What are we talking about?
The Impact of Computer-mediated Communication on Student Learning

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Abstract: Previous research on delivery modes in distance education and their correlation to student achievement outcomes has shown that students learn better via computer-based communication than face-to-face instruction. One explanation for this phenomenon is that the students must take more responsibility for, and be more active in, the learning process. This study looks at how the media used in one aspect of distance education, on-line discussion, can affect the learning outcomes for students involved in distance learning activities. On-line discussion within any learning environment can provide the opportunity for students to engage in thoughtful, content-based conversations about the topic under study, which may result in deeper understanding and greater learning gains. A content analysis of student discussion in listserv-based (electronic-mail) discussion, web-based threaded discussion, and chat discussion will be presented.

Introduction

In the world of distance education, one of the most important elements of a quality is course is that students are able to interact with the instructor and other students as they would in a traditional classroom, and, given the computer-based medium of distance education, this is done through computer-mediation communication. This goal can be met through a variety of methods, using e-mail based discussion groups (or Listserv discussion groups), web-based discussion threads, and chat rooms. Each of these methods has advantages and disadvantages, and may or may not fit with the instructional objectives of the course. In a 1986 study, Hiltz found that the use of electronic discussions not only could offer new educational options, but in some case could be *more* effective than the traditional classroom. Phillips and Santoro found that computer-mediated communication could offer students greater coherence, empower students to improve their communication skills, and enable students to engage in problem-solving activities. McComb found that computer-mediated communication can create a unique environment for discussion that avoids many of the conversational limitations posed by face-to-face communication.

The most common type of computer-mediated communication in higher education today is the use of the electronic mail-based discussion group, or Listserv. An electronic mail-based discussion group allows instructors and students to send e-mail to one another simply by entering one e-mail address in the "TO:" line of an e-mail message. Messages sent to the group may be moderated by the instructor of the course, or may be automatically sent to all members of the group. From a technical perspective, the advantage of e-mail based discussion is that students are sent the messages directly without having to remember to log-on to the internet and to check out the discussion. A common disadvantage is that when the student loses a note, or accidentally erases a note, then there is no record of what he or she has said. Also, an e-mail-based discussion group has the potential to "flood" the inbox of the student with an overwhelming amount of e-mail.

Web-based discussion, or threaded discussions, work similarly to the idea of Bulletin Board Systems (or BBS). The student posts a message to the bulletin board at a specific web-address, and others respond or reply to the message when they log-in to check the board. The advantage of web-based discussion is that one can see

exactly how the discussion or conversation has progressed. As with an e-mail discussion group, one can reply to a message at anytime, but it might be difficult to track the specific message that encouraged the student to respond. With threaded discussion, one can "see" exactly how the discussion progresses, with sub-headings of replies and main headings of new threads. A disadvantage is that the student might not remember to log-in and check the messages frequently (although some discussion groups do send out e-mail reminders when a new message is posted to the discussion board).

Chat-based discussions are synchronous, text-based discussions. All users must be logged in to the same chat session at the same time. The most obvious difference between this form of computer-mediated discussion and the other forms presented here is that all the users are logged on and talking at the same time. This may offer a more "natural" discussion to take place, with real-time interaction taking place. A disadvantage to chat-based discussion is that there is most often no documentation of what was said, and the pace of chat discussion with more than 10 students (where it seems everyone types at once) can be too overwhelming for most individuals.

Method

For the purposes of this study, all three types of computer-mediated discussions -- e-mail-based, web-based, and chat-based -- were used across two sections of an introductory education technology. Three main research questions guided the study:

1. What type of discussion takes place in each setting?
2. How much discussion takes place in each setting?
3. What is the quality of the discussions in each setting?

The computer course, entitled *Uses of Technology in Education*, utilizes hands-on instruction for the integration of computer-based technology in education settings. The course is taught in a computer lab at American University. Two sections were offered, in which a total of 42 undergraduate and graduate students were enrolled. Although the course is listed as a requirement for education majors, approximately 15% of the students enrolled in the course were non-education majors.

