Network-Based Classrooms

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Computer-mediated communication is an increasingly familiar part of the educational experiences of students from elementary school through graduate school. This is not surprising, because electronic mail, bulletin boards, gopher servers, and other forms of telecommunication offer conveniences and exciting new possibilities for learning. The rapid expansion of the Internet, the availability of low-cost modems and high-speed data lines, and a growing awareness of the educational possibilities are leading to major changes in classrooms (Bruce, 1991; Bruce & Rubin, 1993; Hawisher & LeBlanc, 1992; Hunter, 1992; Roberts, Blakeslee, Brown, & Lenk, 1990; Thompson, 1990).

In contrast to ordinary, face-to-face communication within the classroom, computer-mediated communication offers three principal advantages: The first of these is telecommunicating. Students may communicate with each other and the teacher without being present in the same physical space. For example, children throughout the world may share their experiences with each other (Cohen & Miyake, 1986). Or, graduate students who commute for a weekly seminar may continue interacting, even though they are far removed from each other during the rest of the week.

A second advantage is asynchronous (non-real-time) communicating. Communication can take place with participants writing at different times. For example, a teacher can respond at one convenient time to messages written by students throughout the day. People in different time zones can work together more easily.

A third advantage is support for reflective communicating. Both teachers and students have the time for more considered and elaborated responses. Scollon (1983) has suggested that this feature may be especially advantageous for students whose cultural and linguistic backgrounds include communication patterns different from those of the school.

Ordinary postal mail offers these three advantages, too, but it far too slow for most educational purposes. Thus, it does not allow the back and forth interchanges that we see with computer-mediated communication. Moreover, it is difficult and expensive to write to many people at once, as can be done easily with electronic mail. A telephone is another form of telecommunication, but it is synchronous, and thus does not offer advantages #2 and #3.

Having discovered the advantages of telecommunicating, asynchronous-communicating, and reflective communicating, teachers and students have naturally embraced the new communications technologies. Articles and courses on electronic mail often explain its usefulness in terms of these features.

It does come as a surprise, then, to discover that another form of computer-mediated communication, one which supports communicating within a classroom, rather

than telecommunicating; which is synchronous, rather than asynchronous; and which seems anything but reflective, is being widely adopted and used enthusiastically. This alternate form of computer-mediated communication is called local-area, synchronous (or real-time) communication; the classrooms that use it are called network-based classrooms (Bruce, Peyton, & Batson, 1993).

What is a Network-Based Classroom?

A network-based classroom looks like a computer lab, with each student sitting in front of a computer. The computers are connected through a local-area network to the server on the teacher's desk. That part is true of many ordinary computer labs. What turns the lab into a network-based classroom is the use of communications software that supports synchronous, written conversation. Various software packages support this, including CB Utility, Realtime Writer, Daedalus Interchange, and Carnegie Mellon's CECE Talk (Neuwirth, Palmquist, & Gillespie, 1988). Chat programs, such as Internet Relay Chat (Krol, 1993, p. 258), are examples of the same basic idea.

In the classroom, students and the teacher simultaneously compose messages in a real-time, written conversation. Each user sees the message she is composing in a private window at the bottom of her own computer screen. When she completes the message, she can transmit it immediately to all the others in the class. As messages are sent, they scroll up the screen in a continuous dialogue. Each message, or conversational turn, is tagged with the name of the sender, as in the script for a play.

Discussions occur on different network channels. This means that the teacher can organize a whole class discussion or divide the class into small groups, or even pairs, for more focused dialogue. The teacher can view the writing of an individual student or of a group of students on a channel. The computer stores the entire discussion, so that it can be reviewed during the class session or printed out for later use.

As an example, Figure 1 shows a screen that appeared on the teacher's monitor during a discussion in a class at Gallaudet University. The bottom window shows the teacher's draft message ("It is not explained in the text..."), which is private until he decides to send it to the class. If he wishes, he may edit the message before sending it, but the fast pace of the conversation usually discourages pondering over the text. The upper window, which is the same on all screens in the class, shows teacher and student messages interspersed as they have been produced over the last minute or two of discussion.

