

**インターネットの学校教育への挑戦：
インターネットソサエティ第6回年次大会（INET'96）
からの問題提起**

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**Challenge of the Internet for school education:
the problematic aspects of INET'96**

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インターネットソサエティの第6回年次大会（INET'96）が1996年6月26日から28日まで、カナダケベック州のモントリオールで開催された。出席者はインターネットの現在と未来に向けての発展について、経済、社会、文化、技術および教育の各分野において、討議を行った。著者はインターネットソサエティ会員として本会議に出席した。現在、世界の教育機関はインターネットの利用をめぐってさまざまな模索を始めており、その中から新しい試みが登場してきている。インターネットによって生まれつつある新たな環境はこれまでの教育のしくみの全体の見直しを要求している。INET'96における教育分野での重要な主題について取り上げ、特に教育改革の観点から分析し問題点を探った。

It is part of the human vanity that there is intrinsic reward in mental effort. For some, doubtless this is true; for most, mental effort is something that it is exceptionally pleasant to avoid.

John Kenneth Galbraith⁽¹⁾

Summary

The sixth annual Internet Society conference, INET'96, was held in Montreal, Canada from June 26 to 28, 1996. More than 2500 delegates from around the world discussed present and future Internet development. The author attended the conference as a regular member of the Internet Society. Educational institutions are seeking ways to use the Internet and new trends are emerging. This article focuses on the problematic aspects of INET'96.

1 The Internet and its Culture

The Internet is growing every day. Presumably more than 60 million people are now joining in the Net. In the 21st century billions of people will be using it as the new telecommunication infrastructure similar to today's telephone and facsimile network. The Internet was born from the U.S. cold war strategic need to protect the U.S. computer network against a Soviet Union missile attack. The only secure solution was a distributed environment of computer systems in place of the traditional centralized system concept. The RAND, which was the highly advanced think tank in the cold war period, proposed a revolutionary idea in 1964: "In the first place, the network would have no central authority. Furthermore, it would be designed from the beginning to operate while in tatters."⁽²⁾

Vinton Cerf, the father of the Internet, was present when the Internet began. "When I started graduate school, I was originally looking at multiprocessor hardware and software. Then a Request For Proposal came in from the Defense Advanced Research Projects Agency, DARPA. The proposal was about packet switching, and it went along with the packet-switching network that DARPA was building."⁽³⁾ Packet switching is the basic technology needed to support a decentralized computer network environment.

In autumn 1969 an early stage of the network began to work, when four node computers were connected together. This network was named ARPANET (Advanced Research Project Agency NETwork), after its Defense Department sponsorship. But by the second year of operation an unexpected fact occurred on the network. "ARPANET's users had warped the computer-sharing network into a dedicated, high-speed, federally subsidized electronic post-office. The main traffic on ARPANET was not long-distance computing. Instead, it was news and personal messages."⁽²⁾

Ironically, the "no central authority" concept has made the development of the Internet an unexpectedly anarchistic and dynamic one. Researchers were exchanging personal memos using the Email system and even broadcasting hobby-oriented messages using mailing-list technique.

In the 1970s the more sophisticated communications standard TCP/IP, Transmission Control Protocol/Internet Protocol, was developed. This open new protocol made expansion of the Net more and more easy. Another epoch-making result was the birth of the World Wide Web (WWW) in CERN, the European Elementary Particle Physics Research Center in Geneva. "[B]y 1989 CERN's Internet facility was ready to become the medium within which Tim Berners-Lee would create the World Wide Web with a truly visionary idea."⁽⁴⁾

The decentralized expansion of the Internet has been accelerating since the end of the cold war in the early 1990s. Finally the Net entirely began to take off from the US government sponsorship

2 INET'96

The sixth annual Internet Society conference, INET'96, was held in Montreal, Canada from June 26 to 28, 1996. More than 2500 delegates from around the world discussed present and future Internet development.

The Internet Society is the non-governmental international organization for global cooperation and coordination of the Internet and its internetworking technologies and applications. "The Internet Society was announced in June 1991 at an international networking conference in Copenhagen and brought into existence in January 1992 by a worldwide cross-section of individuals and organizations who recognized that the Society was a critical component necessary to evolve and globalize the Internet and internet technologies and applications, and to enhance their availability and use on the widest possible scale."⁽⁵⁾

This year's INET theme is "The Internet: Transforming Our Society Now," which refers to the fact that today ideas and information circulate rapidly and in all directions, bypassing traditional borders. The Internet is transforming not only business and markets, but the human aspects of our society. Future Net users are increasing day by day all over the world in the midst of this transformation. "Educational institutions are seeking ways to use the Internet and new trends are emerging. The entire educational system will have to be redesigned in light of the new tools available and the needs of students in today's environment."⁽⁶⁾

It is not a bad thing if we hope to reform our old way of education using new tools, but it is not a good thing if we hope that new tools will reform it for us.

