DOCUMENT RESUME

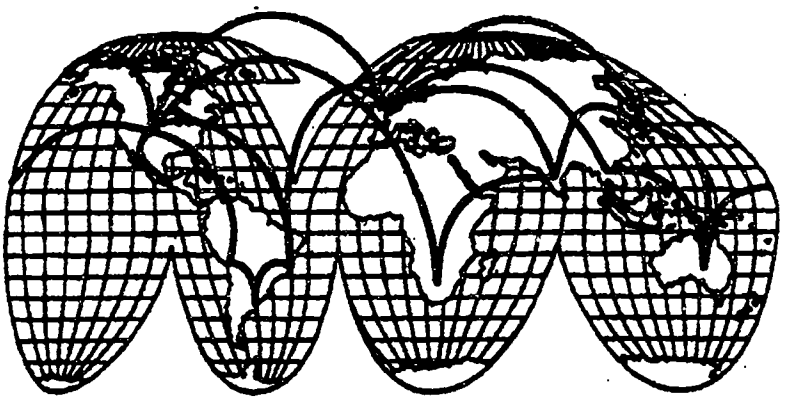
ED 389 284 IR 017 495

TITLE	Tel-Ed '95, Proceedings of the International Conference on Telecommunications in Education (4th, Fort Lauderdale, Florida, November 30-December 3, 1995).
INSTITUTION	Florida Association for Computers in Education.; International Society for Technology in Education, Eugene, OR.
SPONS AGENCY	Office of Educational Research and Improvement (ED), Washington, DC.
PUB DATE	Nov 95
CONTRACT	RP91002001-RP91002010
NOTE	293p.; For proceedings of the 1994 Conference on Telecommunications in Education, see ED 377 824.
PUB TYPE	Collected Works - Conference Proceedings (021)
EDRS PRICE	MF01/PC12 Plus Postage.
DESCRIPTORS	Access to Information; Adult Education; Computer Assisted Instruction; *Computer Uses in Education; Costs; Distance Education; Educational Change; *Educational Development; Educational Finance; Electronic Mail; Elementary Secondary Education; Equal Education; *Information Technology; Multimedia Materials; *Professional Development; *Telecommunications; Teleconferencing
IDENTIFIERS	Internet

ABSTRACT

This conference was designed to offer a variety of experiences for novice and experienced technology users to facilitate new ways of incorporating information technologies in education. The topics covered in these proceedings range from elementary to adult education and cross all disciplines. The following major themes are discussed: (1) professional development; (2) distance education; (3) funding and costs; (4) partnerships in education; (5) integrating the Internet and multimedia; (6) educational change; (7) equal access; and (8) student and teacher connections through teleconferencing and electronic mail. The proceedings are organized alphabetically by the author and include abstracts (for all) and full text (for some) of the papers. (AEF)

Conference Proceedings



Tel•Ed '95

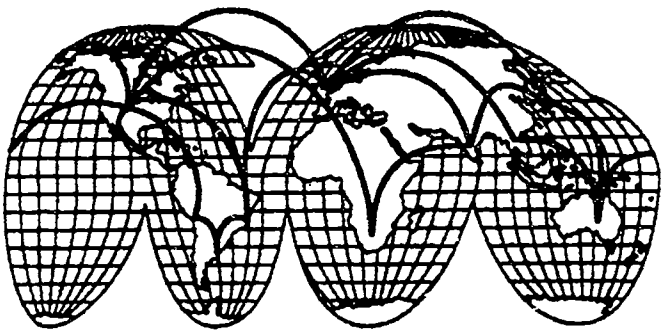
The Fourth International Conference on Telecommunications in Education

November 30-December 3, 1995
Fort Lauderdale, Florida
Broward County Convention Center

Presented By
International Society for Technology in Education (ISTE)
ISTE's Special Interest Group for Telecommunications (SIG/Tel)
and
Florida Association for Computers in Education (FACE)

Proceedings Produced By
SouthEastern Regional Vision for Education (SERVE)

Conference Proceedings



Tel•Ed '95

The Fourth International Conference on Telecommunications in Education

Proceedings of TEL•ED '95

Published by
SERVE
345 S. Magnolia Dr., Suite D-23
Tallahassee, FL 32301

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For
International Society for Technology in Education, November 1995

This publication is sponsored wholly or in part by the U.S. Department of Education, Office of Educational Research and Improvement, under contract numbers RP91002001 through RP91002010. The content of this publication does not necessarily relfect the views of any individual laboratory, the Department of Education, or any other agency of the U.S. Government.

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Message from Your Conference Co-Chairs

Dear Friends Around the Globe,

Thank you for joining us in Fort Lauderdale, Florida at the beautiful Broward County Convention Center for Tel•Ed '95 and sharing the experiences, knowledge, and visions of telecommunications and technology in education. The International Society for Technology in Education (ISTE) and the Florida Association for Computers in Education (FACE) are pleased to jointly sponsor this opportunity for educators from around the world to join together in this unique global forum.

The program has been carefully crafted to offer a wide variety of experiences for novice as well as experienced technology users. Whether your interest is from the perspective of an educator, media specialist, technology coordinator, technology provider, policymaker, parent, and/or school board representative, you will find sessions and workshops to spark new ways of thinking about what you do and the ways in which you might best incorporate information technologies into your world. An interesting group of keynote speakers, and an extensive list of exhibitors, will stimulate new ideas and address evolving new issues in the area of telecommunication technologies. You will leave with interesting ideas, new questions, the most current information, and many new friends.

Tel•Ed '95 Conference Co-Chairs
Ana E. Gutierrez Mackay
Lynne Schrum

Welcome from Your Program Co-Chairs

Welcome to the *Fourth International Conference on Telecommunications in Education.* We hope that you will find it a stimulating and rewarding experience.

The program for Tel•Ed '95 includes a wide range of presentations on exciting new developments in networked teaching and learning. We hope you will enjoy the large number of collaborative sessions in which presenters have used technology to bridge distances, not only in working together, but in planning for their presentations at Tel•Ed '95. We hope that the spirit of this collaborative work will be pervasive throughout your experiences at Fort Lauderdale.

Our goal in planning for this conference is to use the technology to create new forms of conference presentations. This is one field in which it makes sense for the technology to be an embedded part of the talk rather than the subject of discourse. You will find that many of the sessions will have in place the technology to link you with ideas, information, and people located anywhere in the world. This is an approach that we hope to continue to develop for future conferences.

It is our hope that these links open up new worlds for you to explore and that through these gateways you will develop professional and personal links that will lead to ideas and people that will fundamentally change the way you think about teaching and learning.

We hope you will be able to attend some of the workshops available both before and after the conference. The hands-on experiences and small group seminar interactions provide an excellent introduction or review of your educational experiences at Tel•Ed.

Tel•Ed is, at its heart, about collaboration. And, at this very special conference you will find the people who are creating new forms of teaching and learning through tele-collaboration. Social functions, informal tours, and visits provide additional avenues to establish personal ties that can be extended with technology. So, enjoy meeting the people who you have come to know through their words and images on computer screens.

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ISTE

The International Society for Technology in Education (ISTE) and its Special Interest Group for Telecommunications, SIG/Tel, promote appropriate uses of technology to support and improve teaching and learning. Representing more than 40,000 educators, ISTE is the largest professional society committed to the improvement of K-12 education through technology-based curriculum, instruction, and administrative services. A nonprofit, self-supporting organization, ISTE provides college educators, information resource managers, and K-12 educators with the latest information and resources available for classroom integration of computer-based technology.

ISTE publishes Learning and Leading with Technology, the Journal of Research on Computing in Education, and other periodicals, plus an expanding line of computer education books and courseware.

With offices in Eugene, Oregon, and Arlington, Virginia, ISTE offers members an array of professional career enhancement and enrichment opportunities. These efforts are facilitated through special events, a network of Organization Affiliates, a Private Sector Council, special interest groups, distance education courses, and online information services.

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FACE

The Florida Association for Computers in Education (FACE) traces is origins to the 1985 Florida Instruction Computing Conference when a small group of computer-using educators gathered together and identified the need for an organized effort focused on promoting the instructional use of computers. From this need, FACE was born with membership opened to all interested in the pursuit of the purposes of this new group:

- Promote improvement among educators using technology.
- Promote cooperation and communication among educators using technology.

♦ Promote improvement of education through the use of computers and related technologies.

From that initial small gathering, FACE has grown into a viable organization of more than 1,300 members, which is an Organization Affiliate of the International Society for Technology in Education (ISTE). It cosponsors the Florida Educational Technology Conference, the Florida Instructional Technology Leadership Award, and the Florida Instructional Computing Teacher of the Year Award. FACE has established the Florida Association for Computers in Education for Students (FACES), which is open to students in K-12.

In its brief history, FACE has been active in a number of areas important to the instructional use of computers. Valuable input from FACE members helped to shape requirements for computer science certification, and FACE members participated in the creation and validation of the computer science certification examination. FACE members have urged their legislators to support classroom computer use philosophically and with appropriations by seeking reinstatement of computer education into summer inservice institutes.

As FACE continues to grow and make its presence felt, it has been asked to provide representation on important statewide committees focusing on a variety of areas such as textbook selection, multimedia co-development, software acquisition, teacher workstations, model teacher education program, the Comprehensive Plan for Math, Science, and Computer Education, and the Retrofit Grant Program.

FACE's state executive board represents a variety of computing interests throughout Florida. There are representatives from the Florida Department of Education, Florida Instructional Computing Supervisors, the Florida Association of Educational Data Systems, and the International Society for Technology in Education, as well as university representatives, and elected representatives from six geographic regions. There are eighteen local FACE organizations, scattered throughout the six Florida regions, which sponsor workshops and other activities specifically aimed at their membership. FACE Region VI (Southeast Florida) host regional conferences accommodating more than 3,000 state, national, and international educators and more than 100 vendors. Now in their eighth year, these conferences address such issues as new software, new hardware, multimedia, telecommunications, networking, and the one-computer classroom. FACE is instrumental in providing leadership in education in all six of its local regions and serves a catalyst and information center addressing the urgent issues of instructional technology.

Most members are involved in instructional use of computers, but membership from the administrative side is growing. In addition to regular memberships, FACE offers memberships for full-time students, institutions, and corporations. The membership year extends from FETC to FETC and benefits include both local and state memberships as well as *About Face*, which is the organization's newsletter, and a reduced rate subscription to FTEQ.

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SERVE, the SouthEastern Regional Vision for Education, is a coalition of educators, business leaders, governors, and policymakers who are seeking comprehensive and lasting improvement in education in Alabama, Florida, Georgia, Mississippi, North Carolina, and South Carolina. The name Laboratory reflects a commitment to creating a shared vision of the future of education in the Southeast.

The mission of SERVE is to provide leadership, support, and research to assist state and local efforts in improving educational outcomes, especially for at-risk and rural students. Laboratory goals are to address critical issues in the region, work as a catalyst for positive change, serve as a broker of exemplary research and practice, and become an invaluable source of information for individuals working to promote systemic educational improvement.

Collaboration and networking are at the heart of SERVE's mission; the laboratory's structure is itself a model of collaboration. The laboratory has four offices in the region to better serve the needs of state and local education stakeholders. SERVE's Greensboro office managers a variety of research and development projects that meet regional needs for the development of new products, services and information about emerging issues. The laboratory's information office is located in Tallahassee. Field services offices are located in Atlanta, Greensboro, Tallahassee, and on the campus of Delta State University in Cleveland, Mississippi.

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Key words: Internet, training, teachers

Abstract

Students with a variety of ages, interests, background, and abilities come to a class requiring hard work, unavoidable frustrations, and somewhat uncertain outcomes. By changing the course structure to include collaboration, time variation to completion rather than mark variation, material relevant outside of the class setting, and interesting experiences in the instructor's background, student enthusiasm and achievement has been high.

Problem 1: wide variety of backgrounds and interests. Strategy: have students work in pairs or small groups, laboratory and on-line consultation readily available.

Problem 2: wide variety of Internet and e-mail connections. Strategy: attempt to generalize functions, using each connection as a specific example.