In this example, the students are basic writers who have misspellings and other evident difficulties in composing messages. But more notable is the fact that they have the opportunity to stretch their ability to write in a conversational context. Note the multiple threads of discourse, and how the teacher tries to respond to each student's concerns. This is a familiar pattern in network conversations, but it is far from universal. In other classrooms the teacher may assume a more directive role, may participate more as a peer, or may be entirely absent from the discussion.
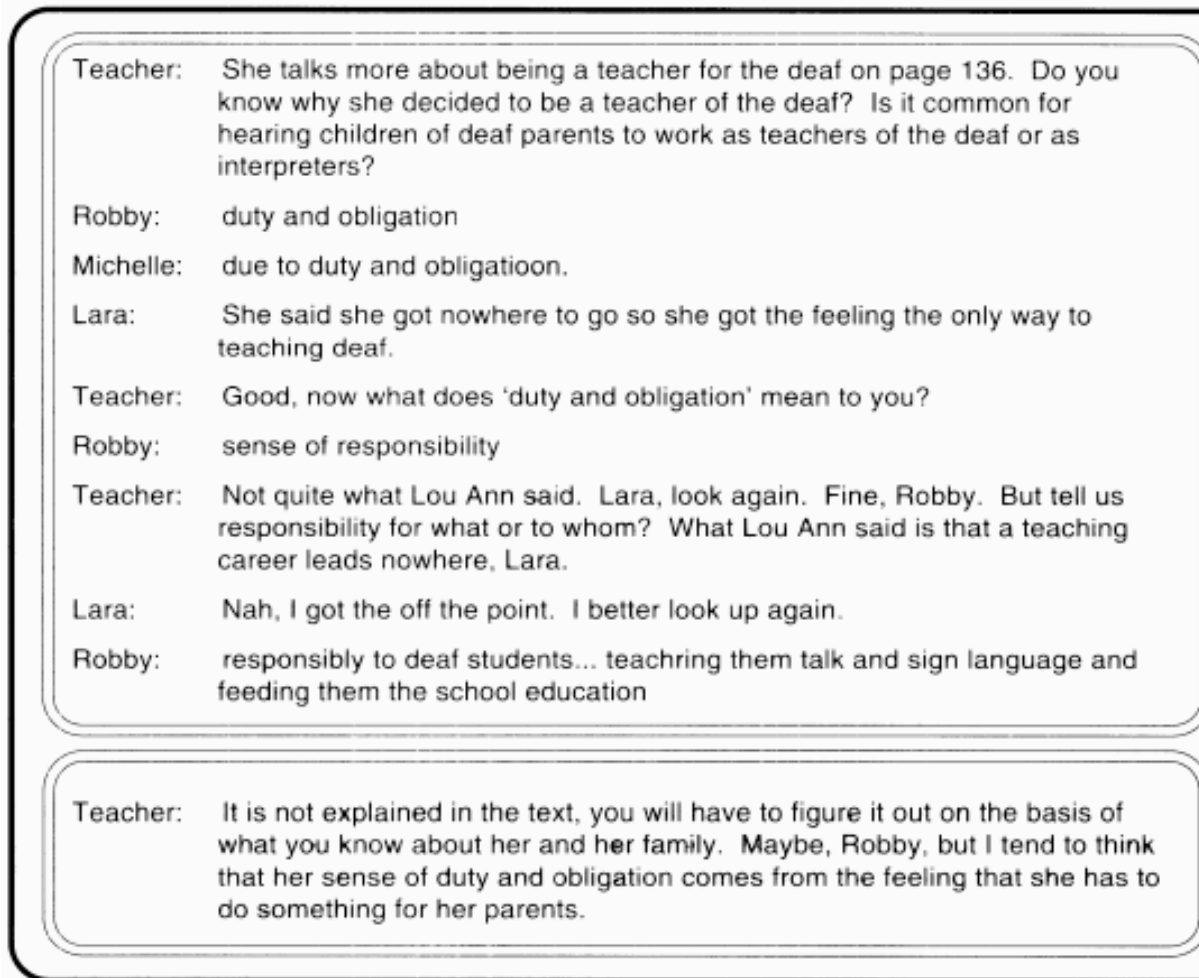
Teacher:	She talks more about being a teacher for the deaf on page 136. Do you know why she decided to be a teacher of the deaf? Is it common for hearing children of deaf parents to work as teachers of the deaf or as interpreters?
Robby:	duty and obligation
Michelle:	due to duty and obligatioon.
Lara:	She said she got nowhere to go so she got the feeling the only way to teaching deaf.
Teacher:	Good, now what does 'duty and obligation' mean to you?
Robby:	sense of responsibility
Teacher:	Not quite what Lou Ann said. Lara, look again. Fine, Robby. But tell us responsibility for what or to whom? What Lou Ann said is that a teaching career leads nowhere, Lara.
Lara:	Nah, I got the off the point. I better look up again.
Robby:	responsibly to deaf students... teachring them talk and sign language and feeding them the school education

