The Internetworked School: A Policy for the Future

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The next five years will radically change the ways that schools relate to the world around them as global computer networks—long the exclusive domain of higher education and private industry—link up to primary and secondary schools. The Internet, a network made up of many smaller contributing networks, represents a powerful educational resource unlike anything that precedes it. Its potential for education grows with the establishment of each new connection.

For the first time, schoolchildren have the means for simple, direct contact with millions of adults in a forum that masks their physical youth and presents them as virtual equals. However, just as the new kid in school has to learn new social codes and rituals to fit in, schools must learn some of the practices and etiquette of the Internet. Of course, the established denizens of the Internet will soon have some adjusting to do as well, with thousands (or millions) of new kids knocking electronically at their doors. Since the Internet was not designed with children in mind, many potentially difficult issues must be discussed by both the education and the Internet communities.

This article presents a framework for thinking about some of the issues that are essential to making the initial encounter between schools and the Internet successful. It also presents an excerpt of a policy that embodies our approach to resolving those issues.

Expanding Access, Expanding Horizons

For roughly the past decade, schools increasingly have participated in specialized computer networks such as the NGS/TERC Kidsnetwork, the Intercultural Learning Network, and FidoNet, as well as for-profit services such as CompuServe, America Online, and Prodigy. The majority of these projects were conducted on networks, where teachers' or students' messages could not be read by anyone beyond a predetermined audience composed of other students and teachers. These projects made it possible for students and teachers to communicate with their peers in faraway places and pioneered some pedagogical uses of networks for computer-mediated communication and collaborative project work that will carry over to the Internet.

Internetworking, however, goes beyond proprietary systems by joining a vast number of distinct networks into one large network, the Internet. As individual schools and bulletin boards are connected to the Internet, the number of people and services within easy reach increases exponentially. By one estimate, there are currently 19 million users of the Internet, with an annual growth rate approaching 80 percent. Furthermore, some of the Internet's most powerful communication tools are specifically designed so that any of these millions of people could join any conversation. The network's true power comes from the synergy of many dispersed minds working together to solve problems and discuss issues, and there is little in the way of hierarchy or control of the discourse.

The schools' shift to internetworking systems involves critical technological, as well as pedagogical, issues. It requires a change in the school computing paradigm from centralized computing to distributed client-server systems, thus bringing about an administrative change in the nature of school computing. Many schools that currently have some kind of network access provide accounts only to teachers or administrators. Internetworking is fundamentally different—giving accounts, access, and therefore control directly to students.

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There are numerous arguments for the pedagogical benefits of school internetworking. But what of the risks? What safety, liability, and, above all, educational concerns must be addressed before schools are ready to tap into the Internet? This policy is not intended as a document that sets limitations or restrictions. Rather, it is designed to facilitate and set guidelines for exploring and using the Internet as a tool for learning. The policy was written with the purpose and goals of the Internet as a background: support for open research and education in and among research and instructional institutions. The context for the policy was provided by the specific needs of a growing community of learners composed of students, teachers, scientists, and researchers. The networked environment must support collaboration and cooperation. Proper frameworks to support network navigation and information searching must be established. And because networks will continue to be a scarce educational resource for the foreseeable future, the policy also provides guidelines for maximizing the educational cost-benefit ratio for teachers and students.

Testbed for Change—The CoVis Project

Our framework for considering internetworking issues is a project currently being conducted at the School of Education and Social Policy at Northwestern University. The Learning Through Collaborative Visualization Project, CoVis, is designed to reconceptualize and reconfigure high school science education. CoVis is a networking testbed funded by the National Science Foundation (NSF). Its goal is to enable project-based approaches to science by using low- and medium-bandwidth

taught, to say nothing of learned, can be observed in only one place at one time. The rest is hearsay and, perforce, inferred. But if we cannot know exactly what is being taught in schools at any given time, how can we expect to assess, much less improve, the education our students are receiving?

Perhaps the greatest service technology can render to education lies in the areas of communication and curriculum, which go hand in hand. Much like books, computers are essentially buffers. By encoding communication, they have the capacity to defer messages from the time they are sent to the time they are received. But there is an important difference between books and computers. While the content of a book is static and unchanging, a computer's content is fluid and evanescent. Thus, a book can be written at one time and place and read in another, carrying communication through the ages and across continents. Once printed, however, a book's content remains fixed. Not so with computers that have the capacity to defer the very process of writing between the keyboard and the printer so that there is no longer any such thing as an "original." Once digitized into the binary code, computer input is fluid, taking the shape of whatever medium we choose, be it visual, acoustic, or even tactile. Transmitted through electrical charges rather than chalk or ink, computer input gains not only in speed and versatility, but also in its capacity to be minutely stored for instant recall.