Problem 3: the Internet is an uncertain thing. Strategy: develop a new frontier, pioneering spirit. You may find out something even your instructor does not know.

Problem 4: no real "card catalog" for finding things. Strategy: motivation for learning search tools. Build your own reference list. Develop (with others) a compendium of useful sources for a specific purpose.

Problem 5: How do you tell good from bad, and, later, better from good? Strategy: everyone gets a (different) site to explore and report to the class about for each tool.

Problem 6: How do we tie it all together (The "final" exam)? Strategy: Each person is assigned 4 unique "hunt" questions, and must answer to the entire class at least 3 of them not only with the information found, but a description of how they found it, using Internet tools only.

Destined for Dissatisfaction?: Telecommunications in Tomorrow's Schools

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Key words: futurism, planning, integration, policy

Abstract

Multiple, varied dilemmas face educators today as we attempt to incorporate increasingly rich and complex telecommunications technologies into instruction. While this condition poses marvelous opportunities on the horizon for teachers, a concomitant set of problems lie in the fore as educators and educational institutions begin learning how to deal with the myriad of possibilities. A group of the most revered leaders in contemporary applications of telecommunications for instruction offer their best thoughts and advice for maximizing the potential of these technologies.

Great energies will be required to ensure that telecommunications technologies are used to strengthen educational opportunities for learners in tomorrow's schools. Some educational technologists predict that overwhelming dissatisfaction will be the most easily recognizable manifestation of students, as they encounter technology. Conversely, other experts say that we shall witness nothing but effervescent success among learners, although the success will be at varying levels and will be seen in varying ways. Regardless at which end of the spectrum one stands, the critical consideration is that we enhance the quality of experiences the learners encounter. A part of the solution to the predicted impending dilemmas is an open examination of various avenues of pursuit. We must capitalize on the creative, collective energies of experts and practitioners to squelch any possibility of encountering a destiny of dissatisfaction.

Kathleen Fulton, in the report released recently by the Congressional Office of Technology Assessment (OTA), *Teachers and Technology: Making the Connection*, observed that, "Despite over a decade of investment in educational hardware and software, relatively few of the nation's 2.8 million teachers use technology in their teaching." Fulton noted further that, "While 75 percent of public schools have access to some kind of computer network, and 35 percent of public schools have access to the Internet, only 3 percent of instructional rooms (classrooms, labs, and media centers) are connected to the Internet." Facts such as these are alarming, but they provide benchmarks against which we can measure our progress if we project several years into the future and plan now for activities that will help assure maximally-effective incorporation of telecommunications technologies directly into the instructional process.

Inabeth Miller (Lightspan Partnership, Incorporated), after many years of working very closely with telecommunications technologies at the state level in Massachusetts, rings the bell of warning to educators that we awaken our creative imaginations in such a way that telecommunications are used for fresh approaches to learning. The span of learner types grows at a remarkable pace; the role of telecommunications, then, in the continuing education process for these individuals must be adaptable to accommodate learners' needs. Perhaps the technologies employed currently will be grossly insufficient before the year 2000. For example, the Internet as we know it currently may be a relic that becomes very quickly the main topic of reminiscence among youth.

Miller contends that the Internet surfing tools available today will be eclipsed by new, more expansive mechanisms that bring learning to the learner's lap. One example may be set-top boxes, or some slight variation. A key element will be the level of control that the learner is able to maintain over the environment. The quality of interactive applications will surpass significantly what we are accustomed to seeing employed now. Students will operate in virtual learning worlds that entice them to explore, conjecture, and build. A dangerous accouterment, though, will be the rampant *complacency* encroaching on effective, time-proven instructional techniques. A "don't care" attitude can inflict great harm, yet it can spread like a virus. A powerful, positive force is possible through the effective use of networked telecommunications tools.

Bonnie Bracey, as the only "real teacher" on the National Information Infrastructure Advisory Council (NIIAC), has witnessed the traditional uses of telecommunications in classrooms. In addition, she has encountered the pioneers who dream of a new way. Demonstrations have been conducted around the country for the NIIAC, in hopes that some of the new approaches will be adopted and promoted for application on the information superhighway. Bracey is an elementary teacher; she has, therefore, viewed her experiences from the vantage point of a classroom teacher who must address daily routines of teaching.

Bracey envisions that the potential dissatisfaction looming in education lies not with the technology at all. Rather, shortcomings appear inevitable in the challenging, effective implementation of *human* creative talents that are malleable. Bracey feels that one solution to the destiny with dissatisfaction is to create exemplary models of successful practice that can be emulated.

Ferdi Serim has developed and proposed a revolutionary model for training teachers to use the Internet, via the Online Internet Institute. The model focuses on instructional applications that must occur when pragmatic, sound instructional principles are applied. The Internet simply is an overlay that covers and supports instruction. An additional component of Serim's model is the perpetual strengthening of professional community, as teachers are linked, via the Internet, in pursuit of common goals and seeking solutions to common problems.

With appropriate development and application of properly-focused activities, we can avoid a destiny with disappointment in our use of telecommunications in the places of learning. To accomplish this dream, though, will take the cumulative energies of thousands of educators, empowered by equitable connectivity, working harmoniously.

National Center for Technology Planning: The Pot at the End of the Rainbow

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Key words: planning, resources, integration, applications, help

Abstract

Technology planning is an activity in which educators are engaged currently in record numbers. The reasons for this surge are many and varied. Several state legislatures have enacted laws that release millions of dollars to school coffers for technology enhancement. Most often, the prerequisite to acquisition of these funds is the development of a local technology planning document.

Some technology leaders are realizing that the money they expended in the past has not been based upon an organized set of strategies that are success-oriented. They want to change future actions, so they have become engaged in technology planning efforts designed to overcome previous mistakes.

As increasingly robust applications are employed at the classroom level and as students, in significantly greater numbers, are feeling empowered by their use of the technologies, wise educators are realizing the importance of involving students in planning for the future. Multiple successes that students experience cause the young people to carry a positive message about technology home to their parents. As a result, many homes that possess the financial capacity to do so are investing in these technologies so the entire family unit can enjoy the successes that the youth encountered at school. This scenario is occurring and multiplying at a ravenous pace. Educators, then, are realizing the importance of engaging in local technology planning and of ensuring that students, parents, and other community members are included as active participants in the process.

Federal legislation has come forth that includes financial assistance for states and local technology planning activities. As a part of the *Goals 2000: Educate America Act*, states are given money to aid in mustering a coalition of energies that will help ensure sensible, practical application of technologies to instruction at all levels throughout the states. Through the *Improving America's Schools Act*, several million dollars are earmarked to assist technology planning at the local level.

The aforementioned reasons, along with many others, indicate that American educators are experiencing a period of renewal, with regard to technology planning. One extremely critical element to the success of all this activity is having adequate and appropriate resources that provide "just-in-time" assistance. The National Center for Technology Planning (NCTP) is fulfilling that role in a unique and supremely important way.

NCTP serves as a clearinghouse for a myriad of technology planning aids and resources. A hard copy collection of exemplary technology plans exists due to the willingness of hundreds of schools and educators around the world to share with others what they have created. The advent and astounding proliferation of electronic telecommunication networks, though, made it essential that these resources could be accessible through the Internet and other online services.

NCTP volunteers worked very hard to compile, convert, and make available as many technology planning resources as possible and practicable. By doing so, NCTP created a virtual smorgasbord—"the pot at the end of the rainbow." We technology planners must not focus on either the rainbow (as beautiful and alluring as it may be) or the pot itself. Rather, it is the contents of the pot that are of utmost importance.

The metaphor of the pot continues to include the understanding that **people** are the critical components. People must tend the pot. People will dip from the pot. People will watch the pot. People will lead other people to the pot for assistance. People, too, must contribute to the pot if its contents are to remain valuable. Thousands of people, using various methods of online connectivity, have dipped from the NCTP planning pot; several have promised to return to the pot bringing improved delicacies as a result of their having gathered original, basic ingredients during a prior visit to the pot. The real beauty of this scenario is that the gold we all expect to find in the rainbow's pot is given a steadily-enhanced luster because people contribute continually.

The collection of technology planning aids available through the NCTP online repository increases in quantity and quality. Planners can reach NCTP using a variety of methods: 1) anonymous ftp to ftp.msstate.edu in the directory path, /pub/archives/nctp; 2) gopher to gopher.msstate.edu in subdirectory: Resources Maintained at MsState Univ; 3) World Wide Web using the URL—http://www2.msstate.edu/~lsa1/nctp (this area has the richest collection of resources); 4) Scholastic Network on America Online using keyword: SN Technology, then choose "Technology Plans Library."

The pot at the end of the rainbow **can** be found. Further, you can dip into the pot and take away wonderful items to help you in your technology planning. For the pot to retain its important position in the area of technology planning, though, it is crucial that you come back to the pot with your contributions. When thousands of people, real users in actual situations, add their great materials to the pot, that makes us all stand back and admire the new, enhanced glow of the technology rainbow!

PreSTO: Preservice Teachers Form a Global Online Learning Community

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Key words: teacher education, training, projects

Abstract

Global seems to be one of the main "catch phrases" added to educators' vocabularies within recent years. Certainly, increased access to the Internet and other online services has bolstered the ability for us to work together in improving instructional processes and policies. Intense dedication by teacher education faculty who desire to promote systemic enrichment in preservice teacher programs has been manifested by constructing and promoting an environment that builds collegiality among thousands of preservice teachers around the world.

PreSTO (Preservice and Student Teachers Online) is an Internet discussion list dedicated specifically as a global online learning community where students preparing for careers in teaching share their energies, ideas, techniques, and queries. In addition, many higher education teacher education faculty are subscribers; they provide strong leadership to the students. The key point that illuminates the strength of the PreSTO concept is that all participants—preservice teachers, student teachers, in-service teachers, and teacher education faculty, alike—learn together.

Deliberations have occurred on PreSTO that span a wide variety of topics. For example, a subscriber might find a message from a student seeking assistance on a class project dealing with multi-grade classrooms, cultural sensitivity, gender equity, solar retrofitting, learner variances, or the writing of behavioral objectives. Regular fare of messaging includes: school prayer, retention rules, classroom/student discipline strategies, classroom/student management strategies, comparative analysis of teacher education programs, certification requirements state-by-state, music in the classroom, sources for lesson plans, interview techniques and strategies, multi-age classrooms, site-based management, and professional association involvement. This rich conversation provides actual demonstration of how beneficial an online community for learners can become. PreSTO has evolved into one of the most advantageous components of many students' preservice teacher education programs. Just as distance learning opportunities have provided a very necessary ingredient for school districts that do not have sufficient resources to offer exotic courses, PreSTO enables students in teacher education programs that are rich with technology implementation practices to share their experiences with students in programs that are sparse.

PreSTO was established and is managed by Larry Anderson in the Mississippi State University College of Education. It is an integral part of the teacher education program there. Faculty and students hold periodic face-to-face meetings to discuss progress on PreSTO as well as desires for future activities. PreSTO has been responsible for steadily improving modification to teacher education at Mississippi State University. PreSTO will provide a fantastic conduit for disseminating positive change ideas to colleges of education throughout the world, too.

Online communities of various configurations are built by teacher education faculty and students at many colleges and universities. At the University of Illinois Urbana-Champaign, Dr. Michael Waugh developed a teleapprenticeship program in which preservice teachers worked with faculty and inservice teachers to strengthen the entire education picture. Students initiated their relationships in a classroom setting, but expanded these soon through their direct involvement with inservice teachers. As the online friendships flourished, so did the levels of expertise in various disciplines that the preservice teachers encountered. These effective teleapprenticeships helped all involved "turn the corner" toward significantly improved instruction. Waugh's efforts with this teleapprenticeship program have been hailed widely as one of the most creative ways to infuse technology into an instructional program.

Subscription information for PreSTO is as follows:

- send mail to **listproc@ra.msstate.edu**
- leave the Subject line blank
- enter this into the message area: **subscribe presto yourfirstname yourlastname**

Make sure you have nothing else in the message area. If you have a signature line in most messages, delete this information. After you have been subscribed successfully, you should send subsequent messages to everyone on the list by sending mail to: **presto@ra.msstate.edu**—we look forward to having you.

