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ABSTRACT

This newsletter addresses educational reform related to student use of computers and the development of computer networks in Illinois schools. This educational trend is particularly relevant for improving the educational opportunities of rural students. Both the Illinois State Board of Education and the Illinois Planning Coalition for Educational Technology have called for using technology as a resource to support student learning and improve operational efficiency. A combination of communications and information technologies constitutes the National Information Infrastructure, commonly referred to as the Internet. The Internet provides students and teachers with access to the following: (1) networking and collaboration through worldwide electronic mail, distribution lists, and group mail; (2) numerous databases and electronic bulletin boards, through which users can exchange information in the form of text, audio, and graphic formats; (3) collaborative investigation allowing teachers and students to investigate problems and issues and share products across geographic and political boundaries; and (4) resources ranging from curricula to exemplary classroom activities. Because of the Internet, every school regardless of size, location, or socioeconomic condition can provide students with the same opportunities heretofore available only to students in affluent schools. This newsletter also discusses cautions for rural and small schools in using the Internet, information on getting connected to the Internet, equipment needs and costs associated with using the Internet, and efforts in Illinois to promote Internet access for all K-12 schools. Contains 25 references. (LP)

RURAL SCHOOLS AND THE INTERNET: PROVIDING AN "ON/OFF RAMP" TO THE INFORMATION SUPERHIGHWAY OF THE 21ST CENTURY

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By:

Bruce O. Barker, Robert F. Hall, and Sally T. Wood

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Rural Schools and The Internet: Providing an "On/Off Ramp" to the Information Superhighway of the 21st Century

by Bruce O. Barker, Robert F. Hall, and Sally T. Wood[1]

In early 1992, the Illinois State Board of Education (ISBE) articulated eight educational goals to be achieved before the year 2000 if the state is to adequately provide a world class education for students in the 21st century. In close harmony with the President's "Goals 2000" agenda, Illinois' eight goals provide a vision for education and a direction for educators, policymakers, parents, government, business, social agencies, and industry to follow if we are to make the education of children a priority. Illinois' goal number five states that by the year 2000

> All Illinois public school students will attend schools which use technology as a resource to support student learning and improve operational efficiency. (ISBE 1992, p. 7)

Illinois' new State Superintendent of Public Instruction, Joseph Spagnolo, reported in a concept paper prepared for the ISBE that technologies, if properly used, can make a significant difference in student academic achievement (1995). Yet, a serious challenge facing state government is how to implement up-to-date learning technology to benefit students in Illinois public schools. According to Spagnolo, the challenge of technology implementation in schools is related directly to strategic planning, infrastructure building, and, most importantly, to professional development for teachers and administrators in how to use the new technologies. Emphasizing the importance of advanced technology implementation in the state's schools, Spagnolo has stated that it would

> be appropriate for the State to sponsor and finance to the extent possible the building of the infrastructure to enhance the capacity of schools and classrooms so that learning can take place literally at any site regardless of size or location. *It is further suggested that the State consider that in lieu of providing subject area textbooks, children be provided with desktop or laptop computers with their appropriate software to update their skills and at the same time develop the capacity for interacting on various networks. It is also suggested these tools be used to enhance school-to-home communication.* (pp. 12-13; italics in original document)

In harmony with this need for ISBE to support the purchase of computers and the extensive use of computers and networks in Illinois schools, the Illinois Planning Coalition for Educational Technology (Goals 2000 Panel 1995) has recommended that

- the ISBE Technology and Systems Division establish a statewide computer bulletin board for the purpose of technology information dissemination.
- the Governor (Lt. Governor) along with Public Pre K-16, the ISBE, IBHE, and other state agencies annually sponsor a statewide technology implementation conference that focuses on collaborative efforts on the use of technology for education purposes in the State of Illinois.
- compatibility standards be established to ensure interconnectability for all educational technology applications (e.g., voice, compressed digital video, Internet applications, satellite delivery, and so on).
- all telecommunication entities be required to provide "hookup, access, and use" to initially enable every education institution and library a ramp onto the information highway.