Teacher:	It is not explained in the text, you will have to figure it out on the basis of what you know about her and her family. Maybe, Robby, but I tend to think that her sense of duty and obligation comes from the feeling that she has to do something for her parents.

Figure 1. Discussion in a network-based classroom at Galluadet University.

Why are Teachers Adopting Network-Based Classrooms?

Teachers have seen that the network-based classroom can be far more than just a tool for exchanging notes. A major impetus to the spread of network-based classrooms was the use of local-area networks at Gallaudet to help deaf students improve their literacy skills (Peyton & Batson, 1986). Students there could use written English to communicate within a classroom community of writers, thus having the possibility of developing their written English in the context of authentic communication. It soon became evident that other students might benefit in a similar way.

Local-area, synchronous communication appears to lose some of the special advantages of other forms of computer-mediated communication. But it offers several of its own instead. None of these are direct, inevitable consequences of the network-based classroom, but rather, possibilities that may be realized within it.

First, as at Gallaudet, students are immersed in a writing community, in which they write to real audiences for authentic purposes. As can be seen in Figure 1, the written interactions are direct, immediate, and responsive.

Rather than writing the standard composition, whose purpose often seems to be to provide grist for evaluation, students in network-based classrooms write to inform, persuade, entertain, develop social relationships, and formulate ideas (Batson, 1988). Writing comes alive; they see it as an important means of communication with their peers. It begins to seem more like talking, which they feel comfortable with, than like composition, which is often difficult and threatening (Langston & Batson, 1990; Peyton & Batson, 1986).

Second, the process of writing is made visible. Through natural (written) conversational interchange, the teacher can present models of good writing. In the Gallaudet example, the teacher wants to model for students the kinds of writing and thinking that are expected in their college courses. Perhaps more importantly, as the teacher, and other students, write, try out ideas, and rewrite in a public forum, they make aspects of the writing process become visible. The rapid interchanges that occur in a real-time electronic chat reveal details of the writer's thinking that are not evident in other forms of writing, computer-mediated or not. Being able to see the writing process in this way may be especially valuable for deaf students, English as a second language students, basic writers, or any student who has experienced difficulty in traditional classrooms.

With a more visible writing process, there is greater support for students to write collaboratively. Students use the network interaction to collaborate in all aspects of writing, including discussing ideas, brainstorming, taking notes, producing drafts, critiquing a text, and revising. This fully-articulated, interactive, and real-time support for collaboration is not possible in other forms of computer-mediated communication.

Third, as a consequence of the creation of a writing community in the classroom and of making the writing process visible, the social organization of the classroom is transformed. The role of the teacher shifts from lecturer or discussion leader to that of facilitator and collaborator. Notice in Figure 1 how far the teacher has moved away from a lecturing mode, even though the discussion is still teacher-directed.

In other classrooms, the teacher's role is transformed even further. Student participation is more equally distributed, because every student may speak (write) at any time. In particular, students who typically do not enter into class discussions may now do so. Traditional classroom interaction patterns are thus radically altered. For some teachers this has been an epiphany in their teaching lives; they have embraced, and could never abandon, a whole new form of teaching and relating to students. For others, the transformation has been equally dramatic, but also traumatic, so much so that they have rejected the approach entirely.

