GP*M	Content	92.01	4	23.00	1.85	.129
	Organization	34.92	4	8.73	1.76	.146
	Compostition	223.99	4	55.99	1.94	.112
GP*TER	Content	126.93	4	31.73	2.55	.046*
	Organization	61.61	4	15.40	3.10	.021*
	Compostition	351.82	4	87.95	3.06	.022*
GP*TRA	Content	144.31	4	36.07	2.90	.028*
	Organization	44.35	4	11.08	2.23	.074
	Compostition	333.63	4	83.40	2.90	.028*

*$p > .05$

L=Linguistic, LM=Logical/Mathematical, S=Spatial, BK=Bodily Kinesthetic, M=Musical, TER=Interpersonal, TRA=Intrapersonal

Another possible explanation for the lack of effects of CC is that the writing prompt may have been too easy for participants to address during unstructured study of the text and lecture notes. A follow-up study using a writing prompt on a topic that no participants have had exposure to might provide better understanding of the effects of CC on writing.

Educational Significance and Implications

Evidence from this study indicates that CCs do not affect expository writing about a specific writing prompt above and beyond f-f discussions or unstructured study. While the writing prompt did not appear to be learned through CC and/or f-f discussion, except for for interpersonal learners, we still value CC as a facilitator of collaborative learning. Students used the medium to address topics of interest to them and collaboratively constructed meaning about topics of their choice. We had a specific objective in mind for learning in the CC. Students took tangents from this objective as they discussed content of special interest to them. Collaborative, social learning environments such as CC may not provide an atmosphere for learning specific objectives.

Therefore, a follow-up study involving content analysis would be appropriate for identifying what was learned in these CCs. In addition, findings indicate that computer conferences might negatively affect writing about a specific writing prompt for students with different types of intelligence. Specifically, CC may interfere with bodily-kinesthetic and intrapersonal learners' abilities to write about a specified topic. Alternative media should be considered. These findings call for future investigation into specific facilitative strategies that might be employed within CCs in order to attain specific objectives and reach different types of learners.

This study expands the research base related to the impact of CC on student performance. We determined that intelligence types and CC interact to create a differential effect. Such findings speak to instructional designers regarding strategies for individualized instruction.

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