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- special reduced (cost-recovery) educational rates be established for all telecommunication carriers.
- regional purchasing cooperatives for technology hardware be established.
- regional technology assistance centers to ensure ongoing maintenance such as basic connections and new hookup be established.

Student Benefit from Advanced Learning Technologies

How will the application of advanced technologies in the schools enhance student learning, provide greater access to individualized instruction, promote new levels of student achievement, and help Illinois attain standards specified by the Goals 2000 Educate America Act passed by the Congress in April 1994? According to the Illinois Planning Coalition for Educational Technology (Goals 2000 Panel 1995), use of advanced technologies in Illinois schools will result in the following (Goals 2000 Panel 1995):

- Students will gain almost unlimited access to resources for a wide array of academic resources.
- Students will be able to work cooperatively over distance to engage in problem-solving activities.
- Students at all levels will be able to develop skills in problem solving, decision making, data collection, self-paced instruction, research, and communications.
- Students at all levels will be able to access ILLINET, Internet, Prodigy, and other centralized databases which provide voice, text, and video information.
- Students in urban as well as rural schools will be able to access advanced placement courses and other high-cost low-enrollment courses through satellite, fiber-optic, and cable television.
- Students will build both learning and knowledge communities.
- Students will participate in learning ventures across geographic and political boundaries.
- Networking and collaboration will take place through the use of e-mail, bulletin boards, and search tools.

Hypermedia: A New Paradigm for Teaching and Learning

State Superintendent Spagnolo's desire to provide support for student use of computers and networks in Illinois schools and recommendations made by the Illinois Planning Coalition for Educational Technology clearly emphasize the need for reform in Illinois education. Much of that reform is focused on the use of advanced technologies which will result in a paradigm shift toward the increased use of hypermedia in education.

Present day and advancing technologies have the potential to change the way young people learn and the manner in which schools function. Traditional models of teaching and learning must adapt to these changes if education is to be relevant and meaningful in students' lives. The shift toward hypermedia learning permits interactive and nonlinear navigation by the student through courseware and learning materials that activate the senses of sight, sound, and cognitive reasoning. Technology is available in today's marketplace for students and teachers to access hypermedia presentations, courseware, and online resources that can be activated at anytime—day or night. Hypermedia and advanced telecommunications suggest the following new roles for teachers and students (Jensen 1993):

- Teachers will be more involved in inspiring students, making them want to learn more, than in transmitting knowledge to them by means of traditional lectures and discussions.
- Teachers will spend more time preparing materials that use the hypermedia technology and that can be accessed by students either at school or at home provided they have access to computers, software, and online data services.
- Under the guidance of teachers, students will select learning goals and choose among multiple learning materials.
- Some teachers will build reputations as authors of hypermedia materials that are available on worldwide educational networks.

Recent studies suggest that teachers and students who work in hypermedia learning environments employ nontraditional strategies for teaching and learning. These include heterogeneous groupings, performance-based

assessment, collaborative work, interactive modes of instruction, student exploration, and teachers serving the role of facilitators rather than knowledge conveyors (Pea 1992; Weir 1993).

This shift toward hypermedia learning includes increased use of instructional videos, interactive multimedia, CD-ROMs, and distance learning technologies (e.g., satellite, compressed TV, fiber optics, and so on). The combination of these communications and information technologies constitutes the National Information Infrastructure—the NII as designated by the Clinton administration (U.S. Department of Commerce 1994).

The Internet: The Information Highway of the 21st Century

The federal government's promotion of the NII, commonly referred to as the "Information Superhighway," has placed increased emphasis on educators to better understand and learn how to access the vast amounts of information available on computer networks. Yet, it is the Internet and its maze of computer networks that is increasingly being recognized as the Information Superhighway. Numerous commercial networks such as *America Online*, *Compuserve*, *Delphi*, *Genie*, and *Prodigy* have been in operation for several years—serving as means of accessing remote databases, bulletin boards, electronic magazines/newsletters, and so on.