3 Reform or Illusion?

Let us review previous circumstances where a new medium promised to reform education. What was the result? Sherwood A. Dowling gave a clear answer. "With the advent of educational television (ETV), it became possible for the best teachers to reach many more students than otherwise possible. "Master" teachers could be broadcast simultaneously (and later, at any time using video tape) to any number of students or for continuing education. It was also now unnecessary for every school to purchase expensive laboratory equipment when an expert educator with all the necessary equipment could perform an experiment once for broadcast to all (Costello and Gordon, 1961)." But television failed to transform education. "Television failed to meet the pedagogical needs of the educational community and was viewed as enrichment rather than as an integral part of the educational process. If Internet education is to avoid a similar failure, it must be consistent with current and emerging educational practice."⁽⁷⁾

As Dowling indicates, we will have to replace rote memorization of facts and formulas with development of higher-order thinking skills. The concept of socially constructed knowledge originates from research in thinking and learning. The point is that mastery needs to be based on a foundation of essential learning driven by the "learner himself or herself", not by the curriculum. "In a traditional classroom, curriculum is presented part to whole, with emphasis on basic skills. Students are viewed as empty vessels into which knowledge is poured." On the other hand a constructive approach goes another way. "In a constructivist classroom, learning is structured around primary concepts, whole to part, with emphasis on the big picture. Students are viewed as thinkers with emerging theories about the world. Lessons are not arbitrary, but built on issues relevant to the student. In a constructivist classroom, teachers behave in an interactive manner, mediating the environment for students."⁽⁷⁾

In short, traditional Western education is about memorizing information and learning how to recite or derive correct answers, says Dowling. But this is true in Eastern education, too. Yet some new stream has begun to flow into the traditional educational system. "The current educational reform movement embraces constructivist principles, incorporating them into a culture for learning consisting of heterogeneous student groups, given clear goals, administered locally by professionally trained and certified educators." Established examples of programs designed to integrate constructivist educational theory and technology are presented on the Smithsonian's National Museum of American Art (NMAA) Web sites.^(8, 9)

The Internet has changed not only educational methods, but the educational environment. Boris Berenfeld says, this new environment created by the Internet can be identified as an

"infosphere" analogous to the biosphere. Functionality of this infosphere has been classified into five general educational categories.⁽¹⁰⁾

1. Tele-access
2. Virtual publishing
3. Tele-presence
4. Tele-mentoring
5. Tele-sharing

First, tele-access includes online libraries, databases, museums, satellite data and so on; space shuttle photos, web museum paintings, and congressional documents.

Secondly, using a virtual publishing system means that almost everyone is able to publish without depending upon an expensive printing machine. Virtual publishing on the World Wide Web is not limited to text documents; graphics, video, sound and animation are available as well as hypertext links to the virtual library.

Thirdly, students are able to experience events at remote sites through tele-presence.

Fourthly, on many sites, by serving as mentors, scientists and scholars answer questions and provide classrooms with resources outside textbooks and teachers' experience.

Finally, "In their totality, the various functionalities of the infosphere enable students to share all forms of information in a variety of ways."⁽¹⁰⁾

"Sharing" is the very essence of the Internet culture. The sharing of resources, ideas, experiences, data and findings has been changing the traditional vertical teacher-student relationship.

Berenfeld says that this new learning environment begets a new learning paradigm. "The emerging infosphere is changing how we work and how we find, access, analyze, process, and exchange information. These information access and management skills, as well as the ability to critically evaluate information, demand a new type of literacy: information literacy. Yet linking students to the infosphere will do more than prepare them to compete in 21st century economies."⁽¹⁰⁾

Nine advanced goals have been indicated;

1. Bringing real-world relevance into the classroom
2. Helping students perceive knowledge as constructed
3. Providing students with an effective model of lifelong learning
4. Bolstering social, communication, and critical-thinking skills
5. Meeting emerging standards for inquiry-based learning
6. Increasing the authenticity of the learning environment
7. Putting a human face on learning
8. Finding role models for students

9. Equity

The most notable point is the first goal, "bringing real-world relevance into the classroom." This means that telecommunications expand the learning context by bringing the real world into the classrooms. But, ironically, in a sense real-world relevance has already been brought into classroom by the students themselves. Most students know the real world through part time job experiences. Today more isolated from real world might be the teachers. Teaching has been a closed-door practice ever since school education system was invented. Even today some teachers are proud of their isolation from real world. The Internet environment enables teachers and students to establish interactive connections, making learning more relevant to their lives, interests and concerns.⁽¹⁰⁾

Three basic components of Internet-based education are students, teachers and computer systems. If students don't like computers, or, worse, if teachers don't like computers, what will happen? How can teachers help students who are suffering from "cyberphobia" to join in the Net world? Who helps the teachers? We should review the whole system in order to make the new environment really effective.