Educators' Use of a Statewide Telecomputing Network

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Key words: telecomputing, computer-mediated communication, networking, survey research

Abstract

This study investigated use of TENET, a statewide educational telecomputing network in Texas. A 70-item survey was sent to a random sample of 300 TENET users. The response rate was 66%. Most respondents were seasoned and highly educated public school teachers, support staff, and administrators, who were experienced computer users with easy access to the network . Most worked with other TENET users. Electronic mail was the most often used network function. Nearly all felt TENET was useful.

Introduction

In recent years there has been a significant increase in the number of educators with access to educational telecomputing networks as well as growth in the number and quality of networked educational resources. Recent surveys indicate that between 35-40% of American educators have access to telecomputing facilities from their school buildings, although only 3-5% have access from their own classrooms (National Center for Educational Statistics, 1995; National Institute of Standards and Technology, 1994). More than 40 states now provide public educators with some level of Internet access (Doty, 1995).

The rapid growth rates in the availability and use of educational telecomputing systems highlights an immediate need for applicable research results that will help guide efforts to design, implement, and make effective use of such networks. Although a considerable amount of descriptive information exists about the kinds of telecomputing activities and projects being conducted by educators, and some small-scale research studies focusing mainly on individual projects have been reported, there has been little broad-scale systematic analysis of educators' usage of telecomputing networks (Honey & Henríquez, 1993). Thus far, four survey-based studies of precollege educators' use of telecomputing networks have been reported (Broholm & Aust, 1994; Frazier & Frazier, 1993; Honey & Henríquez, 1993; Mathies & Nelson, 1995).

The primary aim of the present study was to investigate educators' use of a statewide educational telecomputing network. Specifically, the following research questions were asked:

1. What are the characteristics of network users, the contexts in which they use the network, and their perceptions of it?

2. How much is the network used overall and how often are different types of network services used?

3. What are the outcomes of network use?

The current study differs from previous studies in that it is a large-scale survey of a randomly selected sample of users of a single educational telecomputing network. Although many claims have been made regarding the benefits of such networks, and substantial resources have been devoted to their development and implementation, there has been little empirical evidence to support these claims or to justify the allocation of resources to such endeavors.

The site for the study reported in this paper is the Texas Education Network (TENET), which was authorized and established through Senate Bill 650 of the 71st Texas Legislature (Parker, 1989) and officially opened in August of 1991. More than 33,000 educators (representing approximately 15% of the state's teaching force) registered for TENET accounts during its first 3 years of operation. At the time the study was conducted, TENET offered electronic mail, discussion forums or newsgroups, Clarinet's news service, reference databases, interactive access to remote Internet services via telnet, access to file archives via FTP, and the ability to locate and retrieve Internet resources via gopher.

Method

Sample

Surveys were sent via electronic mail to a random sample of 300 TENET account holders who had used the system at least once during a two-week period immediately prior to the survey mailing. In addition, these individuals had previously agreed to participate in research on TENET. During the Fall of 1993, as part of the process of updating information in TENET's user directory, individuals were

asked about whether they would be willing to participate in research regarding TENET. The system operator provided a list of 8,382 users who had responded affirmatively to that question, as well as a list of 7,620 users who had logged on to TENET during a 2-week period in mid-June of 1994. The sampling frame consisted of 3,839 users who appeared on both lists, from which a random sample of 300 user IDs was drawn.

A total of 190 surveys were returned within 4 months of the initial mailing. Data provided by the system operator indicated that 12 of the 300 who were sent surveys did not log on during the survey period. Thus, the response rate based upon the 288 users who actually received the survey was 66%. Excluding undeliverable surveys and/or ineligible respondents from consideration in calculating response rates is common practice with conventional interviews and mailed surveys (Babbie, 1990; Dillman, 1978). According to Dillman, this procedure provides a more direct indicator of a method's response-inducing capabilities than do other methods.

To investigate the potential for response bias, we compared the frequency of log-ons by respondents and nonrespondents. These data were generated from log files kept on the TENET computers over the 4-month survey period. This comparison revealed that respondents were likely to use the system more often ($t = -4.21$, $p < .001$) and for more time ($t = -3.22$, $p < .001$) than were nonrespondents. On the average, respondents logged in more than twice as often and for more than twice as much time than did nonrespondents.

Procedure

Procedures for administering the survey were adapted from Dillman's (1978) Total Design Method for mailed surveys and had been used in a previous survey of users of a community telecomputing system (Anderson, 1992; Anderson & Gansneder, 1995). A cover letter and 70-item survey were sent to sample members via electronic mail. The cover letter introduced the questionnaire and attempted to motivate individuals to respond. Each person's first name was typed into the greeting of the cover letter, which was sent in a separate message immediately preceding the survey. Respondents could respond via e-mail, print out the survey and return it via regular postal mail, or request a paper-based survey and return it in the self-addressed stamped return envelope supplied. The initial mailing yielded a return rate of about 25%.

Up to three follow-up messages were sent to nonrespondents at 2, 4, and 8 weeks from the initial mailing date. As with the initial mailing, the follow-up messages were sent individually and each person's first name was typed into the greeting of the message. Each follow-up message served as a reminder and used a slightly different approach and successively stronger appeals for the return of the survey. These follow-up messages yielded returns of 16%, 18%, and 7%, respectively.

Surveys in which respondents edited in their responses could usually be coded by computer, whereas others had to be coded by hand in the usual manner, as did responses to open-ended questions. Answers to open-ended questions and comments within or at the end of the survey instrument were transferred to into a word-processed document in tabular format. This allowed us to categorize and sort data for the purpose of content-analyzing answers to open-ended questions and written survey comments.

Instrument

The 70-item questionnaire was designed to measures variables which have been identified as important, according to several theoretical perspectives, to understanding use of computer-mediated communication systems. The selection of variables was based primarily upon a model for studying personal computing developed by Dutton, Rogers, and Jun (1987) which, in turn, was based upon the

theories of Diffusion of Innovations (Rogers, 1983) and Uses and Gratifications (Katz, Blumler, & Gurevitch, 1974). Five categories of variables were measured by the survey: personal attributes, environmental characteristics, perceived media characteristics, system usage, and gratifications obtained.

Whenever possible, survey questions were based upon reliable and valid measures that had been used in previous studies. In many cases, one variable was measured by several related items which could then be combined to form a scale. Many items were derived from two surveys of a community telecomputing system (Anderson, 1992; Swift, 1989) and two surveys of educational telecomputing systems (Frazier & Frazier, 1993; Honey & Henríquez, 1993).

Results

Personal Attributes

TENET users tended to be seasoned educators who worked in public school systems and had completed advanced levels of schooling. Seventy-seven percent of the respondents worked in public school systems. The majority (66%) had 10 or more years of experience working as educators. Teaching tenure ranged from 0 to 44 years, with an average of 15 years. Thirty-five percent of the sample were classroom teachers, 16% served in support roles such as that of library media specialist or computer coordinator, and 24% were school or district-level administrators, regional service center staff, or state education agency personnel. More than half (60%) had completed one or more graduate-level degrees.

Respondents ranged in age from 20 to 70, with a mean age of 44. Slightly more than half were female (53%). The sample was geographically diverse; 42% worked in an urban setting, 33% worked in a suburban community, and 26% worked in a rural area. Respondents were scattered among nearly 100 different Texas towns and cities, with clusters of 10 or more located in several of the larger cities.

Respondents had a great deal of experience with using computers. Eighty-seven percent had 5 or more years of experience with computers, with 36% having over 10 years of computer experience. Slightly less than half (44%) had been using TENET for over 2 years. Thirty-seven percent had never used another telecomputing network. Of those who had used other networks, about half (54%) had been using them for more than 2 years.

Environmental Characteristics

The majority of respondents reported easy access to TENET. Over 90% reported that the equipment they ordinarily used to connect to the system was close by, accessible, and convenient. More than half (57%) usually accessed TENET from home. Of those who typically used TENET at work, nearly 90% had access from their own classroom or office. Eighty-six percent reported having relatively few difficulties connecting to the system. Most (87%) dialed into TENET via modem; 61% dialed a local number and 26% dialed a toll-free number. Slightly more than 10% typically accessed TENET via a direct network connection.

Another aspect of access is affordability. Although it was not directly addressed by the survey, cost and/or source of funding emerged as issues of concern to some survey respondents. Twelve respondents chose to address this topic when asked for general comments at the end of the survey. Some expressed frustration about the expense of providing connectivity within school buildings to allow more widespread access to TENET. Half of those who addressed cost in their comments expressed their approval of what was perceived to be a very low price ($5 per year for public school personnel and $25 per year for others) for the amount of interpersonal and informational resources available via

TENET. A few compared TENET to commercially available online services, apparently agreeing that it is less costly, but at the expense of being less user-friendly and/or technically sophisticated.

About half of the respondents had learned to use TENET without assistance, whereas the rest learned with the help of a friend or colleague (23%) or by attending inservices, conference workshops, or college courses (24%). Nearly 40% had no ongoing source of continuing assistance for their use of TENET. Others had help available through other teachers or school staff (19%) or from district-level computer coordinators, TENET trainers, regional service center staff, or university faculty (29%). Several stated a preference for individualized interpersonal assistance rather than from a printed manual or from TENET's telephone-accessible "help desk." Other comments linked assistance with time pressure. Given the busy schedules of typical teachers and administrators, it is not surprising that most respondents reported experiencing pressures in their environment at least occasionally; 93% said their lives sometimes or frequently involved time pressures, 87% reported the occurrence of unexpected problems or situations, and 78% reported experiencing urgent matters or crises. Such pressures, especially with regard to time, may limit the extent to which users explore various features of the system, especially those that are somewhat complex.

Another relevant aspect of users' environment is "social integration" or the extent to which they participated in a community of other users (Burt, 1973). Most respondents (88%) were not the only person using telecomputing at their work site. Of those, about half collaborated with others on telecomputing activities or served as a resource person for others. In addition, 11% of the sample held leadership positions on TENET by serving as a trainer or newsgroup moderator. Most (80%) thought of themselves as members of a community of TENET users even when they were not using the system. Many engaged in interactions with others concerning past (64%) or future (60%) TENET sessions, while nearly three-quarters exchanged tips with others about what to do or how to do something on TENET.

On the average, respondents regularly communicated with at least one or two other people they knew via TENET. Nearly two-thirds kept in touch with 3 or more co-workers or colleagues (including those who were friends), whereas slightly less than a quarter usually corresponded with 3 or more personal or social contacts (who were not also co-workers or colleagues). About half consistently contacted more than 2 people outside their school district but within Texas, whereas only 22% regularly reached more than 2 out-of-state contacts.

Perceived Media Characteristics

On the average, respondents perceived TENET as being relatively user-friendly. About two-thirds considered it understandable, 56% felt it was simple, and 58% rated it as relatively easy to use. Comments regarding TENET's ease of use were mixed, with some indicating a high degree of satisfaction with the user interface and others complaining about its complexity.

Responses were less positive regarding the system's "social presence," or the degree to which users perceived co-communicators to be socially and psychologically present (Short, Williams, & Christie, 1976). Half of the sample indicated that they thought the system was sociable, whereas less than half found it to be sensitive (43%) or personal (41%).

Nearly all the respondents (96%) felt that TENET was useful. More than half (56%) found it to be useful in many ways, whereas almost one-quarter felt that it had "revolutionized their work or communication processes." About three-fourths also rated TENET as effective (78%) or efficient (73%).

"Relative advantage" refers to the degree to which an innovation is perceived as being better than other ways of doing the same thing (Rogers, 1983). Respondents generally found TENET to be

advantageous, compared to other media, for accessing information and communicating with others. Most (87%) agreed that without TENET, it would more difficult to obtain information and that they often looked for information on TENET that they would not otherwise have sought. About 80% said that without TENET it would be more difficult to reach people they wanted to contact and that they often communicated with people who they would not otherwise have contacted.