Now, however, these commercial networks are increasingly being seen as gateways into the Internet's immense data resources which are growing at an exponential rate.

The Internet is literally a labyrinth of computer networks which make available to users a mind-boggling array of information, services, and resources. No one knows how big the Internet is. Current estimates range between 15 million to 20 million users in as few as 60 to more than 200 countries (Estrada 1993; The Internet Society 1994; Pawloski 1994). The Internet Society estimates that this "mother of all computer networks" links more than 30,000 computer networks into one global network, and that it is experiencing a 15 percent growth rate in number of users each month (Jain 1994). Composition of the Internet is estimated at 55 percent commercial networks, 35 percent educational networks, and 10 percent government networks (The Internet Society 1994; Jain 1994). No one individual or group manages or controls the Internet. It is a decentralized collection of computer networks managed by separate groups who have agreed to a common set of technical standards or protocols which connect and interconnect their individual networks to one another for information sharing. The Internet uses a variety of operating systems which make it compatible with different types of computers for information access and data exchange.

The Internet has tremendous potential as an educational resource in K-12 settings, chiefly because proper use of the Internet demands that educators incorporate new strategies for teaching students. The Internet provides students and teachers with access to the following:

- networking and collaboration on the part of both students and teachers through worldwide electronic mail, distribution lists, and group mail
- information via numerous kinds of databases and electronic bulletin boards, through which users can exchange ideas as well as huge amounts of information in the form of text, audio, and graphic formats, which can be located using a variety of search tools
- collaborative investigation that allows teachers and students to investigate problems and issues and shared products across geographic and political boundaries
- resources ranging from curricula to exemplary classroom activities that students and teachers can use at times most convenient for them (Jones, Valdez, and Rasmussen 1994).

Most of the information on the Internet is text-based. However, the release of Internet "browsers" such as the National Center for Supercomputing Applications' (NCSA) Mosaic™ in early 1994 and Netscape™ in late 1994 have made available thousands of materials on the Internet which combine text, audio, graphics, and even short video clips—all of which can be downloaded and viewed on one's personal computer.

The Internet's resources can be grouped into three major categories: (1) messaging, (2) remote login, and (3) file exchange (Ayre 1994; Dyrli 1993). Messaging applications include electronic mail, discussion groups, and newsgroups. Remote login permits a user to "connect" to a computer system in a distant location thereby accessing information on the system through his/her own machine. File exchange is possible once a user has logged into a distant computer or computer system. Through file transfer protocols, the user can copy the files from one computer and transfer them back to his/her own machine. Files might include text documents, computer programs, application programs, sound clips, images, photographs, or movie clips.

E-mail. Sending and receiving electronic mail (e-mail) is the most widely used application on the Internet. In addition to personal messages, e-mail also includes files, reports, articles, journals, books, and even sound and graphics files. E-mail has allowed students and teachers to correspond on projects across the country and around the world. For example, when the Gulf War and the breakup of the Soviet Union occurred, classes connected to the Internet were able to communicate directly with people in the countries involved, confirming that the Internet knows no political or geographical boundaries (Dyrli 1993).

Discussion Groups. Internet users who share common interests can easily subscribe to discussion groups, or listservs, by adding their e-mail address to the appropriate interest group. There are literally thousands of discussion groups addressing virtually every topic of human interest. Most of these are cost-free to join. Once a user has joined a listserv, e-mail from other users will automatically be sent to the user's e-mail address. The user can in turn respond to these messages which are sent out over the Internet to all other members of the same listserv.

