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ABSTRACT

This study provides detailed descriptions, analyses, and interpretations of student interactions and participation that occurred in computer-mediated interactive writing activities in two different college classroom network situations. A freshman composition class focused on the teaching of writing through assigned exercises and incorporated electronic discussions into every other class. A plant science laboratory class used computer-based discussions to amplify what students had learned in interactive computer-based tutorials, simulations, and "traditional" hands-on activities with plant specimens. Both courses used a software program called Daedalus to manage the computer-mediated communication (CMC) activities. Daedalus contains a word processor and various support tools, an electronic mail program, and an interchange program that allows real-time "conversation." Observations and analysis of student computer use show that CMC activities can result in increased and more equal student participation in classroom activities. Students in both classes thought that the network use improved their understanding and problem-solving strategies. (Contains six references.) (SLD)

Student Responses to Network Resources: Formative Evaluation of Two Classes

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Introduction

In many ways the network resources just becoming available on a community scale through the electronic village have already been explored within smaller experimental platforms, such as classes that use computer-mediated communication (CMC). What is the nature of the social environment of these network-based classrooms? This study provides detailed descriptions, analyses, and interpretations of student interactions and participation that occurred in computer-mediated interactive writing activities in two different college classroom network settings: a freshman writing class and a plant science lab. The freshman composition class focused on the teaching of writing through assigned reading and writing exercises and incorporated the electronic discussions into every other class. The plant science lab used the computer-based discussions to put students in a position in which they had to reflect on and verbalize what they had observed and learned earlier in the class session, where they used interactive computer-based tutorials, simulations, and "traditional" hands-on activities with plant specimens. Both courses used a software program called Daedalus™ to manage the CMC activities.

This study documents verbal communications and social interactions that occurred in the CMC environment in both settings. It also includes naturalistic observations of other activities in both cases since the computer-based writing activities were one among several different kinds of communications activities occurring within each class. Both cases include a capstone event which occurred about half-way through the semester. The capstone event was a carefully designed series of in-class activities adapted to each setting which provided multiple data points for analysis.

The specific questions addressed in this study were:

1. What are the characteristics of student interactions and participation in the computer-mediated environment?
2. What kind of impact do CMC interactions have on student learning?
3. How are CMC interactions the same and different in the two settings observed in this study?

Prior Research

Prior observation-based research of school-based learning demonstrates that traditional classroom interactions typically consist of two thirds to three quarters teacher talk and one third student talk (Flanders, 1970; Levin, Kim, & Riel, 1990). Preliminary research on instructional uses of CMC indicates that teacher-led discussions in the computer-mediated environment dramatically change the teacher-student interaction ratio, and that was our experience in these studies. Student interactions dominate the electronic discussions with student-initiated comments occurring 70 to 80 percent of the time, and the ratio of teacher-initiated comments decreasing proportionately (Faigley, 1992). This shift to a student-centered discourse in the CMC environment raises many questions about participation and interaction. If the teacher isn't dominating the discussion who is? What kind of conventions regulate the interactions that occur in the CMC social environment? This study examined the computer-based classroom environment to provide detailed, descriptive information

regarding the nature and quality of the electronic discourse created by students and their teacher through CMC interchanges conducted within the classroom setting.

Context

Both settings used the Daedalus Integrated Writing Environment (Daedalus) application program for the in-class CMC activities. Daedalus is a collection of computer programs that is designed to operate on a computer network and typically is used by a single class within an electronic classroom. In addition to a word processor and various support tools for writing (spell-checker, bibliography, prompted or structured writing templates), it contains a standard e-mail program and an interchange program that allows real-time "chats" between any number of participants during a class period who work on their own computer. The text-based interchanges communicated via computer are each tagged with the name of the sender(s) and displayed as a sequential list of messages in the top section of the interchange window. Once the interchange session is completed, it can be saved as a text file that can be printed, copied onto a disk or electronically distributed. It is Daedalus' interchange capability that was the primary arena for this study because it essentially changes the nature of classroom communication. In addition, the archived interchanges served as the primary data source for this study.

The two classes that were studied used Daedalus interchange in different ways with resultant differences in student response and participation patterns. The freshman writing class alternated its location between a traditional classroom and a computer-interactive classroom (CIC) with 25 networked computers. On the days in the CIC, the class would use Daedalus to discuss assigned readings, and participation in the online discussion was part of a student's grade. The plant science lab, on the other hand, used the interchange as a summary and closure activity for each once-weekly 3-hour class, which met in a traditional laboratory that had been modified to hold 9 computer workstations. In a typical lab, students worked on computer-based multimedia tutorials, simulations, or other programs, but they also spent considerable time dissecting plants or otherwise working with real plant specimens. For the final 45 minutes of each lab session, they would return to the computer and engage in an ungraded Daedalus CMC discussion that required some higher-level reflection on the implications of the lab's topic.

Data Analysis

A variety of data collection procedures and tools were used to address the research questions. The analysis of social interactions in the CMC environment was primarily based on the electronic transcripts of the interchange sessions. However, since the computer-based discussions in both of these settings were conducted within the classroom, field notes from observations of the CMC and other classroom interactions have been used to describe the context in which the interactive writing discussions occurred. Descriptions of the ways in which the electronic transcript data were organized and coded follows.