Findings

A total of 279 statements were posted during the spring 1998 semester. 108 of those postings were submitted via a an e-mail discussion group. 110 postings to the web-based discussion occurred, and 61 statements were made in the chat format. Participation varied among the different types of discussion formats. Each posting to the discussion forums were cataloged and evaluated at the end of the spring 1998 semester. Postings were then evaluated using content analysis with respect to each of the research questions listed above. Each posting to the discussion forums were cataloged and evaluated at the end of the spring 1998 semester.

Figure one illustrates the type and number of statements made in each type of computer-mediation communication. The first bar in each set represents procedural statements, such as questions about when and assignment is due or where the class might be meeting. The second bar represents content-related statements, those statements directly related to the course content. represents content-related statements, those statements directly related to the course content.

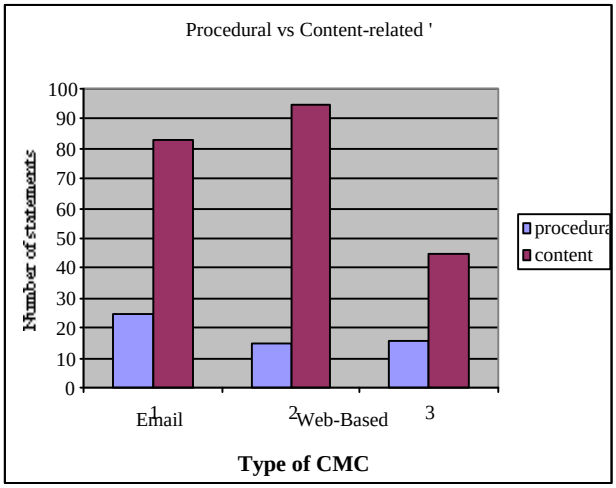

Figure 1: Number of procedural or content related statements in each discussion format

Figure two illustrates the number of statements or posting by the instructor or by the students in each type of Computer-mediation communication. The first bar in each set represents instructor statements, the second bar illustrates student statements.

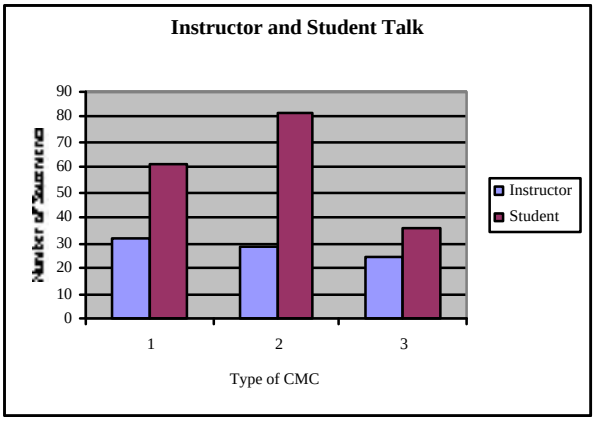

Figure 2: Instructor and student talk in each type of Computer-mediation communication

In the e-mail and web-based discussion formats, students were more likely to post statements that were at least four sentences in length. In the chat-based discussion, most statements were about one sentence in length. In addition, in e-mail and web-based discussion, students were more likely to provide quotes from the textbook, cite example problems, or provide links to other resources. In the chat-based discussions, students were less likely to post this type of connection to outside readings or the textbook. In the email and web-based discussion formats, students were also more likely to make direct reference to another student's statements or comments.

In a follow up survey conducted at the end of the semester to assess the effectiveness of the discussions in terms of their understanding and perceptions of the course content, students were asked what they found most valuable about the discussion forums. Some sample responses (from both classes) were:

- "I became aware of different points of views. In addition, sometimes I didn't have any idea on the subject so discussions were a good start for me!"
- "I got a chance to hear many different perspectives on important issues."
- "It provided the chance to do research on the web and share others perspectives."
- "I enjoyed reading people's responses because it helped me to understand the concepts and the questions in the homework."