Newsgroups. Unlike discussion groups or listservs, one does not subscribe to a newsgroup. Hence, e-mail messages are not automatically sent to individual users. Newsgroups can best be described as electronic bulletin boards which users access in order to find out the latest information on topics of interest. There are well over 1,000 newsgroups on the Internet, and these numbers are increasing. Much like discussion groups/listservs, newsgroups cover a broad range of topics.

Cautions for Rural and Small Schools in Using the Internet

The Internet has the potential to radically change information access and learning resources in American schools. By making all kinds of information available to anyone with an Internet account, differences between big and small schools have begun to blur. The dual stigma of remoteness and geographical isolation, so commonly associated with rural schools, begins to fade as more and more schools connect to the Internet. The vast domain of information contained within the Internet's archives can provide unlimited educational opportunities for today's students. For the first time in history, every school—without regard to size, location, or socioeconomic condition—can provide students the opportunity to access the same highway of information heretofore available only to students in the nation's most affluent schools.

The bulk of attention given to the phenomenal growth of the Internet by educators and writers is extremely positive. Yet it is notable that this network of networks, as one writer stated, is still in the Jurassic stage of development (Masters 1994). It is also important that we not get swept away by the hype of it all (Billings 1994). The Internet is a continually evolving information resource which is still in its very early stages of development. Access, depending on the number of users connected at any one time, can sometimes be slow and frustrating—especially when any of the following messages appear on one's computer screen: "unable to connect to remote host," or "connection to remote host refused," or "maximum users exceeded, try later."

In spite of all the accolades given to the Internet, there is a "down side" that educators might consider. The Internet can be highly addictive. It is not unusual for users to spend hours at a time communicating via computer with others on the Internet or simply browsing the unnumbered data resources.

Inasmuch as the Internet is a decentralized conglomeration of networks with no central administrative headquarters or governing body, much information on the Internet is controversial. The Internet, by design, is uncensored. No one fully monitors or censors information entered to Internet's archives. As a result, not only can students access unlimited information on almost every wholesome topic known to man, they can also access information on almost every deviant and perverse topic in our society. And, there is currently no easy way to totally restrict or limit student access through hardware or software devices.

Some K-12 school administrators have adopted an "Appropriate Use Policy for Internet Users" which stipulates that students shall not intentionally access or download any text file or picture, or engage in any conference, that includes pornography, violence, racism, anarchy, treason, or discrimination. Access to such information is permitted only when (1) permission has been granted from the building principal, identifying the specific purpose and educational value of such access; and (2) the teacher has requested and received permission from the parent/guardian of each student involved (Wood, Blacket, Owens, and Harrison 1994).

Getting Connected to the Internet

There are a number of ways that users can log on to the Internet. One is by means of a computer which is directly connected to the Internet (Hahn and Stout 1994). Most Internet users at universities, government agencies, and large corporations have their own Internet accounts which are paid for by their institutions. As a result, many users think the Internet is free. The Information Superhighway, however, is not a freeway; it is a toll-way.

Some K-12 schools have partnered with local colleges or universities to receive Internet accounts. In many cases, these have been provided at no cost or at nominal cost to the school. The host institution, however, does pay a recurring telephone or line access charge to connect to the Internet. Understandably, most rural schools are not near universities so they do not have this option open to them.

An alternative for connecting new users is to gain entrance through a commercial vender. The user pays a monthly bill to receive an Internet account and typically also pays a "use fee" based on number of hours online each month. Logging on through a commercial vender usually permits access to messaging services such as e-mail, discussion groups, and newsgroups, but may not provide users with a "full connect" to databases offering images, sound, and video clips. Among some of the commercial vendors serving as entrance points or "gateways" to the Internet are *America Online*, *Compuserve*, *Delphi*, *Genie*, and *Prodigy* (Cahape 1994). Toll-free telephone numbers to contact these vendors for current information on costs and services are: *American Online*, 800/827-6364; *Compuserve*, 800/848-8199; *Delphi*, 800/544-4005; *Genie*, 800/638-9636; and *Prodigy*, 800/776-3449.