Quantitative Measures of Participation and Social Integration.

The distribution of participation refers to quantitative comparisons of the messages sent and received. This analysis also considered who messages were directed to and received by within a specific interchange. Increasing student participation and providing interesting topics for students to discuss resulted in lengthy and highly interactive electronic discussions. The message flow analyses and social psychological coding systems described above do not provide a systematic way to measure the impact of individual participant's message(s). Butler (1992) describes three quantifiable measures of individual participation--the participation ratio, participation frequency, and integration ratio.

Description of Coding Systems

(1) Message Act Analysis. The "message act analysis" developed by Levin, Kim, and Riel (1990) is based on a system for classifying instructional speech acts developed by Mehan (1978) to document a common classroom interaction pattern called "IRE sequences"--Initiation by teacher; Reply by student; Evaluation by teacher. The message act analysis provided a useful way to

describe the pattern of teacher-student interactions in the electronic community. This method of analysis was used to interpret the capstone transcripts of student peer and student-teacher interactions in both settings, but it does not describe the emotional quality of the messages or the content and quality of student participation. Since this study focuses on describing how students interact and regulate each other on-line, additional analysis tools were also used to document the social emotional quality of the messages as well as the content and rhetorical strategy of student responses.

(2) Rhetorical Analysis. The rhetorical content coding system used by Butler (1992) was modified from a twelve to ten group system by combining the last four categories into two as follows: (1) Question; (2) Reply; (3) Consensus Building; (4) Evaluation; (5) Topic Initiation; (6) Assertion; (7) Acknowledgment; (8) Off-Task; (9) Qualification/Definition; and (10) Clarification/Elaboration. This analysis showed that most of the comments by students were assertions and clarifications, but some "consensus building" comments were also exchanged which are of particular interest in this study. This system describes the nature of the content of the interchange.

(3) Bales Interaction Analyses Scale. The Bales Interaction Analyses Scale (Bales, 1976) provided a coding system which was used to identify and compare the positive, negative, or neutral quality of social mediations evidenced in the text transcript. In analysis of the interchange transcripts, the Bales system for categorizing interchange transcripts provided fairly adaptable categories for coding the text messages which accounted for the social-emotional quality of the message. This scale was primarily used to distinguish positive reactions, attempted answers, questions/new topic initiations, and negative reactions.

The Capstone Activity

The "capstone activity" is a somewhat artificial event which fits into the normal curriculum and activities of the class, but which also provides a way for getting a matrix of measurable comparable data within one class period. It can be described as a Daedalus activity with the following characteristics:

- Occurs far enough into the semester that the students and their teacher have become familiar with the Daedalus interface and can open, use, and manipulate this program with minimal assistance.
- Consists of a pre- and post-discussion individual rating activity with numeric data to compare how students are influenced by the on-line discussion.
- Includes a Daedalus interchange discussion in which all students participate.
- Addresses one or more of the content objectives of the course .
- Asks students to comment on their experiences with the Daedalus interchange activities in a written questionnaire.
- Gives back information to students regarding their participation in the "capstone activity" from which students are again asked to share their reactions to the capstone discussions and the rating scores.

Summary of Findings and Implications

CMC offers a medium for interacting which is somewhat like writing and somewhat like talking. Having characteristics of both of these channels, it can offer an effective new format for modeling higher levels of learning within a social context which may enhance participation, interaction and learning.

The observations and analysis from these two settings show that carefully constructed CMC activities can result in increased and more equal student participation. Students in both cases reported that their understanding improved by being able to read responses composed by their peers. As an active participant in the discussion, the teacher was the most influential participant and, as the plant science lab in particular shows, students can learn to model and adapt the problem

solving strategies of their instructor when it is portrayed for them in an on-line setting. However, student responses dominated the computer-mediated discussions, and the students took on more responsibility for the outcomes of the on-line interchanges by sending more reactive and supportive comments as well as more elaborations and initiations to the messages by their peers. This is documented in the comparison of interchanges created from the beginning to the end of the semester. While the teacher has a strong influence on the CMC discussions, the status of the teacher and of the frequent student participants in the face-to-face class setting is reduced. On the other hand, The CMC discussions are regulated by social conventions which are imposed or which evolve from the initial and continued use within each setting. The conventions for participation and interaction in the CMC environment did not mirror the face-to-face conventions in either class.

Finally, the analysis of electronic interchanges revealed that student participation and interaction in the computer-mediated environment differed from the traditional, face-to-face setting in both cases in the following ways: (1) increased student participation; (2) increased student-to-student interactions; (3) students initiated more socially regulating comments to each other in the computer-mediated communication (CMC); (4) students responded to the CMC environment with varied timing in their responses and with variable styles of adapting to the sense of anonymity associated with the solely text-based communications. The social conventions for participation and interaction in the CMC interactive writing activities were influenced by the computer interface and limited bandwidth of the media, the instructor's behavior as exhibited in the CMC discussions, the nature of the topic being discussed, and comments by their other students.

The CMC activities conducted as part of the capstone were found to have a noticeable impact on student learning in the following ways: (1) students reported increased understanding of computers; (2) the instructors in both settings reported that student on-line behavior showed that students were taking more responsibility for the interchanges; (3) students reported that they were less hesitant to share their ideas and that their understanding of the content material increased by being able to read the responses of their peers.

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