It is this feature that renders technology a boon to education, for it enables teachers and students to transcend the limitations of time and space that imprison them in every school. Computers give us time to communicate because they need never sleep; they remember what we tell them and translate and transfer our messages at any time of day or night. They thus have the capacity to link individuals without forcing them to meet in a physical place. Schools equipped with a telecommunications network become schools without walls where learning can continue after the bell and in spite of the buses. Teachers equipped with computers at home and at school can create and preserve and revise and convey their instructions in forms hitherto denied them. They gain access to resources both within and outside the school. Curriculum thus becomes fluid rather than static, continuous rather than periodic, enriched by the work of others, enhanced in its form and presentation, manageable in its progress and assessment.

During the first revolution mistakes in applying technology in education were threefold. Early on, we viewed computers as objects rather than as instruments of learning, thinking that computer literacy meant we had to learn to program a computer's internal codes. As the face of technology became more transparent and user friendly, we saw how it could be employed in helping us do what we were already doing—easing the teachers' clerical burden of developing and producing instruction.

Whatever the medium, learning must remain fundamentally personal, genuinely interactive, and indelibly humane.

Our second mistake was to wedge technology between teacher and student, making machines the medium instead of the instrument of instruction. Bypassing teachers is the mistake made with nearly all technological innovations applied to schools—radio and television being examples where teaching was confused with talk and naked information was misconstrued as knowledge. Whatever the medium, learning must remain fundamentally personal, genuinely interactive, and indelibly humane.

Our final mistake was to allow administration to take precedence over instruction. Where attendance is recorded and moneys are expended, where parents are notified and policies are made, there we are likely to find the latest technology in use. Teachers and teaching come second, usually making do with leftovers and hand-me-downs. If administrators had to perform their own clerical tasks as teachers do, technology in schools might have kept pace. Teachers might have been given their own computers as part of their professional equipment. They might have received the kind of education and training demanded of every work force bent on elevating its standards of performance. Computers confined to the main office do not serve the main purpose.

Schools today have enough technology at hand to begin the second revolution. Let's hope that we will learn from our past mistakes so that this new revolution will be a revolution not so much in equipment as in thought, not so much in new things to do as in new and better ways of doing the things we have always done. As the instrument of thought, technology is the linkage of minds in the enterprise of learning. ◀

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Illustration by Karen O'Neill

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Ken Lewandewski, standing, teaches earth science at Evanston Township High School. Here he supervises freshman students in the CoVis classroom as they use a cruising program to network with other students. Ryan Hart, left, Myah Smith, and Seiji Hori are observing weather data from the University of Illinois in Champaign-Urbana.

networks to put students in direct contact with practicing scientists and scientific tools. In CoVis, we are working with the types of network connections we believe will be common in schools in the near future.

In the first phase of our project we are working with two Chicago-area schools, Evanston Township High School in Evanston and New Trier High School in Winnetka. CoVis is deployed in 12 classes at the two high schools, involving three teachers at each school. Approximately 300 students are involved in the project: 100 freshmen, 100 sophomores and juniors, and 100 seniors, all enrolled in either earth science or environmental science classes. Each classroom contains six Macintosh Quadra computers with audio/video conferencing units linked to an internal ethernet, which is linked to Northwestern's ethernet by a primary-rate Integrated Services Digital Network bridge for telecommunications using the public-switched network. Additional computers are available for Internet use in computer labs at each school.

The CoVis Network Community consists of students and teachers in CoVis classes, scientists who wish to collaborate on CoVis student projects, the researchers conducting the CoVis project, and other interested parties who are granted special accounts. In the CoVis classroom, each student is given an account that makes him or her a "full" member of the Internet community. This means two things: Each student has access to all Internet services with minimal mediation by teachers or other adults, and anybody with an Internet account can contact the students directly, again without mediation.

In addition to the standard Internet resources, which include electronic mail, listservs, Usenet news discussion groups, Telnet, gopher, and file transfer, CoVis makes it possible for students to communicate with peers and scientists via video and audio conference tools and remote screen-sharing technology for synchronous collaborative work. Therefore, the CoVis Network Use Policy goes beyond the needs of the typical low-bandwidth internetworked school.