Another means of connecting to the Internet is through a statewide or regional network. *NetILLINOIS* provides Internet access for Illinois residents and organizations. Users in Carbondale, Charleston, Chicago, Effingham, Peoria, the Quad Cities, Quincy, and Springfield can dial direct through local telephone access (Internet Access 1994). Schools located outside these cities can dial through an 800 toll-free service to connect to *netILLINOIS* and from there link on to the Internet. Once connected, users in either a direct dial or toll dial access pay a use fee per hour of connect time. The current rate ranges between $2.75 per hour to about $8.25 per hour depending on type of dial-up access (Roll 1994).

Yet another option through *netILLINOIS*, where available, is to purchase leased line or direct connection services—no dial-up required. Such access permits higher bandwidth resulting in a significantly faster rate of data transmission. Also, it is typically easier to connect a number of work stations to the Internet for simultaneous information access and exchange. A leased line or direct connection, however, is more costly than dial-up access and may be cost prohibitive for many rural schools. More detailed information about Internet access via *netILLINOIS* can be obtained by calling the *netILLINOIS* office at 708/866-1825.

Freenets are one means of providing partially free access to the Internet. As long as long-distance tolls are not needed to connect to a provider, freenets can be very inexpensive. In Illinois, the Heartland Free-net serves the Peoria (309/674-1100) and the Bloomington-Normal (309/438-2300) areas (Internet Access 1994).

Equipment Needs and Costs To Use the Internet

In order for a school to connect one workstation to the Internet, the following minimum telecommunications/equipment items are needed: direct telephone line (56 kilobits per second); modem connection (14,400 baud); telecommunications software; and either an MS-DOS computer 386 machine or greater operating on DOS 3.1 or higher with at least 640K internal memory and a hard drive with at least 3.5 megabyte of disk space available or any Macintosh computer which runs System 7.0 or greater with at least 2 megabyte of internal memory and a hard drive with at least 2 megabyte of disk space free. To connect multiple workstations at a school site, additional computers and peripherals would be needed as well as additional direct phone line connections if the link is via dial-up access. If the plan is to connect a multiple number of machines, it would be best to use a T1 telephone connection or multiple 56 kilobits per second phone lines and access through a direct connection rather than individual modems.

For those few schools which are able to connect to the Internet through a university or corporate sponsor, the cost for connect fees will likely be minimal or nonexistent. Commercial vendors typically assess a monthly charge as well as a use fee based on the number of hours per month each machine is online or the number of times specific services have been used. Fees and methods of charging vary. An example of charges might be 6 cents per minute while online; 25 cents for each time specific services (e.g.,

listservs, e-mail, and so on) are accessed; or a set charge for the first 10 hours of online time each month followed by 3-4 cents per minute for online time thereafter. Schools which form connections through *netILLINOIS* pay a one-time network access fee and a monthly line use fee. Inasmuch as fees are constantly subject to change, interested readers should contact potential providers for current and detailed pricing options. It is not unusual for users who get "hooked" on the Internet to spend three hours or more a day online. The online connect charges do add up, particularly if multiple machines are on-site and user demand is high.

Illinois Efforts To Promote Internet Access for K-12 Schools

In Fiscal Year 1995, the Illinois General Assembly provided funds to ISBE to promote the use of technologies in K-12 schools. Approximately $5 million earmarked for technology implementation in the classroom and for the installation of networks to increase student and educator access to the Internet was released for competitive bid among schools (Spagnolo 1994). Of the $5 million, about one-half was devoted to support infrastructure upgrades necessary for schools and districts to access the Internet. One intent of this initiative has been to provide schools access to ISBE's information service thereby enabling the electronic transfer of administrative data to schools. Administrators and teachers in Chicago and other selected Illinois cities can connect to the server via local dial-up access. For those schools and teachers out of reach of local dial access, a toll-free 800 service is available. Initially, 32 ports in Springfield and 80 ports in Chicago which accommodate approximately 1,000 and 2,000 simultaneous connections, respectively, have been installed. The ISBE's long-term goal is to make Internet services available to every teacher in Illinois (Whitney 1994). Specific information on how to connect to the ISBE server can be obtained from ISBE offices at 217/782-4313.