System Usage

On the average, respondents reported logging onto TENET 4-6 times per week for 15-30 minutes per session and for a total of about 1-3 hours per week. The most popular use of TENET was reading electronic mail. More than three-fourths of the respondents reported almost always or frequently reading electronic mail messages, whereas somewhat fewer (60%) reported sending messages. Slightly less than half said they often read newsgroup messages (46%). However, only a very small percentage (3%) reported frequently posting newsgroup messages. About 30% frequently connected to other Internet services via telnet, while about a quarter frequently used gopher to access Internet resources. Special information databases, such as Grollier's Encyclopedia and the AskEric service were used frequently by 16% of the respondents, while TENET's user directory was used frequently by only 9% of the respondents.

Gratifications Obtained

Prior Uses and Gratifications research has shown that gratifications obtained from media use often factor into three categories: cognitive, diversion, and interpersonal utility (Blumler, 1979; Palmgreen, Wenner, & Rayburn, 1980). In the current study, a fourth category of gratifications was created in order to examine benefits obtained from using TENET for student-oriented purposes.

The most strongly supported gratifications obtained from using TENET were cognitive in nature. More than three-fourths of the respondents agreed that TENET had helped them to "access curriculum materials, content-area information, or news about current events" and to "find out about state, district, or local happenings or staff development activities." Nearly two-thirds also agreed that TENET had enabled them to "participate in discussions on educational issues, problems, or other current topics" and to "exchange teaching ideas, information, or advice."

Support for social or interpersonal gratifications resulting from TENET use was more mixed than that for cognitively-oriented satisfactions. While almost three-fourths felt that TENET had helped them "keep in touch with family, friends, and/or colleagues," less than half found it helpful for planning or scheduling work-related meetings (41%) or social activities (18%).

Support for diversion or entertainment-oriented gratifications was also mixed. Almost 60% of the respondents indicated that TENET allowed them to "participate in entertaining conversations or activities" and that it "provided a nice break from work." On the other hand, only 34% felt that TENET provided a "means of filling up free time."

Benefits obtained from student-oriented uses of the network were the least strongly supported. Forty-four percent of the respondents indicated that TENET had helped them "send or receive reports or student information," 42% agreed that TENET provided students with "access to resources for research projects," and 37% said that it "enabled students to exchange messages with people beyond school boundaries." Only about one-quarter indicated that the network had allowed their students to "participate in online classroom exchange projects" or to "practice writing skills in an authentic context." At the time of the survey, students were only allowed to access the network indirectly via their teacher, as accounts designated for student use were unavailable. Survey comments indicated considerable concern about lack of sufficient student access to TENET for use in instructional activities.

Discussion

The results of this study provide information about the characteristics of TENET users, the contexts in which they used the network, and their perceptions of it, as well as patterns of network use and outcomes of such use. The methodology used in this study was shown to be an effective and efficient way of collecting data from a random sample of network users via electronic mail surveys. The response rate of 66% for the current survey is typically considered good for mailed surveys (Babbie, 1990) and falls within the range (from 50% to 93%) usually attained by surveys employing the Total Design Method (Dillman, 1978).

Respondents to the current survey can probably be categorized as "innovators" or "early adopters" (Rogers, 1983) of educational telecomputing systems. At the time the survey was conducted, approximately 15% percent of Texas teachers had registered for TENET accounts. According to Rogers, innovators and early adopters typically make up 16% of the members of a social system. Having a high level of education has been a consistent predictor of adoption and use of new communication technologies (Rogers, 1986). Respondents to the current survey were, for the most part, highly experienced and educated public school teachers, support staff, and administrators. They tended to be experienced computer users with relatively easy access to equipment needed to use TENET, often from a home computer and modem. This suggests that they were not only early adopters of computers, but also were probably fairly skilled in using them. To ensure equity, it is important to find ways to get less experienced and innovative individuals involved in using telecomputing networks. Concern about the availability and cost of better network connectivity within schools was identified as a predominate theme in the content analysis of survey comments. Providing for adequate network connectivity from school classrooms and offices is one way to enable those without home access to participate in the network.

These findings give us an idea of the conditions under which use of telecomputing networks in education is likely to occur, at least during the early development of such networks. In addition to experience with computers and convenient access to a computer and modem, other contextual factors that may influence the use of telecomputing networks in education include the system's ease of use and the availability of assistance and time for learning to use the network. The majority of respondents perceived TENET as being relatively easy to use. About half had taught themselves to use the system and nearly 40% reported no ongoing source of assistance for using TENET. However, the need for time and assistance for learning to use the network was mentioned by a number of respondents in their comments. Such comments also indicated that respondents preferred informal interpersonal sources of assistance over manuals and other more formal means of help. Proximity to other network users may also be an important condition for network use. The majority of respondents worked with others who also used TENET and reported talking with others about past or future TENET sessions or exchanging tips with others. Making more time available in the school schedule for learning and experimentation and encouraging peer interactions as a means of informal interpersonal assistance are other possible ways to facilitate network use, particularly among less experienced computer users.

Respondents to the current survey were generally active users. On the average, they used the network 4-6 times per week, with nearly one-third logging on once or more each day. Electronic mail was the most often used network function. Respondents in the current study read electronic mail more often than they sent it. After electronic mail, reading newsgroup messages was the next most popular network activity, followed by accessing Internet resources.

TENET clearly provides benefits to educators who actively use the system. Respondents felt overwhelmingly that TENET had been useful to them. Most felt that it had provided them with opportuni-

ities to access information and to communicate with people that would otherwise be difficult or unlikely to occur. Outcomes from using the network were mainly centered around accessing information, exchanging ideas, and discussing issues. Respondents also reported outcomes of an interpersonal or social nature. Three-quarters indicated that TENET was useful for keeping in touch with family, friends and/or colleagues. In addition, about half perceived the system as being sociable. Finally, most respondents indicated that TENET served a diversionary purpose. Nearly 60% reported engaging in entertaining conversations or activities and indicated that using TENET provided a nice break from work.

Student-oriented benefits were not as frequently reported as other types of outcomes. Many of the survey comments indicated that improved access for students was desired. Nevertheless, about 40% of the participants seemed to have found ways to use the network for activities that benefited their students. In addition to access issues, it is likely that involving students in telecomputing activities is a more complex endeavor, and thus it may be more difficult to implement than professionally oriented activities. Educators may need not only improved access for their students, but also improved assistance for using networks in instructional ways.

In order to corroborate the results of the current study and to determine the generalizability of the findings, similar research needs to be replicated on other systems. However, it is not safe to assume that such networks and their users will remain constant over time. Educational telecomputing networks are constantly evolving and growing. The user population is also changing, as less innovative adopters begin using telecomputing networks. Those who adopt such networks later will most likely differ from the early adopters represented in the current study. Thus, ongoing research is needed to further our understanding of network use over time. In addition to descriptive research, as reported in this paper, research on factors associated with network use is needed. More studies of this nature, particularly those that build upon the theories generated by communication researchers, or those that attempt to develop new theories, would help to further our understanding of educators' network use. Such knowledge will help to guide the development and implementation of educational telecomputing networks, as well as provide a basis for improving strategies for helping educators learn to use and effectively apply online resources for professional and instructional purposes.

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Acknowledgments

The author gratefully acknowledges the support and assistance for this project provided by Connie Stout and Gene Titus of the Texas Education Network, Judi Harris at the University of Texas at Austin, and Stephani Wise at Texas Christian University.

The Language of Images in the Transfer of Scientific Information

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Key words: CD-ROM, information, image, language, science, protein, engineering, modeling, design.

Abstract

The molecular modeling is increasing our understanding of molecular mechanisms catalyzed by enzymes as well as providing the opportunity to predict molecular structures from data like the

aminoacyl sequences of proteins derived from genes sequence. The scientific community involved in protein science has progressed to protein engineering and drug design. Bioinformatic techniques are used daily in protein laboratories. Students should have the opportunity to learn and use those techniques during their study in biochemistry and molecular biology. Since the transfer of scientific knowledge has received a boost upon the advent of new technologies like multimedia and the access to Internet, these opportunities are particularly timely.

The CD-ROM seems to be the best support for presenting scientific data concerning fields such as proteins, nucleic acids and carbohydrates (structure and function) in an interactive way. Because CD-ROM is increasingly used in education, it is important to set down some rules concerning the way images are presented in such a support.

Introduction

The multimedia CD-ROM is largely used for transferring knowledge and the "how to". This technology is prominent in the culture, science, leisure, and games sectors. Types of expression such as text, images, video, and sounds are presented on the CD-ROM which is becoming the fist choice of media for many purposes. However, because images are taking an important place in this multimedia, it is necessary to redefine the way of using images and to elaborate a language by which the use of images will correctly convey information. Indeed, in the case of scientific information, graphics, and illustrations, when connected to a text, usually lead to a better understanding of it. This property of the image to explain a complicated text can lead to misinterpretation when the quantity of images exceeds the quantity of text. Isolated images have no marks similar to the syntax of any linguistic systems by which it is possible to determine the positive, the negative, the possible, the impossible, the probability, the reversibility or the irreversibility.

Thus, the perception of a text presented in written language and the perception of a text presented in image language is not the same and the conclusions drawn from the written text or from the image text also differ. In addition, the mechanism of memorization of both written and image languages must be different. When the image has been used in the past for specifying the text presented in written language, it is the written text which specifies the image in order to preserve the correct message.

In this article, I am presenting a comparative analysis of the two languages: the written language* and the image language* in an attempt to analyze how the images can be used to correctly transfer the scientific information.

Rules of the Written Language

The written language is diversified in several linguistic systems which have specific properties. Some languages, such as Indo-European languages, express in detail the chronology of the events and the time period of the events. Instead, in English for example, the preterit means a finished action and the present perfect means that the action which started in the past is still continuing. Other languages such as Asian languages express instead the space of events. The space of action is described from the general to the detail of space, from the biggest area to the smallest area. Languages spoken by the Hopi Indians express a psychological view of events. Two times are distinguished, one corresponding to a past event with no effect in the present time and another one corresponding to a past event which still has an effect in the present time. Whatever their specific properties, all of the linguistic systems share some or all of the common rules which are defined by the syntax. Thus, the linguistic systems express the chronology and the duration of the event and its characteristics: positive, negative, possibility, impossibility, probability, temporary, eternity, reversibility, irreversibility.

Scientific studies like biology possess linguistic possibilities that allow us to express each one of the different steps of a biological mechanism. From a text well-structured by specific modalities, the thought can organize itself, always directed by these modalities. These specific modalities (duration, probability, reversibility), correctly used, lead the thought, by successive steps, toward deductions and the expression of what one believes is the scientific truth.

The written text can be simple or complicated. The written scientific text is always complicated because it must express a physical, chemical or biological mechanism in all its components. The description of the interaction between an enzyme and its substrate in the process to chemically modify this substrate to a new product is an example. This type of molecular interaction requires specific properties of the enzyme which can be acquired by chemical modifications as the phosphorylation, methylation, acetylation, glycosylation of specific amino acids or on the contrary removal of specific chemical groups beared by the amino acids which composed the molecule of enzyme. These molecular modifications are supposed to change the conformation of the enzyme which is now ready to be able to recognize and therefore to interact with its substrate. The interaction between the enzyme and its substrate is reversible but it becomes irreversible when the enzyme is not able to recognize and interact with its substrate after a first enzymatic reaction. As one can see, several ideas (taking in count conformation, change of conformation, duration of steps of biological reactions) must be expressed in order to transfer the scientific information. Of course, the expression of scientific information, uses all possibilities offered by the linguistic system chosen but very often, one must paraphrase in order to modulate the meaning. This procedure leads to the complication of the text which cannot be directly memorized. The memorization of such a complicated scientific text in written language requires the fragmentation of the text followed by a second rewriting using drawing, if necessary.