What Actually Happens in Network-Based Classrooms?

The vision of network-based classrooms presented above is one that has been realized in diverse classrooms. Many people refer to the network-based classroom approach as electronic networks for interaction, or ENFI, following a large-scale study conducted from 1987 to 1990. The ENFI consortium, funded in part by the Annenberg/ CPB Project, included Gallaudet University, Carnegie Mellon University, University of Minnesota, New York Institute of Technology, and Northern Virginia Community College

(see Batson, 1988, 1993; Bruce, Peyton, & Batson, 1993; Peyton & Mackinson, 1989). Researchers at The University of Texas at Austin (Kemp, 1993) and the National Technical Institute for the Deaf were informally associated with the consortium. Courses using the approach included community college writing, college preparation for deaf students, first-year composition, dramatic literature, advanced writing for seniors in business, and English as a second language.

Network-based classrooms are now in use at well over 100 college campuses, and in many K-12 settings as well (Peyton, et al., 1993). At the University of Illinois, 33 writing classes in English, including several experimental classes in Equal Opportunity Program Rhetoric, first-year composition, and business and technical writing use the network-based classroom. It is also used in writing across the curriculum seminars for faculty who later incorporate it into writing-intensive courses throughout the university.

Clearly, network-based classrooms are achieving widespread use. What is more remarkable, though, is the diversity of uses, even within English classes. In one study, we identified 16 distinct realizations--qualitatively different ways to use the network-based classrooms (Bruce & Peyton, 1990).

One professor set up a Socratic dialogue, in which he posed problems for students to resolve, such as "Who is responsible for the Exxon Valdez disaster?" He then used the network to engage in simultaneous dialogues with each of the students in the class. He was able to keep pace, because he could ask short questions, whereas they would write long responses. One of the students said that this was the first time that she had found it easy to communicate in class. She was too timid to speak (orally) in class and experienced writer's block when she was asked to write an essay. The conversational nature of the writing and the quick responses made her feel that writing was natural and fun.

In another class, students re-enacted plays they had read, or created the sequel on-line. Other classes used the network for brainstorming, for playing the devil's advocate to a student's essay, for literature discussions, to support collaborative writing, to help with revising, for note-taking, for exchange of texts, and for many other purposes.

Not all of the classrooms can be viewed as successful. In some cases, the logistics of managing a computer network have been overwhelming. In others, students appeared to use the network more for "flaming" than for serious inquiry or language learning. Many teachers felt that achieving a classroom in which they were not in control was not a positive outcome. Moreover, different students respond to these classrooms in different ways. Some never adjust to the fast pace, the multiple threads of discourse, and the apparent disjointedness of the network dialogues. These problems point to needed research on the way the network-based classrooms are used and for caution in adopting them for a given classroom.

Conclusion

When electronic mail was first introduced into computer systems that had been developed for educational purposes, it was seen as a novelty at best, or an interference with the true instructional tools, such as drill-and-practice programs, or frame-based

computer-assisted instruction. But after many years, educators began to see that meaningful communication over a network could be an effective way to enhance learning, probably more effective than much of the instructional courseware students were supposed to use. Today, distance networking is expanding rapidly in terms of educational users and purposes.

A similar story may be told about network-based classrooms. Although the idea of conversation over linked terminals has been around for more than 30 years, it is only in the last 10 years that these conversations have been widely seen as having educational value. As with any tool, successful use requires careful planning, adequate support, and an understanding of how it can be used to meet pedagogical goals. But it seems clear that network-based classrooms are a significant new way to use computer-mediated communication for learning.

The many ways in which network-based classrooms are used highlights questions about the goals and means of education that are too often pushed aside. By affording new ways of communicating, these classrooms ask us to rethink questions such as: What role should the teacher have in the classroom? How can students support each other's learning? What kinds of writing should students learn to do? How should we accommodate, or balance, student interests with other curricular concerns? What is needed to make a classroom become a true learning community? In addition to raising these questions, they provide us with new possibilities for answering them.

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