Access Illinois is a free service available to Illinois Association of School Boards (IASB) members. In addition to providing a gateway to Internet e-mail, *Access Illinois* links the user to IASB's information server and provides direct access to online programs offered by numerous other organizations and government agencies. Examples include the Governor's office, Illinois Chamber of Commerce, *Illinois Issues* magazine, and the Illinois Department of Commerce and Community Affairs. Additional information can be obtained from the *Access Illinois* systems operator at 217/698-9003.

The Illinois State Library annually provides grants in the amount of 75 cents per student (minimum of $100 per school) to purchase materials for public school libraries and media centers in Illinois. Grant funds must be used to support the services of the school library media center and may be used toward purchase of books, maintenance of equipment, or for computers and telecommunications equipment. More information can be obtained from the Illinois State Library at 800/665-5576.

The Illinois Distance Learning Foundation was established in 1993 under the direction of the Lt. Governor's Rural Affairs Council. The Foundation seeks funding from grants, corporations, private citizens, and other sources to help rural schools implement distance-learning technologies. School administrators submit a formal proposal to the Foundation explaining their need for distance learning and include an outline of their implementation plan. The Foundation board members, as they are able, will either look for funding sources or suggest where funding might be obtained. For more information, contact the Illinois Distance Learning Foundation at 217/783-7514.

Learning More About the Internet

The explosive growth of the Internet has resulted in an increasing number of articles and books on the subject. Due to the ever evolving and changing nature of the Internet, any book on the subject becomes dated shortly after publication. According to Tanaka and Rogers (1995), recent titles which have received positive reviews include *Everybody's Guide to the Internet* by Adam Gaffin, MIT Press; *The Whole Internet* by Ed Krol, O'Reilly and Associates; *Internet Starter Kit* by Adam Engst, Hayden Books; *The Internet Roadmap* by Bennet Falk, Sybex; and *The Internet Unleashed* authored by over two dozen people, published by Sam's Publishing.

Perhaps one of the best resources is to get on the Internet itself and begin "net-surfing." The Frequently Asked Questions (FAQ) data file on the Internet will help orient newcomers. Also, the Internet is a "hot" topic at many professional workshops and seminars statewide and nationally. Attendance at such sessions will likely be useful in acquiring a basic awareness of Internet protocols for navigating through and searching for information.

Conclusion

Understanding and connecting to the Internet can be complicated. It will be some time before all schools in Illinois are connected. In rural areas particularly, state-of-the-art telephone services needed to transport high-band widths of data are not as readily available as in more populated areas. Current wisdom suggests that it may be the year 2000 before high-band telecommunications networks are fully operational in all sectors of our country (Graumann 1994).

To find out more about what school leaders need to do to get connected to the Internet and about the status of phone line services in their local area, school administrators might contact their local telephone carrier to inquire about telephone connections to their school that will link them to the Internet.

Contacting some of the Internet gateway providers listed in this report will result in an increased understanding of equipment needs, line costs, and current services which are available.

If the technology of the printing press and books revolutionized learning in the 15th century, it will be the technology of the computer and the Internet which revolutionizes learning in the 21st century. Once the Internet evolves to its full potential, and students and teachers are skilled in navigating through its databases and services, the information of the world will truly be at their fingertips and before their very eyes.

References

Ayre, R. 1994, October 11. Making the Internet connection. *PC Magazine*:118-122, 126, 128, 132, 134, 135, 138, 139.

Billings, J. C. 1994, November-December. Lurching along the information highway. *Illinois School Board Journal* 62(2):2.