As an NSF testbed, CoVis has the job of developing new frameworks for the use of internetworking. In seeking to understand problematic issues of networking, we turn both to other projects—Bolt Beranek and Newman's work with the Ralph Bunche computer-minischool in New York: AT&T's Learning Circles; and TERC's LabNet project—and to analogous situations extant in schools. Our attention thus is placed on the development of a policy to establish ground rules for the students who will be introduced to the Internet.

The Need for a Proactive Policy

Exciting or revolutionary educational programs too often are derailed. In the 1970s, Jerome Bruner's curriculum Man: A Course of Study (MACOS) was at the center of a political and ideological firestorm that prevented its implementation in many schools. The experience of the MACOS developers taught us that it makes sense to spend time in the initial stages of a project trying to determine what challenges might arise to an educational innovation in order to avoid, preempt, or co-opt them.

Schools likely will have to justify student use of network resources to a public that does not understand the medium or its utility to education.

In March 1993, the Communications Policy Forum, a nonpartisan group of telecommunications stakeholders convened by the Electronic Frontier Foundation, met on the issues of Internet services for the K–12 educational community. The forum concluded that services should be provided only to schools that would indemnify the service providers. It also recommended that a warning statement be developed to advise schools of the presence of materials on the Internet that may be deemed inappropriate for minors.

We believe that it is not enough to devise a policy designed to protect schools and service providers, although our policy also speaks to those roles. In this policy designed to guide students through some of the social complexity presented by the Internet, we created guidelines to alert novice users of established expectations and practices. Because the Internet is somewhat anarchic in its daily commerce, it is necessary to define a safe local space, or identity, for a school network where students can feel like members of a supportive community. The goal of establishing the boundaries of our own community forms the framework of our policy.

Issues and Analogies

The kinds of issues posed by internetworking are not new. Similar issues have been debated by schools many times before, from creation science to dress codes. These concerns resurface in the availability of networked material that some parents, teachers, or students might find objectionable, pornographic, or otherwise inappropriate. Although the actual percentage of materials in this category is small, their mere presence draws plenty of media attention. Consider this lead-in to a story about graphic material that can be retrieved through the Internet, published in the *Houston Chronicle* in 1990: "Westbury High School student Jeff Noxon's homework was rudely interrupted recently when he stumbled across the world's most sophisticated pornography ring....It was supported by taxes and brought into town by the brightest lights of higher education."

It is not farfetched to consider the Internet, at least in part, as a vast digital library.

While some are shocked, an alternative interpretation might point out that in using a valuable resource provided by the local university, a high school student chose to view material that many (including regular Internet users) find objectionable. Educators must understand that, as a byproduct of introducing internetworking, schools likely will have to justify student use of network resources to a public that does not understand the medium or its utility to education. By seeking out analogous situations and applying them to the development of our network use policy, we believe it is possible to establish frameworks for responding to these challenges. We found several significant analogies.

- **American Library Association (ALA).** In considering information access issues, the most striking and informative analogy is to a remarkable set of documents built around the ALA's *Library Bill of Rights* of 1980. It is not farfetched to consider the Internet, at least in part, as a vast digital library. After all, the electronic database and information search tools it employs are rapidly becoming part of new school media centers, and many public and school libraries are beginning to offer some type of network access to their patrons.

  The ALA documents state, "Attempts to restrict access to library materials violate the basic tenets of the *Library Bill of Rights*." However, they add, what goes into the library collection should be chosen thoughtfully and with an eye toward instructional goals. School librarians are bound to devise collections that "are consistent with the philosophy, goals, and objectives of the school district," and they must "resist efforts by individuals to define what is appropriate for all students or teachers to read, view, or hear." Similarly, tools used to access the network must be designed to direct access to materials that support curricular concerns. Thus, the interface to the network embodies the notion of a library collection. In a school network policy, the "intent of the collection" should be clearly reflected in a statement of purpose for the network.

  Directly addressing the information access needs of children, the ALA opposes attempts to limit access based on the age of a library user. "Librarians and governing bodies should maintain that parents—and only parents—have the right and the responsibility to restrict the access of their children—and only their children—to library resources," it states.

  While we in the CoVis Project have some ability technologically to restrict what is in our Internet "collection," it is virtually impossible to prevent students from accessing materials whose presence we never anticipated while preserving the students' status as full members of the Internet community. In this way, the Internet is fundamentally different from a relatively static library collection. Following the lead of the ALA, however, we believe that the precise limits placed upon students' access cannot be formalized by the school policy. Instead, it is the students' responsibility to adhere to the standards set by their parents.