Rules of the Image Language

Images used in the image language are similar to images which accompany the text in the written language. These images either correspond to the measurements which are obtained from scientific instruments or images which are recomposed by scientists expressing their analysis of the scientific phenomenon. However, when isolated from the scientific information expressed in written language, the images, even from scientific instruments, can be analyzed incorrectly and lead to a misunderstanding of the biological mechanism analyzed. Nothing around the image can modulate the perception of the image as the syntax of any linguistic system. An image inserted in a text or a text composed by isolated images should correspond to different cerebral activities. When an image is inserted inside the written text, it helps the understanding of this written text. This is true especially when the linguistic system used to express ideas, becomes limited. In the image language which is composed by isolated images, there is no architecture to mark some limits of the isolated images. However, these isolated images compose the basic material which is used in order to coordinate the thought, the imagination and furthermore the elaboration of new theories. Of course, these scientific images are obtained and analyzed by either isolated specialists or by an international community of specialists who know what they are looking for. At least they have discussed several theoretical hypothesis which allow them to understand the meaning of these scientific images. In the absence of the written text which give the marks of the images, the knowledge accumulated during several years of scientific work which is memorized by the specialists, bring up these marks usually expressed by the written text. This indispensable scientific knowledge is unknown to the non-specialist audience such as students.

If a complicated scientific written text is rarely directly memorized, the isolated images are directly memorized. Such a possibility of a direct memorization of isolated images without any previous analysis opens the question of how to use isolated images. These memorized images will be used later

on during the process of understanding of other scientific information expressed either in written language or in image language. One already imagines how the isolated images when they are misunderstood, could direct the elaboration of new theories based on these memorized isolated images, in an incorrect manner.

What are the scientific images and how the images can correctly transfer scientific information
The scientific images are composed either by images which are obtained from scientific instruments (**figure 1**) or by images which are recomposed by scientists in order to illustrate the conclusions they drew after the experimental analysis (**Figure 2**).

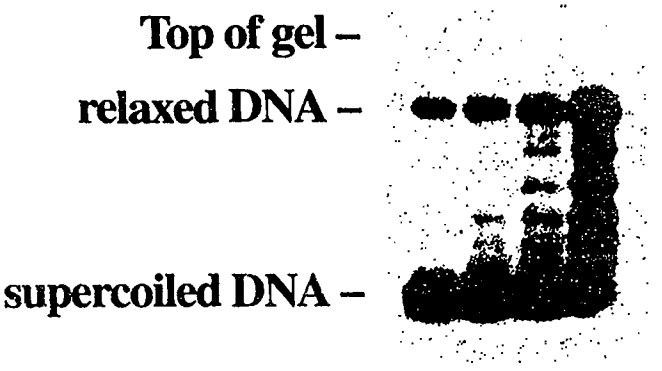

Figure 1: *Example of an image obtained from scientific instrument. This image represents the enzymatic reaction catalyzed by DNA topoisomerase I which relaxes supercoiled DNA by removal all turns present in the molecule of circular double stranded DNA. The figure shows the evolution of the degree of superhelicity of the DNA molecule (**lane 1:** supercoiled DNA, **lanes 2 to 4:** after 5, 10 and 15 minutes of the enzymatic reaction) the quantity of supercoiled DNA is decreasing although the quantity of relaxed DNA is increasing.*

The scientific images which are elaborated by the instruments usually illustrate single steps of the biological mechanism analyzed. These single steps can be reversible or irreversible steps. When published in scientific reviews, these scientific images are used as illustrations of the text. If the image can explain the text, in the reverse way, the text can also explain the image.

The limitations of scientific images in such a text are understood by all the specialists working on the domain analyzed. The specialists know some of the different steps of the biological mechanism analyzed, then they bring themselves limitations to the presentation of scientific results. This is not the case when scientific results are presented to an other audience like students who do not know

enough about science to be able to limit themselves which allow the correct evaluation of the images even if these images are presenting scientific results. The isolated images corresponding to events which are either temporary or not, can express the opposite of their real meaning, when they are disconnected from any text which explains in detail the scientific phenomenon.

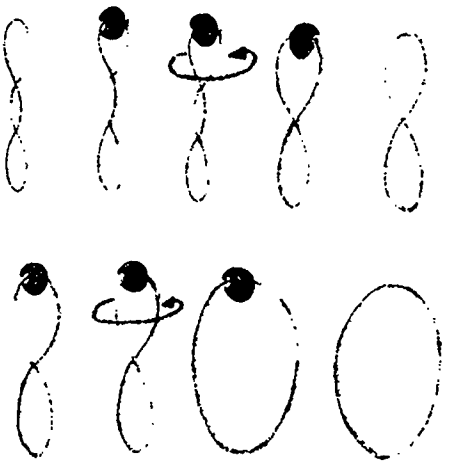

***Figure 2:** Example of an image recomposed by the scientist to explain Figure 1.This image explains the enzymatic mechanism of eukaryotic DNA topoisomerase I which relaxes supercoiled DNA. The protein is figured as a black ball on the figure and DNA as twisted or relaxed circle. The protein nicks one strand of the double helix of DNA, then induces a torsion of one strand of DNA around the other one, then reseals the strand previously cut. In such a way, the protein removes all turns of supercoiled DNA.*

How can real scientific images obtained from scientific instruments correctly transfer scientific information in the absence of any structured language composed by isolated images? This question needs to be solved as the consequence of the enormous importance of the CD-ROM as a vehicle of scientific information. Several principles can be pointed out. First, the image needs an accurate legend. The legend has all the chances to be very static. An isolated image with its legend can express a static view of a biological mechanism which is on the contrary a dynamic process.

How are the dynamics of a biological mechanism expressed? The multimedia seems to answer to that question by allowing the opportunity for connecting a lot of details expressed in the written language to the scientific image. What must be exploited, especially in the case of CD-ROM, is an architecture able, in connecting several images with the property to explicate each of them. By connecting an isolated image to other isolated images, one can create a language based on the comparative analysis of all several isolated images. By comparing several isolated images, one can deduce the different steps of the biological mechanism analyzed. In addition, the presentation on the same support (CD-ROM) of scientific results obtained in different ways by using several specific techniques helps the understanding of the biological mechanism analyzed. The visualization of these different types of results on the screen at the same time could bring structure which is absent in the image language (**Figure 3**).

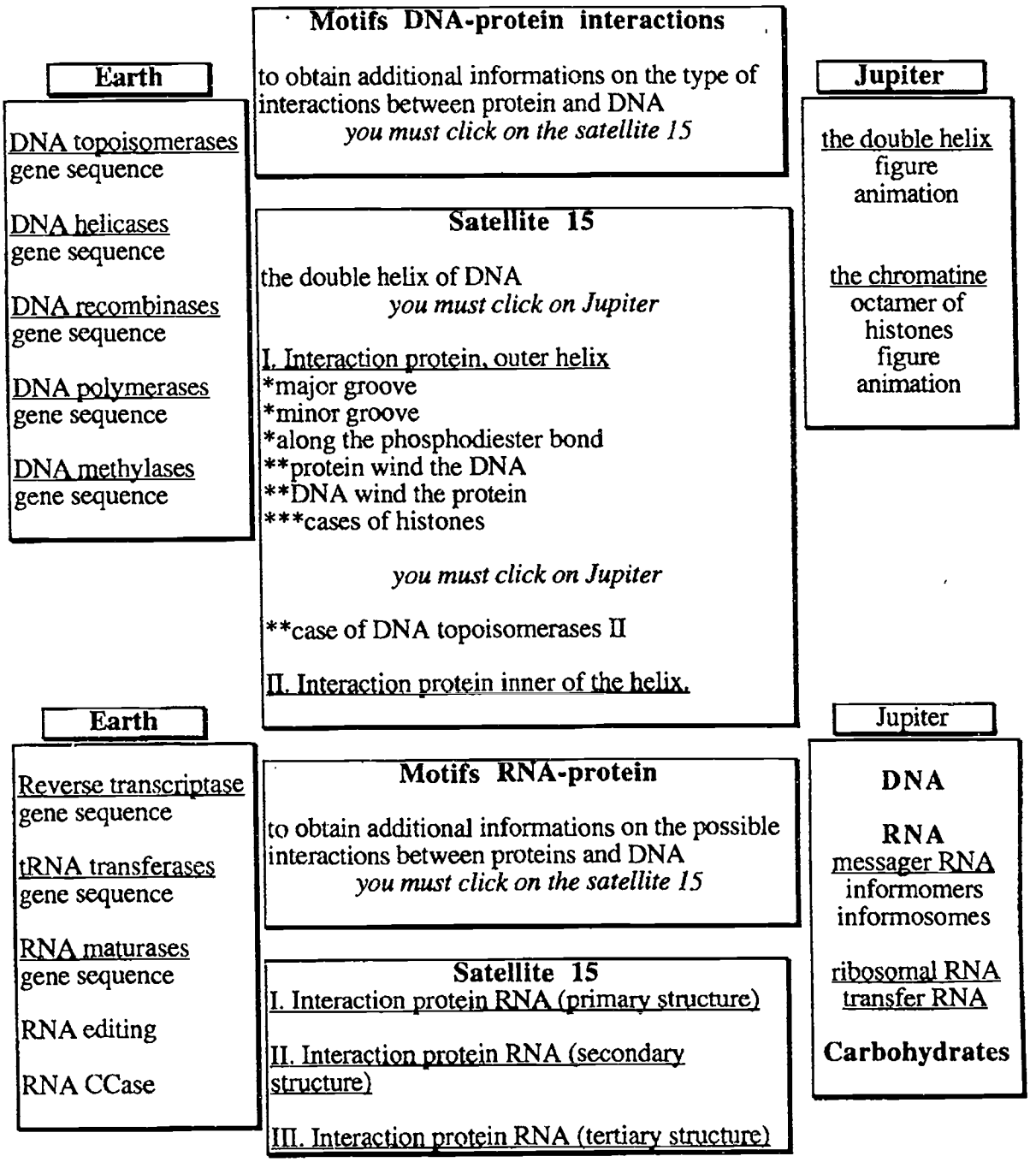

Figure 3: *Example of an arborescence connected between two documentary spaces (planets). a) aminoacyl motifs which specify DNA-protein interactions. b) aminoacyl motifs which specify RNA-protein interactions.*

Conclusion

Thus, the multimedia CD-ROM is probably the best medium to present and transfer the scientific information. Its great capacity and its possibility to present images in a moving way help the understanding of the scientific mechanisms which are very often difficult to be understood. The images presented which are directly obtained from the scientific instruments need to be treated in order to be correctly understood by the users of multimedia. This treatment of scientific images is a different process comparing to vulgarization because, the audience targeted is composed by students with aspirations to become scientists. Also, the level of presentation of results must be high. One must present data obtained from research laboratories. The audience is not composed of scientists who obtained the information presented, so one must give enough additional information in a form of text or series of images. The architecture of all the connected documentary spaces must take into account the needs of understanding of the scientific phenomenon presented, the needs of additional basic information to understand the phenomenon the experimental way used to analyze the phenomenon, the theoretical development related to the experiment, and the design of new hypothesis coming from all the scientific and technical information presented.

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Definitions

*written language: this language is composed by text with some illustrations.

*image language: this language is composed by isolated images like video.

Notes

Experimental procedure concerning the Figure 1.

Eukaryotic DNA topoisomerase I is incubated in the presence of supercoiled DNA (plasmid DNA) in the incubation mixture at 30°C. At 0, 5, 10 and 15 minutes, samples were removed from the incubation mixture. All samples were analyzed by electrophoresis on agarose gel on which, molecules of DNA migrate according to their degree of superhelicity.

A Virtual Classroom: The Electronic Agora

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Key words: Internet, teaching, research, ethics, multi-cultural

Abstract

The Internet medium has given birth to an exponential growth of virtual communities, whose citizens (NETIZENS) are known primarily by the expressed ideas and thoughts that define their identities. Virtual classrooms and seminars in cyberspace raise exciting educational possibilities— and pose potential human-human interactive problems. In this presentation, a case study of my multimedia virtual Philosophy class, with little or no physical contact between participants, will be discussed for analysis and criticism.a As reported in the Chronicle of Higher Education, the initial offering took place during summer 1994; a global version of the course began in June 1995. Specific issues to be explored in this presentation involve ethical questions of privacy, confidentiality, and honesty; the impact of anonymity on class discussion and group dialogue; the research benefits of an electronic Virtual Library, and diversity in education on the Information Superhighway.