Cahape, P. 1994. How to log on to the Internet. *ERIC/CRESS Bulletin* 6(3):3. Charleston, WV: Appalachia Educational Laboratory, ERIC Clearinghouse on Rural Education and Small Schools.

Dyrli, O. E. 1993, October. The Internet: Bringing global resources to the classroom. *Technology and Learning* 14(2):50-55.

Estrada, S. 1994. *Connecting to the INTERNET*. Sebastopol, CA: O'Reilly & Associates, Inc.

Goals 2000 Panel. 1995, January. *How does the state use technology as an integral part of the state improvement plan to improve student learning in all schools.* Unpublished report prepared for the Illinois State Board of Education, Springfield.

Graumann, P. J. 1994. The road to the information superhighway. *Technology and Learning* 14(6):28-34.

Hahn, H., and Stout, R. 1994. *The Internet complete reference.* New York: Osborne McGraw-Hill.

Illinois State Board of Education. 1992. *Illinois goals: World-class education for the 21st century.* Springfield: ISBE.

Internet Access for Private Citizens and Local Businesses. 1994, April 20. Electronic Communications Series - 1d, produced by the Academic Computing Office at Western Illinois University, Macomb.

The Internet Society. 1994, July 13. *About Internet.* An information sheet provided at the Mining "The Net" Conference held in Des Moines, Iowa. Also available via O'Reilly & Associates, Inc. @ email: ibox@ora.com.

Jain, V. K. 1994, November. The multimedia magic carpet. In *The world and I: A chronicle of our changing times*, 25-31. Washington, DC: *The Washington Times* Corporation.

Jensen, R. E. 1993, July-August. The technology of the future is already here. *Academe*:8-13.

Jones, B. F., Valdez, G., and Rasmussen, C. 1994. *Toward redefining technology effectiveness in education.* Unpublished report prepared by the North Central Regional Laboratory for the Illinois State Board of Education, Springfield.

Masters, B. S. 1994, March. Press sees Internet lights and shadows. *Academic Leader*:5.

Pawloski, B. 1994, April. How I found out about the Internet. *Educational Leadership* 51(7):69-72.

Pea, R. D. 1992. Augmenting the discourse of learning with computer-based learning environments. In *Computer-based learning environments and problem solving*, eds. E. De Corte, M. C. Linn, H. Mandl, and L. Verschaffel, 313-44. New York: Springer-Verlag.

Roll, P. 1994, November 8. *Regional meetings on Internet access for Illinois K-12 schools.* Presentation by *netILLINOIS* at Sangamon State University, Springfield, Illinois.

Spagnolo, J. A. 1994, October. *Technology implementation in schools and installation of networks.* Requests for Proposals. Distributed to Illinois schools in early October by the Illinois State Board of Education, Springfield.

Spagnolo, J. A. 1995, January. *The Illinois Quality Schools Initiative: Building the foundations for change.* A Concept Paper. Unpublished report prepared for the Illinois State Board of Education, Springfield.

Tanaka, J., and Rogers, A. 1995, January. Navigating the Internet. *Newsweek*: 66.

U.S. Department of Commerce. 1994. *A transformation of learning: Use of the NII for education and lifelong learning.* Washington, DC: U.S. Department of Commerce, National Institute of Standards and Technology.

Weir, S. 1993. *Electronic communities of learners: Facts or fiction? TERC Star School Project Evaluation.* Cambridge, MA: Technology Education Research Centers Communications.

Whitney, F. R. 1994, November 8. *Regional meetings on Internet access for Illinois K-12 schools.* Presentation by *netILLINOIS* at Sangamon State University, Springfield, Illinois.

Wood, S., Hacket, J., Owens, B., and Harrison, G. 1994, December. *Internet Appropriate Use Policy: Executive summary.* Unpublished report prepared by the Great River Area Education Agency #16, Burlington, Iowa.

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