- **American Society for Information Science (ASIS).** The code of ethics of ASIS provides another informative analogy, this one speaking to issues of professionals' responsibilities to both individuals and society. Where individuals are concerned, information professionals—a designation we believe should be applied to teachers—must strive both to "protect each information user's and provider's right to privacy and confidentiality" and "respect an information provider's proprietary rights." With respect to society, information professionals should "serve the legitimate information needs of a large and complex society while at the same time being mindful of [the] individual's rights." They also should "resist efforts to censor publications."

  The ASIS code speaks directly to issues of electronic mail privacy. We believe that students and teachers must feel certain that their communications are private. In many electronic mail systems currently used in schools, the teacher must act as an intermediary between the school and the outside world. When students are "full" members of the Internet, mail is sent directly to the outside world with no human mediation. As a rule, such communications should be private, and the network policy must make explicit any reasons for teachers or researchers to have access to message content. Users must be made aware of times and circumstances under which private mail may be monitored.

- **Prodigy.** Privacy in electronic mail communications seems like a straightforward issue—it is analogous to the U.S. mail. But what about network bulletin boards or Internet newsgroups? Posting a message in one of these public information exchanges may raise questions of freedom of expression among students and other network users, but no more than in any other public forum.

Rights and Responsibilities of CoVis Network Community Members

"The CoVis Network Use Policy" is sent home with students at the beginning of the school year and must be read and signed by both parents and students. In this way, parents are informed of the activities their children will be engaged in as participants in the Internet community as well as the innovative nature of the activities in the CoVis classroom. To ensure that students have an opportunity to think through the issues and guidelines described in the policy, time in each classroom is devoted to a follow-up discussion, led cooperatively by a CoVis teacher and a Northwestern graduate student. This excerpt has been edited for publication in TECHNOS.*

Rights

- **Privacy** in their electronic communications. Users must recognize the fundamental differences between public (e.g., news) and private (e.g., e-mail) forms of communication and shape their content accordingly.
- **Equal access** to as many network services as the user's technology allows.
- **Safety** from harassment or unwanted or unsolicited contact. Any user who receives unwelcome communications should bring them to the attention of a teacher. Users must be aware that there are many services available on the Internet that could be considered offensive, and individuals must take responsibility for their own actions in navigating the network.
- **Intellectual freedom.** The CoVis Network must be a free and open forum for expression. Statements are implicitly understood to be representative of the author's individual point of view and not that of the CoVis Network, its administrators, or the participating high schools.

Responsibilities

Failure to fulfill these responsibilities may result in the loss of network privileges.

- **Using appropriate language.** Profanity or obscenity will not be tolerated on the CoVis Network.
- **Avoiding offensive or inflammatory speech.** Community members must respect the rights of others both in the local community and in the Internet at large. Personal attacks are an unacceptable use of the network.
- **Adhering to the rules of copyright.** CoVis community members must respect all copyright issues regarding software, information, and attributions of authorship.
- **Refraining from re-posting personal communications** without the original author's prior consent. To do this is a violation of the author's privacy. However, all messages posted in a public forum such as newsgroups or listservs may be copied in subsequent communications, provided proper attribution is given.
- **Using the network only for legal activities.** Illegal activities include, but are not limited to, tampering with computer hardware or software, unauthorized entry into computers, or knowledgeable vandalism or destruction of computer files.
- **Avoiding the knowing or inadvertent spread of computer viruses.** Deliberate attempts to degrade or disrupt system performance by spreading computer viruses is considered criminal activity under state and federal law.
- **Accepting full responsibility for account usage.** Under no conditions should a user give his or her password to another.
- **Using one's real name.** Impersonation is not permitted; pseudonyms are not allowed.
- **Taking responsibility for one's messages.** Anonymity is not allowed on the CoVis Network. Individuals must take responsibility for their actions and words on an educational network.
- **Displaying exemplary behavior on virtual field trips.** CoVis community members must conduct themselves as representatives of both their respective schools and the CoVis community as a whole when using the network.

* The entire text is available from the authors. Write to: Barry Fishman, Room 234, School of Education and Social Policy, Northwestern University, Evanston, IL 60208. Or use e-mail: bfishman@ils.nwu.edu for Barry Fishman; pea@nwu.edu for Roy Pea.

One approach to dealing with this issue was described in the *Wall Street Journal*'s technology supplement of November 15, 1993. Prodigy, a dial-up bulletin-board service jointly owned by IBM and Sears, has a strict editorial policy for both its public forums and its members' private e-mail exchanges. Prodigy employs editors who screen every message before it is posted, sometimes delaying posting by up to 40 hours. It also uses special software to screen messages for what it deems objectionable language. The result is a lowest-common-denominator approach to what is acceptable or unacceptable material.