Hypermedia Curriculum Design on the World Wide Web

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Key words: Internet, instructional design, World Wide Web, telecommunications, curriculum

Abstract

The creation of the World Wide Web and its interface tools such as Mosaic and Netscape have made it possible to design hypermedia documents that can be accessed worldwide. In addition to using this environment for databases and informational resources, many universities are developing instructional applications.

Advantages and Disadvantages

There are many advantages to delivering instruction via the WWW, including:

- Cross-platform delivery. When course materials are placed on a WWW server, they can be accessed by Macintosh, MS-DOS, and UNIX computers.
- World-wide delivery. Programs located on a WWW server are accessible from all over the world, without expensive diskettes or postal charges.
- Easy update process. Instructional materials on the WWW can be updated continuously simply by revising the files stored on the computer server.

Delivery of online courses via the World Wide Web is not appropriate for all circumstances, content areas, or grade levels. The disadvantages include:

Slow transfer of multimedia resources. Depending on the traffic on the Internet and the type of access you are using, the transfer of multimedia elements can be quite slow.
Direct connections required. To be able to access the multimedia components, a direct connection through a leased data line or a Point-to-Point (PPP) connection is required.
Addresses may change. The Internet is very dynamic; addresses and links are constantly changing.

Design Considerations

Designing documents for delivery via the World Wide Web is quite different than designing documents for stand-alone delivery on a computer disk or CD-ROM. Currently, the level of interactivity possible on the WWW is not as sophisticated as it is in programs such as HyperStudio, ToolBook, or HyperCard. In addition, graphics and other multimedia elements must be evaluated carefully for their instructional value, considering the fact that they may require extra time to transfer to the user's computer. Other important design considerations include:

- Keep multimedia file sizes small. Because the size of the file will impact the amount of time it takes to transfer it over the Internet, multimedia files should be constrained as much as possible. If possible, use 16 colors instead of 256; record audio at lower sampling rates; and limit the length of digital video movies to less than 2 megabytes.
- Label file sizes of multimedia elements. It is a good practice to label the file sizes of multimedia elements—especially digital video files. By including a remark such as (2.5 MB) after a video link, the user can estimate how long it will take to transfer the file.
- Use common formats. Graphics, sound, and video files require that viewer programs be resident on the users' computers. It is best to develop using the most common formats. For example, graphics should be stored as .GIF or .JPEG; audio files should be .AU; and video should be .MOV.

- Test the program with a variety of browsers. On the WWW, you cannot control the user's environment. Although the course may look great on your computer, the users may be using different browsers (including a text-only browser), or they may have different settings for their font and text preferences.

Multimedia Resources on the Internet: Free for the Taking

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Key words: multimedia, media production, telecommunications

Abstract

Through the Internet, educators have access to a "virtual" library of millions of files of information including text, images, sounds, and movies which can be used in multimedia presentations and student reports. How do you find them? How do you retrieve them? How can you use them? This session, designed for those with moderate to advanced telecomputing skills, will cover a compilation of Internet sites and resources for use in multimedia projects. In addition, tools for using these resources will be described and demonstrated , ideas for using them in instructional projects will be presented, and file management tips for those who gather resources in the manner will be shared.

Educators have long used pictures, sounds, movies, graphics, and text in creating their own instructional materials and in helping students create their own presentations and reports. The Internet contains many useful multimedia resources for teachers and students. However, these files must first be 1) located; 2) transferred or downloaded; 3) decompressed or decrypted (usually one or both); 4) evaluated; 5) integrated into a word processing, authoring, or other application program's file; 6) printed or presented. This presentation addresses many of these points: where to find resource-rich sites; how to retrieve resources using various telecommunication tools; and what to do with them when you get them.

Many telecommunications tools and skills are useful in retrieving resources from the Internet. Common search tools and Boolean logic (Archie, Veronica, and Jughead, as well as WebCrawler, Lycos, and other World Wide Web search engines) can be used to locate Internet multimedia resources. Recognizing file extensions (.sea, .txt, .zip, .gift, .tar, .hqx, .arc. cpt, sit, .zoo) and knowing how to make files with these extensions useful are other necessary skills for accessing and using these resources. File management skills are also essential: using an anti-virus program, deleting compressed files after decompressing them for use, and using shareware legally are most important. In short, while learning skills and concepts in a content area, and gathering resources and authoring a report or multimedia project, students can also learn and expand their computer skills.

During this session, presenters will demonstrate downloading an image or sound file from a gopher, decompressing and decrypting it, and using it in a *HyperStudio* multimedia classroom project. Examples of other resources from other sides will be demonstrated. Participants will also be introduced to an Internet site from which they can access tools, sites, handouts, and ideas related to this concepts presented in this session (http://www.itrc.ucf.edu).

Schools of the National School Network Testbed: Current Internet Use

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Key words: survey, testbed, connectivity, e-mail, web publishing, cost, opinions

Abstract

As part of the evaluation of the National School Network Testbed, an ongoing survey of Testbed member schools will provide a wide range of information about these leading-edge Internet users. This presentation summarizes the data documenting the particular ways and contexts in which Internet accessibility is being exploited.

Background

The initial "baseline" survey of the first 153 Testbed member schools was conducted in April-May, 1995. Other surveys are being conducted during 1995-96—a survey of newly-joining Testbed schools, a survey of teachers within Testbed schools, a survey of Testbed intermediary organizational members, and a survey of comparison schools (other schools with Internet access but not in the Testbed community).

The baseline survey included three respondents—the site-based network coordinator or primary network-using teacher; the technical specialist knowledgeable about network hardware connectivity; and a school administrator able to provide important contextual data about the school, its organizational arrangements, and its instructional culture. Information from the survey is presented under nine categories, several of which are summarized here:

1. Testbed Member School Characteristics

2. Hardware Resources and Connectivity

3. Electronic Mail Use

4. Network Learning Activities and Programs

5. Use of Internet Resources

6. Internet Publishing and Community Service

7. Support and Training

8. Costs and Financial Support

9. Perceptions About Purposes, Benefits, Problems, and Needs

Some Highlights from the Baseline Survey

Testbed member schools, although having strong histories of involvement in leading-edge technology programs, comprise a diverse array of schools across the country. About one-half serve high school grades, one-quarter cover middle grades, and one-quarter are elementary schools. Although predominantly white and middle class, underrepresented minorities constitute 24% of the collective student body and 9% are limited-English proficient.

At their starting point in Testbed membership, more than three-quarters of the schools met the minimum standard of connectivity initially envisioned—TCP/IP connectivity at the school site. The vast majority of those connections involved high-speed digital or ISDN connections to a school-based local area network. Most of the schools with a direct Internet connection had an Internet server located on-site, with its associated mail and user accounts (59% of all digitally/ISDN-connected schools; 44% of all Testbed schools). Of the schools with digital/ISDN connectivity, the mean number of computers able to have simultaneous Internet connections was 59 (median: 40). High schools with digital/ISDN lines averaged 6 teachers with classroom LAN/Internet access while elementary and middle schools averaged 15 teachers with classroom access.

Most of the Testbed schools described specific network learning projects that at least one class at their school had recently participated in. About two-thirds reported some use of electronic pen-pal activities, and about one-half indicated that at least one teacher had students do "electronic field trips to museums, science centers, or with adults conducting a scientific or creative activity." When we add up all of the network learning involvement described in the survey, we find that at Testbed schools about 20% of the students and 14% of the teachers were involved in network learning activities during the past year. Science classes were the most common academic context for the network learning activities reported.

The cost to schools of building a network infrastructure is substantial, roughly $100,000 per school. By far the largest portion of those costs are for establishing the LAN itself ($86,000 per school, on average, including wiring, retrofitting specifically related to LAN installation (e.g., electrical work, classroom remodeling, etc.), LAN file server hardware and software, and connectivity enhancements to individual computers, such as Ethernet cards. The remaining one-time costs are for Internet connectivity itself—routers and connectors and Internet server hardware and software. In terms of recurring costs, schools were expecting to pay roughly $6,000-$7,000 during the next 12 months on Internet or network access fees ($9,000 per school, if we eliminate schools that expected to have those costs covered from grants or other benefactors).

Respondents were asked to rank-order five different educational values of the Internet. The one clearly thought to be more important than the others was providing "access to a huge variety of curriculum-relevant information for teachers and students." The second-ranked value was enabling "students to participate in research and problem-solving with scientists and other specialists." When asked which two or three benefits of network learning they had observed most often, the item selected most frequently was that "students apply themselves for longer periods of time." Other benefits cited were that "students take on more responsibility for their own learning," "average kids are communicating and producing in ways only gifted kids did before," and "students are better working collaboratively with peers." To make the Internet attractive to teachers who have not yet shown an interest, the most important factors cited were classroom access and ability to use the World Wide Web.

Telecommunications in the Science Classroom: Integrating Technologies & Curriculum through Telecollaborative Inquiry

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Key words: telecollaboration, teaching tools, inquiry-based learning.

Abstract

Based on his experiences developing and directing large-scale, international telecollaborative science learning projects, the author will discuss and analyze the circumstances in which telecommunications technology becomes a powerful teaching tool in science classrooms. The presentation will focus on piloted strategies and specially designed telecommunications-based curriculum to engage students to real world knowledge construction.

Introduction

Though there is much attention and enthusiasm for connecting our classrooms to the information superhighway, we face the danger that if teachers do not clearly see its benefits on their students' learning, they will abandon the technology. The potential of connectivity is wasted if teachers are unable and unmotivated to use telecommunications in their teaching practices. The classroom computer could turn out to be nothing more than a mailbox for junk e-mail. This is why it is important that we critically examine the opportunities and applications of telecommunications in teaching.

Similarly to computers in the early '80s, telecommunication technology generally has been pushed into schools top down with an emphasis on the hardware and conventional applications. There has been precious little in the way of developing true learning opportunities with telecommunications, particularly in the way of connectivity-based curricula. Telecommunications must be placed into innovative curricular contexts in order for it to deliver pedagogical benefits.

Telecommunications & Curriculum

Based on the author's experience in piloting, developing, and implementing the Global Laboratory Project and other large-scale telecommunication-based, investigation-centered science projects, the presentation will analyze their impact on classroom learning. The author will examine telecollaborative inquiry as a way to:

- deliver an authentic learning environment into the classroom;
- introduce students to real science;
- support their investigations; and
- engage students in collaborative knowledge construction.

It is a common belief that students who perform various measurements and share data are "doing real science." Though conducting measurements afford students important skills and even mimic aspects of scientific work, these activities often lack the essence of true science—the collaborative construction of new knowledge. With the right mix of tools, telecommunications technologies, and specially designed curriculum, educators can bring students beyond mere data collection to the practice of true science in the classroom. The Global Laboratory Project, funded by the National Science Foundation, has developed and tested different ways to support a world-wide community of student researchers involved in constructing new knowledge about local and global environments.

The Global Lab curriculum is designed to engage students worldwide in the various stages of the scientific process, from identifying a relevant object of study, usually a plot of land called the Global Lab Study Site, qualitatively and quantitatively examining it, and designing and conducting research, to report writing and peer review. The curriculum is rooted in the real-world and focuses on inquiry-based knowledge construction. Using this curriculum, Global Lab students from 300 schools in thirty countries selected part of their local environments for their study sites. With shared tools and methodologies, students over the course of the school year mapped, described and monitored their sites, collected and shared data, and then placed their local findings into a global context.

The Global Lab curriculum is designed to achieve two key goals: motivate students to perform real science and prepare them with the basic skills to do so. The curriculum motivates students by creating relevancy. Students study the environmental characteristics of their own communities and then are

empowered to place their local data into a global context created by the findings of their peers worldwide. The curriculum prepares students in a three-staged, sequentially progressive process. The first, Community Building, teaches students how to use telecommunication technologies to exchange text and data with other schools. In the process, students create a global community of their peers, teachers and scientists. The second, Building Investigative Skills, teaches students through hands-on activities how to conduct scientific investigations. This stage introduces students to the process of science and teaches them how to make qualitative and quantitative evaluations, including using advanced technologies for continuous monitoring and data acquisition. The final stage, Advanced Research, engages students in open-ended investigations that include research design and peer review.