- "I was able to see aspects of a concept I might not have thought about when answering a question."
- "That people are interested in the class and therefore interested in giving their opinions about the topics discussed."
- "I found that others have the same questions as I. I found that looking at other responses helped me to answer the question I had because there were often more than one answer or way to solve the problem."

On the survey, 85% of the students who participated in the discussion indicated that the topics discussed changed or influenced their opinions, and 100% indicated that their knowledge of the content improved. In the educational technology course, 72% of the students indicated that they would use a discussion group in their own teaching, for such reasons as:

- "To get my students to actively research a specific issue or topic."
- "To allow students to express their ideas without worry of immediate backlash."
- "To help them learn how to use email!"

The survey included a question that queried students' opinion of the fairness of the assessment in the online discussion. 100% of the students responded that they felt the assessment was fair. Comments to this question included:

- "We were graded according to content and apparent effort."
- "I think it's very hard to assess a tool like this. Assessment was fair."
- "Because you could not just say anything and get away with it. You had to think a refer to a site or reference."

Overall, the results of this survey suggest that students found the on-line discussion beneficial and useful to them. Many students felt that the on-line discussion format should be continued in future classes. However, some of students in the course felt that participation in the discussion should remain voluntary. The most common rationale supporting voluntary participation was that students felt there was already sufficient activities (i.e. homework, labs, folders, etc.) required in the course. Other students simply felt that students should be allowed to choose whether or not they want to participate in the discussions. In addition, students felt that there were benefits to active as well as passive participants on the list.

Conclusions

The findings indicate that computer-mediated discussions can be a valuable component to any traditional technology course. Students were able to actively participate in an activity that allowed them to extend the ideas of the course outside the traditional confines of the classroom. In particular for this educational technology course, students were able to think more deeply about the information presented in class in a different format. The focus of the educational technology course is generally on the technical components of "using computers" and the use of computer-mediated communication allowed students to discuss the implications of content as it relates to real-world applications.

Requiring students to participate in class discussion, be it in person or on-line, can be a formidable task. Most faculty hope that students will participate in class discussions simply because they are interested in the course content, and external reinforcement (such as giving points for attendance) can interfere with students internal motivation for participating in class. However, using a rubric can serve as a guide to help students structure their comments, and often can help facilitate discussions that are grounded in research and practice. In the online environment, students have a greater amount of time to prepare their comments, and using a rubric can assist them in preparing and reflecting on what they are going to say.

Web-based and Listserv discussion seem to generate much more thought and deeper consideration than either face-to-face or chat. During the early phase of chat, a lot of time is used up on procedure. In the first chat session of the semester, it can take more than an hour for students to stop focusing on the medium. In a two hour class period, only in the last 45 minutes is there any real discussion. In chat, much as in face-to-face discussions, students did not give much consideration to the views of others. They simply used them as cues to propound their own beliefs. There was more talking, but we did not notice more listening.

A much larger portion of the class did participate during chat. Even those who never speak in class could eventually be prodded into participating. Participation has been at 100% in web-based discussion. It was fairly

close to that during chat. In face-to-face discussion in class, it can be more often in the 50-60% range. The ability to send private message during the chat discussion can prompt shy students into participating. One would not have had the same opportunity for private, personal contact in a classroom. In all but face-to-face, the instructor loses most of their ability to guide the discussion. The chance to ask further probing questions diminishes.

Technology, such as on-line discussions, must be carefully evaluated before being implemented into any curriculum. As with other types of technologies, from video simulations to computer-based tutorials, the instructor must be comfortable with not only the medium, but also the message sent through the medium to the students. In an on-line discussion format, the instructor must carefully monitor students' statements about concepts and redirect them as necessary. Monitoring the discussions requires time and commitment on the part of the instructor, as well as a desire to assist the student to come to a deeper understanding of the concept itself. It is our opinion that this is time well spent. As seen with the discussion of weightlessness in the physics example above, the instructor's role is often to not only provide the opportunity for in-depth investigation into a topic, but also to provide constructive feedback as it develops. In this way, the instructor can better integrate electronic discussions to help students come to a deeper and broader understanding of concepts from networking to equity in education.

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