This approach undervalues the maturity of Prodigy's users. In the CoVis classroom, we want to strive to develop students' maturity, and in order to learn these lessons, they must feel that their message content is under their own control. To let students know what level of behavior is expected of them, we are very clear about the use of offensive, obscene, or inflammatory language on the network. These guidelines are

For further reading:

Roy Pea, "Distributed Multimedia Learning Environments: The Collaborative Visualization Project," *Communications of the ACM* (May 1993).

Denis Newman, Susan Bernstein, and Paul A. Reese, "Local Infrastructures for School Networking: Current Models and Prospects," Bolt Beranek and Newman Tech Report No. 7726 (1992).

Richard Ruopp, Shahaf Gal, Brian Drayton, and Meghan Pfister, *LabNet: Toward a Community of Practice* (Hillsdale, NJ: Erlbaum, 1993).

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not unfamiliar to the students in CoVis, as their local school codes of conduct include the same admonitions. Offensive messages posted by students are not ejected from the network. However, students can lose their privileges on the network if they post such messages (a significant disincentive for CoVis students), and they are encouraged to post a retraction or apology once they understand why their message was problematic. These interventions are only initiated upon the complaint of another user, not as part of an explicit editorial policy.

- **School Conduct Codes.** Every school has a code of conduct for its students that details appropriate school behavior, outlines rights, and sets expectations for students. Because the CoVis Network is used as part of a school activity, the school's code of conduct applies to network activities. Thus, we believe the network use policy should be an extension of the school's policies. An important part of the development of the CoVis Network use policy was a close reading of the participating high schools' codes of conduct. For example, at one of our high schools, special rules against vandalism of computer equipment and unauthorized access to information exist. These rules cover such important concepts as computer piracy, hacking, and other tampering with hardware or software. Both CoVis schools have codes warning students that use of harassing or abusive language is unacceptable, as is obscenity. At the same time, both high schools place a high value on students' right to freedom of expression and outline the dimensions of that right in some detail.
- **Field Trips.** All of the rules that apply to student conduct in school also apply when the students are off campus on field trips. The Internet offers many opportunities for virtual field trips to distant locations, and CoVis adds a new twist to this genre with the addition of full audio and video connections to remote locations. Students in the CoVis community will be able to "visit" the Exploratorium in San Francisco, directing a remote camera around the exhibit floor and engaging in conversations with guides and other museum visitors. It is important that students realize they act as ambassadors for their school in such encounters, and our policy states this explicitly. Currently, parental permission slips are required before students may take field trips. At one of our participating high schools, such slips are required even for "trips" within the school building. Is there a precedent for extending the concept of permission slips to the virtual field trip? We do not believe so, but we do recognize the importance of written information alerting parents to interesting or innovative school activities.

Beyond the Barriers

Barriers to internetworking in schools are being lowered every day, and soon electronic bulletin boards may be as familiar to the American classroom as blackboards. Educators are encouraged by continuing developments that make the Internet accessible to schools. This is accomplished in part through commercial networks such as America Online and Delphi and by the decreasing costs of modems and communications software. With the cooperation of nearby universities, dial-up Internet connections can now be obtained for an investment of under $100 per existing computer.

Schools will find tremendous new opportunities for enhancing, extending, and rethinking the learning process with the advent of internetworking. But will they be ready to face the challenges? To date, schools have had little experience with advanced telecommunications technologies. Many classrooms still lack even such basic tools as telephones. Given the general lack of communication even between classrooms in the same school, it will not be easy for schools to join in the fast-paced discourse of the Internet. The CoVis Project has taken a proactive stance toward the issues that internetworking raises for schools with the development of a network-use policy based upon the best lessons available. We invite feedback on our policy and offer it as a contribution to this exciting and rapidly developing area of educational technology. ◀

Electronic versions of the original texts of American Library Association, American Society for Information Science, and *Houston Chronicle* documents can be found at FTP (file transfer protocol) address ftp.eff.org, in the pub/academic/library/directory.

The Communications Policy Forum meeting is reported on by Andrew Blau in the EFFector 5(4), also available from ftp.eff.org in the /pub/EFF/newsletters directory. Statistics about the Internet are available from ftp.nisc.sri.com, in the /pub/zone directory. Both of these FTP sites can also be reached via gopher.