This broad perspective provided by such widely distributed student investigations enables the Global Lab community to discover and identify interesting environmental phenomena. These include a dramatic rise of indoor carbon dioxide levels in classrooms by the end of the school day, a lowering of the tropospheric ozone levels in places where vegetation is abundant, and the substantial accumulation of nitrates in certain over-fertilized vegetables. Upon identifying significant patterns in their data, this telecollaborative community of practice then engages in the most rigorous aspects of science—experimental design, peer review, and publication. In doing so, the Project's students experience a true apprenticeship for the world of science.

On Running a Time Machine

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Key words: editing, servers, sysop, World Wide Web

Abstract

Keeping the content in a public-access file server up to date is an ongoing challenge. By appreciating user needs and adopting fundamental organization and editing guidelines, the server administrators or editors can make their site a dynamic communication tool for their school or organization.

Network information sites, such as World Wide Web servers, are time machines. They take time to maintain, and the information they provide tends to go out of date. In fact, the more useful the content is—the more sources it uses, the more timely the material, and the more pressing the subject—the more frequently files need to be updated, and the greater the consequences for falling behind.

Procedures for maintaining content on the Internet Gopher and World Wide Web could also apply to shared LAN servers, hypermedia stacks, or fax-on-demand systems. The most basic technique is to make it easy for people who really care about the material to do the work. If conference and meeting announcements are a service you offer, provide a convenient pathway for organizers to update their listings. Create easy-to-use stylebooks or HTML templates for your contributors and yourself. If it is technically possible and doesn't violate security, allow contributors write-access to a portion of the server. This approach requires initial training, supervision, and acceptance of shared control.

On the server itself, file names in directories should announce their ages. Because files on the Internet may be accessed directly through Veronica searches or Web links without going through the directory structure, documents themselves should announce their dates and pedigrees with copyright notices, e-mail forward headers, or original source references.

Organize directory and web structures for easy file modification. Maintain a diagram or outline of your site, as you would in designing a hypertext stack. If a file or directory needs to be deleted or moved, you can quickly identify links that need to be rewritten. Documents that are interlinked and likely to be moved together in common directories benefit from relative links that are still valid if the common directories are moved. Use complete pathnames for links to unrelated documents in other high-level directories or on other servers. If you do need to move or rename a popular document, directory, or Web page, try to leave a forwarding address in the old location for some time.

Establish an archive where you can quickly store outdated material without having to fret about whether each item is safe to delete. (In six months, it is usually clear what ought to be thrown out.) Finally, visit your own server often as a user, reading your own material from the standpoint of your audience.

Integrating the Internet Into Your Classroom

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Key words: World Wide Web, K-12, curriculum

Abstract

So you've finally gained access to the World Wide Web on the Internet. Now what? How do you find the time to infuse the dynamic learning resources available on the Web into your daily teaching experience? The Education Center, a joint publication of Houghton Mifflin and the Global Network Navigator, can save you time and help you with this challenge. In this session we'll show you how.

The Education Center is designed to help teachers navigate the vast resources of the Internet and integrate those resources into existing curriculum. We research the latest online projects and information, create our own unique Internet resources, and present it all to you in an easy-to-use, accessible format. The Education Center is currently divided into an online magazine and three curriculum centers: reading, math and social studies. In this session we'll show you how to use all of the sections of the Education Center to find:

- Thematic teaching materials including bibliographies, extension activities, and links to other theme-related sites on the Internet including virtual field trips, "ask the expert", and informational databases;

- A searchable database of bibliographies, extension activities and links;
- Interactive learning tools, games, math brain teasers and other student-centered resources;
- Student publishing;
- K-12 news, events and articles profiling how teachers and students are using the Internet;
- Places to connect with other educators to collaborate on projects, find penpals, conduct surveys and share information with other classrooms around the world;
- A comprehensive library of hundreds of links out to other education-related sites on the Internet; and
- Professional development resources.

This is a whole new way of publishing, and we've just begun to explore the possibilities. Participants in this session will be encouraged to respond to the resources in the Education Center and make suggestions for resources they'd like to find there in the future.

Science on the Bus!! Nechaco's Electronic Home Schooling Science Program

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Key words: home schooling, science education, electronic schooling, science and technology, technology

Abstract

Home schooling connections for rural British Columbia have faced the age old problem of resource availability. This problem is being addressed through the emergence of Nechaco School District #65's Electronic-Bus home schooling program. After a successful two years of providing electronic resources for parent/teachers of the district's home schooling program, requests for enhanced science resources have been submitted. Electronic networking globally has opened doors to myriads of

students and teachers willing to share information. Too often this information is misguided or not directed. Computer programs are often misunderstood, underutilized, and misused. The purpose of this project is to provide not only exemplary science education through an electronic medium for home schooled students, but also the guidance necessary for enhanced understanding and consequent demonstration of science concepts by students.

The Electronic-Bus home schooling program originated in Nechaco School District #65 in British Columbia as a result of parental requests for assistance in home schooling efforts. Families living in remote areas of British Columbia or others dissatisfied with public or private schooling options choose to home school their children yearly. Needs for resources that connect students, their parent/ teachers and their learning experiences to a broader base of knowledge are a driving force in home schooling education. Nechaco's response to these needs for assistance in home schooling were answered by placing computers in homes of students and adding a direct connection to "teachers on-line" that offered assistance, advice, counseling, and support. Along with the electronic support, software programs supporting subject matter areas are an integral part of the program. The first students to receive help through the Electronic-Bus program were in the Vanderhoof, B.C. area. Denise Milne was the first teacher involved with the program as she worked with about a dozen home schooled children out of her home. Positive results of student achievement and parental satisfaction led to the growth of the program to areas outside district boundaries. The project spans over twelve school districts in B.C. with projections for the 1995-96 school year of over 600 students in more than 20 school districts.

Participants in the program have pointed out the need for more guidance in certain areas. Two areas of need have arisen from parental requests. Those are the areas of French education and science education. Science is not often easy to teach, regardless of its interesting nature. Connections between everyday science and the technology supporting that science are not being made by most home schooled students. Many parents do not feel qualified to teach science, don't understand science concepts, or cannot see how to make connections between abstract and concrete science. This project is specifically designed to enhance science connections and understandings of home schooled students through correct usage of technological tools and by providing cohesive curriculum planning to parents in the areas of science and technology.

Lurk Before You Leap with Telecommunications

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Key words: projects, telecommunications, elementary, public, private, cautions

Abstract

Previewing is necessary when using telecommunications as a part of your curriculum. Lurking before leaping provides valuable lessons for users of telecommunications. Successful projects provide succinct information concerning their goals. Educators as well as students can utilize telecommunications to find grants, participate in projects, create and explore WEB pages, and more.

Educators have a valuable tool via telecommunications. Successful usage depends upon learning from others as well as learning with others. There are places to travel and helpful choices in every area of teaching.

Those who teach can get help from others who also teach, virtually participate in projects all over the world, create WEB pages to disseminate information about a particular school or district, or just explore to find answers to pertinent questions or ideas. Students at Haven Middle School and Baker Demonstration School in Evanston, Illinois did just that!

Haven Middle School students began by answering a response to what a typical school day was like for a group of students in Japan. These students also shared their day with our public school students. Later, we sent letters of sorrow and hope to the people of Kobe, Japan.

Next, we answered another call for participation in an algebra mentoring project. High school students in Minnesota were going to mentor our advanced eighth graders in solving algebra problems. Although the idea seemed dynamic, sadly nothing ever came to pass.

Career Week took on a new meaning for our eighth graders. In prior years experts came to school and gave lectures about careers. We were fortunate to have participated in a student emissary project which Judi Harris developed. Our students were able to submit questions to an expert in the field of careers. The quality of the questions and the ability to be anonymous were invaluable.

More projects were explored. Yet we've only just begun.

Telecommunications was also used in a private school in the same area. Telecommunications at Baker Demonstration School has really grown over the past two years. We still do e-mail projects and have added World Wide Web and Multi User Simulated Environment (MUSE) projects. Students also enjoy chatting with their friends thro_h an Internet Relay Chat (IRC). The curriculum integration in my school includes INTERNET usage in many ways.

In science classes students created WWW documents about the chemistry projects they did. The documents were created by the students so other students could give them feedback.

The Latin classes are busy working in a text-based virtual Rome project which uses their knowledge of history, Latin, and English. They are having visitors from other schools go on virtual tours of Imperial Rome.

Both of these projects also include e-mail exchanges and Internet Relay Chats (IRC) so students get to know each other and have a chance to exchange many ideas.

Telecommunications allows users to take an active, participatory role in their education as well as give students an audience and a reason. Teaching changes, and classrooms no longer must rely upon

the confines of their buildings, snail mail exchanges which take a long time, or the lack of resources. Much can be shared and compared through telecommunications. However, lurk before you leap!

Science Learning Network: Linking Museums and Schools on the Internet

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Key words: elementary, inquiry, Internet, middle school, museum, science, World Wide Web

Abstract

The Science Learning Network is an online educational resource network which supports the teaching and learning of science, mathematics and technology (SMT) in grades K-8. The SLN is composed of a national collaboration among science museums, industry and schools in six cities. The Science Learning Network integrates the educational resources offered by science/technology centers with the power of telecomputing networking to provide powerful new support for teacher development and science learning.

Structure

The Science Learning Network is composed of the following three aspects:

Intelligent Agent Software: a unique online SMT database and software package that will provide interactive capabilities to actively and intelligently assist K-8 classroom teachers in their Internet explorations, much like an "electronic librarian."

Online Museum Collaborative: a national consortium of science museums that pool their resources and expertise to create online assets and provide ongoing professional development in telecomputing networking for precollegiate SMT teachers.

Online Demonstration Schools: a network of K-8 schools working in collaboration with consortium museums and Unisys volunteers as demonstration sites for online teaching and learning in SMT.

The testbed participants are:

- The Exploratorium (San Francisco, CA);
- The Franklin Institute Science Museum (Philadelphia, PA);
- The Miami Museum of Science (Miami, FL);
- The Museum of Science (Boston, MA);
- The Oregon Museum of Science and Industry (OMSI) (Portland, OR);
- The Science Museum of Minnesota (St. Paul);
- Each museum has selected one local school to participate in the testbed;
- Unisys Corporation, which provides funding, technical expertise, and volunteers; and
- The Association of Science-Technology Centers and Bolt, Beranek and Newman (BBN) (Cambridge, MA) are also associated with the Network and continually offer dissemination and technical assistance.

The primary audience for this project is K-8 classroom teachers and science museum educators. Over the course of three years, the Science Learning Network will provide direct support to 180 teachers and 3,000 K-8 students in the online demonstration schools. Through existing teacher networks, each museum will offer professional development for an additional 200 teachers each year in museum-based Network Resource Centers. Philadelphia and Miami will offer the potential for broader impact through the Urban Systemic Initiatives in those cities.

By the end of the grant period, the SLN will have provided field-tested models of a new kind of online SMT community through the collaboration of science museums with industry and schools. The sustainable impact of the SLN will be assured by the intelligent agent's status as a publicly accessible database and software package and the development of the national consortium of online museums, whose network resources will be made available on a ongoing basis to educators. The three-year formative development of the online demonstration schools will contribute vital data to precollegiate school reform in SMT, showing how schools build capacity to become members of the online community and demonstrating how teaching and learning in SMT are enhanced by online resources.

Project Goals

The Science Learning Network supports the teaching and learning activities of teachers, students and museum staff through the development of a museum-centered, high bandwidth computer network. The goals of this project are to:

1. Use telecomputing to strengthen inquiry-based teaching and learning in science, mathematics and technology.

2. Convert museum assets to Internet assets.

3. Build capacity for K-8 educators and museum staff to engage in inquiry-based teaching and learning.

How to Find the Online Museum Collaborative Partners

The museum partners of the Science Learning Network can be visited on the World Wide Web at the following locations:

- The Exploratorium, http://www.exploratorium.edu
- The Franklin Institute, http://sln.fi.edu
- Miami Museum of Science, http://www.miamisci.org
- Museum of Science, Boston, http://www.mos.org
- Oregon Museum of Science and Industry, http://www.omsi.edu
- Science Museum of Minnesota, http://www.ties.k12.mn.us:80/~smm/

Project INSITE: Developing Project-Based Science Curriculum

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Key words: science, curriculum, constructivism, problem-based learning, telecommunications integration

Abstract

Successful technology use demands that teachers change what and how they teach. This means altering long held beliefs relating to their role as teachers and the role students play in their classroom. These established paradigms must be shifted in order for students to become more actively involved in the learning process and for teachers to move away from being the primary deliverers of information. A project based in the Eagle Union Community School district in Zionsville, Indiana is taking up the challenges of improving science instruction in the middle grades (5-9), altering the teaching styles of educators, and changing the roles of both teachers and students.