4 Evaluation and limitation

Some problems, difficulties and limitations of Internet-based education are those listed below by Yuri Quintana.⁽¹¹⁾

1. Lack of motivation can lead students to drop out.
2. Internet methods of communication (Email, newsgroups, listservs) may be intimidating or awkward to use for some students.
3. Students may not be able to express themselves using computer based communication methods as well as they would in direct conversation with their professor or in classroom discussions. As a result, not all questions may be asked by the student when using computer mediated communications.
4. The Cost of computer equipment and communications infrastructure may limit the number of students who can afford an Internet-based course.
5. Students will may lack technical support in their homes to support using the software tools needed in the course. Poor technical support or tutorial help can lead to incorrect usage of the software tools needed to do assignments.

The most important limitation is from the teachers' side. How can we solve the lack of incentives for instructors to learn and use new technology? In most schools there is not any support for training instructors with new technologies and methods. Another big problem is the unreliability of the equipment being used. This kind of trouble may cause difficulties in the delivery of courses over the Internet, which can be reflected in poor student evalua-

tion of such courses.⁽¹¹⁾

The unreliability of equipment, suggests Quintana, is an extremely important issue.

Wakabayashi writes, "The Net is changing constantly. Most people have a strong need to join in the Net culture, but the present Net culture prohibits it. Why? Because today's Net culture is mainly based on the PC culture that started from the hobbyist sub-culture in the 1970s and has grown up into the present sophisticated systems. Ordinary users enjoy no more than a small, limited part of it. Only professional or manic users can fully enjoy such culture. Ironically, we know many "professional" PC users are suffering from problems with bad user interfaces: the sudden freezing of the desktop screen, and the unlucky and suddenly-occurring system crash."⁽¹²⁾

The above PC culture has been poorly served by computer businesses. Really easy-to-use systems need to be created for the ordinary users.

Quintana suggests four criteria to evaluate distance education courses.⁽¹¹⁾

1. Accessibility - What type of bandwidth is required to properly view the content? How much will it cost to access the system? How difficult will it be for students to install the appropriate hardware and software?
2. Communication - How well can a student communicate with the instructor or other classmates? What limitations are there on communication as a result of the communications medium chosen? How effectively can feedback be given? How isolated do students feel?
3. Content - What types of content can be delivered? How can interactivity and multimedia be used?
4. Flexible - How easy is it to re-use previous educational modules? How much flexibility is there for students to view the information at their own pace and in their own chosen order?

Accessibility means technical bandwidth in the above context. But another side of accessibility is "social bandwidth." The haves and the havenots have extremely different Net environments in their homes. Paper and pencils are cheap things for both sides. But Net environments like computers or communication lines are not. Social welfare will have to be redefined in the Net age. Public spending might be necessary to support a Net environment for the information-handicapped class or community.

Finally, what is communication in the Net age? The most essential component of a school is a group of students and teachers who share ideas and information. This will be absolutely true even in the highly advanced Net age.

5 Beyond the Net labyrinth

The interactive function of the new medium is a sword that has two sides. Passively trained consumers are apt to accept the output of the interactive medium under some powerful authority. When an interactive medium plays such an aggressive role on the Net, it will become a formidable brainwashing machine.

Many people who want to join the Net world are eager to master how to handle personal computers and its related software. But the important thing is not how to handle machines, but where to find what they want. Most important is the fact that most Net users don't know what they really want.

"Wiring up schools today offers a fascinating business opportunity. Computer hardware and software makers, Internet access providers, and other Net-related industries are expecting to develop a huge untapped market in the schools.

But introducing the Net into a knowledge-based culture might be the modern equivalent of the bow and arrow introduced into a spear-based hunter economy. Every "hunter" will need the skills to use a bow and arrow. Basic skills and fundamental knowledge to handle information have become more and more important in the Net age. The Net is an extremely large information labyrinth. Children are likely to lose their way in it.

They have to be able handle information for themselves, not just know how to handle a computer. This is the key point. Unfortunately, it is technology-oriented people who teach computer classes in many schools today. Basic intellectual skills like reading, writing and calculating or logical thinking need a cyber "bow and arrow."

Teachers must teach children how to move around the Net and how to search for information. I believe wiring up schools is a good thing; every schoolchild can then enjoy his or her own global-sized virtual library on the Net."⁽¹³⁾

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