Project INSITE, started in June 1995, is a four-year project funded by a grant from the National Science Foundation to provide 290 teachers and 40 preservice teachers from any school district in Indiana in a series of two-year experiences which focus on problem-based learning, constructivism, themes from the Benchmarks for Science Education, and the integration of information technologies (telecommunications and multimedia). In order to accomplish this task, the project personnel have developed what is called the Institute for Science and Technology.

The Institute for Science and Technology involves several key components including: in-depth training in essential science skills, comprehensive instruction in teaching methodologies, classroom restructuring ,telecommunications and multimedia integration strategies, and developing relationships with practicing scientists. The project is based on the realization that there is a need for providing students a positive learning environment that is responsive to the needs of all students.

A precondition for participation in the program is a formal commitment on the part of the school district and school administration to provide the financial and administrative backing for the project. Schools must put into place the necessary hardware and software before teachers in those schools will be considered for participation. Each school must send a team (minimum of three individuals) consisting of science teachers, teachers who teach science, media specialists, and/or technology coordinators. Schools involved in team teaching efforts are encouraged to send the entire interdisciplinary team.

As a result of the Institute, teachers develop long term student projects which emphasize science proficiencies and learning objectives and pay specific attention to the processes of science. Long term activities last up to one semester and are to be connected to the existing curriculum but not duplicate activities currently being conducted in the classroom. The goal of these activities is to connect the science instruction to the real world; to make the activities hands-on and student centered; to incorporate other disciplines and multiple grade levels of students; involve diverse resources; and use technology as a vehicle for accumulating, analyzing, and sharing data. The activities within the projects relate to local, state, and/or national concerns and issues and encourage students to conduct real experiments and find, if possible, real answers.

Through the Institute for Science and Technology, Project INSITE is responding to the need by educators who wish to make the adoption of technology and improvement of science instruction priorities in their schools. The project is in harmony with the research that illustrates the importance of investing substantially in human resources as opposed to simply providing hardware and software. The project fosters connections with business, industry, governmental agencies, and higher education as well as the local school communities.

The important features of this project are that it looks holistically at the use of technology within the learning experience rather than in isolation. If technology integration is to be successful, teachers must have direct experiences and practice in a non-threatening environment, which allows them to explore new teaching methodologies in order to elicit change, and to recognize the need for altering the instructional process in light of the changing needs of students.

Expedition Icebound Was More Than Just E-mail

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Key words: electronic mail, audioconferencing, fax, social studies

Abstract

Expedition Icebound 1995 provided school students in 480 New Zealand schools with the opportunity to link directly with Don and Margie McIntyre and other Antarctic experts. Don and Margie will spend the entire year in complete isolation at the site of Mawson's Hut in Commonwealth Bay. Their unique experience is being shared by school students who have the opportunity to interact with them and share in this experience through a variety of telecommunication tools. The interaction has taken the form of:

- Thirty-five audioconference sessions with Don and Margie McIntyre and other Antarctic experts throughout the year. Each session is of 20 minutes duration and may have up to 50 schools participating.
- Fax bulletins from Don and Margie received at each school every Tuesday morning.
- Electronic mail for one-to-one interaction.

The names of "Don and Margie" have become household words among many New Zealand schoolchildren who have shared the personal hardships and joys along with the findings and challenges of their scientific program. The cross-curriculum focus has been utilized by many teachers who have been able to maintain interest and enthusiasm from February to November. Curriculum and technical support for teachers has been a vital aspect of the program.

Telecommunications has allowed Don and Margie to come right into the classrooms and establish the information role of faxing, e-mail and audioconferencing to achieve clear learning objectives. The characteristics of each of the medium have become clarified within a learning context and this has provided a positive model for the use of information technology within the N.Z. curriculum framework.

This presentation will show:

1. The reason for the development of the project and the planning details.

2. How Expedition Icebound 1995 was promoted to New Zealand schools.

3. The resources which were made available to schools and teachers.

4. Samples of the activities and action.

5. The positive, negative and interesting aspects of the project.

Distance Education National Program

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Key words: distance education, inservice training, telecommunication, computer technology.

Abstract

The concepts of tele-education, tele-media, and computer technology are explored here, in the specific context of developing a project for inservice training and professional development in a consortium of 80 higher education institutions. The issue is not only one of effectiveness, but also one of sound design and proper use of the new technologies combined with the old ones; the assumption is that a new approach to schooling and formal education is required, that media must not be limited to electronic gadgetry, and that the concept of the computer should be expanded to include all technology based on it. Some results are discussed here.

The Sistema Nacional de Institutos Tecnologicos. SNIT, (National System of Institutes of Technology) is a federal consortium of 80 higher education institutions spread all over the country (at least each of the 30 states has one institute of technology), with undergraduate and graduate studies. All

careers, in both undergraduate and graduate levels, are science and technology-oriented: the major areas are architecture, engineering, electronics, computer and information sciences, biology, chemistry, and business administration. About 2,000 executives and officials run the different institutions of the consortium; its faculty includes 2,500 researchers and 13,000 professors who assist 150,000 students.

In addition to the shared need by all higher education institutions of providing training opportunities for both staff and faculty, different events, for one thing NAFTA, compelled SNIT to make more extensive activities of inservice training and professional development in order to be prepared to cope with the different educational challenges imposed by the new order.

The central question is this: how can the consortium respond to the vast number of training needs of executives, staff and faculty? The answer was apparent and easy: distance education through the use of video telecommunication both live and videotaped. Many factors provide the impetus for such a decision. These include the sincere desire to extend the benefits to all 80 institutes of technology, the pressure of political and economic groups to provide degree opportunities at the workplace to reduce time and cost, and the fact that many institutions are beginning to use distance education programs, apparently with proved results and outcomes. The rationale seemed obvious: if you think the use of technology is expensive, try the little red roof school.

The CIIDET, a research center created to provide inservice training to the consortium, was given the chore of developing a national program of distance education for the 80 institutes of technology of SNIT. In developing the national program of distance education, two major sets of questions were raised.

The first group is related to the theoretical and conceptual framework. Here, the major issues were three. First, what is tele-education? Second, what is tele-media? Finally, what is the role of computer technology? As we begin to gain more experience and knowledge about distance programs, the use of different media, and the capabilities computer-oriented technology is displaying, it becomes more and more obvious that distant teaching and learning are quite different from traditional teaching and learning. Before developing the program, it was necessary to discuss the concepts of tele-education, tele-media, and even the definition of computer technology and telecommunication.

With regard to this first group of concerns, the major ideas relate to the need of introducing a new concept and culture of teaching and learning; the conventional methods of traditional models of teaching can not be applied anymore; the term tele-class emerges and new pedagogical trends show. The concept of tele-media was also reexamined; telecommunications and telecomputing do not exhaust tele-media; paradoxically, conventional tele-media, including mail (without e-) and personal commuting are still valid and effective ways of providing distance education. By the same token, computer concept has also to be reviewed; computer technology includes computers and multimedia, modems, compact disks, videoproduction, telecommunication, Internet with WWW, general applications, specific applications, active, interactive and adaptive software, videoconferencing, virtual reality and more. From this point of view, computer technology is at the core of distance education and, very soon, of virtual universities.

The second set of concerns was management and logistics related. We consider that even the smallest unit of a distance program has to be developed in such a way that all elements and components are taken into account. If a traditional class is demanding, a tele-class has to be so in a much greater degree. Not only are the required teaching skills and learning abilities different, but also classroom management skills, testing, feedback materials, and presentations, among other things, are quite different.

In order to develop the national program for distance education for SNIT, a model of tele-education was developed to essentially respond to all initial concerns. At the present, experiences include itinerant graduate specialized studies, instructional material for courses in master degree programs (computer sciences and engineering), inservice training videos (teaching skills and research methods) and student support instructional material. The major difficulties found in this project, financial resources aside, relate to the tele-class and to the teleteaching skills; instructors and professors are not use to the new nature of education, which is rushing to the virtual university, with no walls, with no time barriers, and consequently, with a new concept of teacher.

C.U. See-Me: Teacher Conferencing for Global Student Internet Exchanges

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Key words: telecommunications, curriculum, social sciences, cooperative learning, global projects

Abstract

This collaborative presentation will feature K-12 educators from three of the following countries: Australia, New Zealand, Canada, Israel and the United States. Discussion will include curriculum planning and scheduling in addition to arrangements for a classroom-to-classroom live exchange planned for the New Zealand Technology in Education conference to be held in January 1996. Participating educators (and their students) have previously participated in exchanges in the air/water Internet-based thematic units for elementary students. C.U.-See-Me, an Internet-based audio-video conferencing system will be used to deliver the presentation. C.U. See-Me is a useful and inexpensive tool allowing educators in many locations to discuss global classroom projects by way of the Internet.

Internet-based Curriculum Projects

The Water and Air Projects are curriculum-based models for global interaction in elementary education. These international projects are Internet-based thematic studies in which children in New Zealand, the United Kingdom, Israel, Canada, Australia and the United States share information via teacher-moderated electronic mail exchanges on the uses of water and air in their environment.

The Water Project was a pilot project in 1992. The original idea came from Nola Campbell and Gray Clayton in New Zealand. This project linked students in New Zealand, the United Kingdom and the United States. Due to its success, the Air Project was added for 1993. These projects have continued in the fall planning, spring implementation model for four years.

The Projects feature elementary students ages 9-12 in public, private, urban and rural schools. The students are researching, discovering and sharing information about water and air in their communities. Each project has an introductory module and four modules of curriculum study. These are long term semester projects which exhibit cooperative learning at a global level.

For the 1995-96 school year, plans are underway to implement C.U. See-Me in the initial teacher communication/planning phase of the project. It is believed that projects of this type can be more successful if teachers are able to communicate with one another. This medium allows more than one teacher to exchange ideas at the same time at an affordable cost. As more and more classrooms have access to the Internet, this becomes a viable way for educators to exchange ideas and discuss current projects. It is expected that some of the teachers will also incorporate C.U. See-Me in their classrooms as part of the Air and Water projects.

Students Reaching Around the World: Internet Projects for Students

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Key words: telecommunications, sites, listservs, projects, education, Internet, WWW

Abstract

At Pikeville Elementary School students and teachers are connected to the world through global telecommunications. This information-filled session conducted by classroom teachers will present

opportunities for student learning on the Internet. Educational sites, listservs and student projects will be presented. Learn how to find and participate in exciting student projects using the Internet.

For teachers looking for projects for their students, this presentation provides the answers as we will demonstrate a variety of student projects suitable for most any grade level. The presenters will explain how to find, organize, administrate and evaluate student projects which make use of the wide range of Internet resources. We will explain the process, exhibit products and provide ample time for questions and answers. Reactions to this presentation when it was presented at the Tennessee Education Technology Conference, March 1995, were very enthusiastic and positive as teachers felt it had given them a real sense of direction in finding and doing projects with their classes. We feel that given the opportunity to present this collaborative effort, we can help teachers feel comfortable and excited about using the Internet as an invaluable classroom resource and teaching tool.

The presenters themselves are relative newcomers to computers and global telecommunications in the classroom, and they know exactly what it is that the novice Internet user needs to know to get started. We are living proof that a great deal can be accomplished in a relatively short period of time using one telecommunication workstation in the classroom.

Using handouts and computer slide shows, Ms. Quay and Ms. Webb in a down-home fashion will explain in detail projects they have successfully done with their classes. Previous undertakings include: e-mail projects with other schools across the nation, joke-a-day exchanges, keypal communications around the globe, following the global travels of Roger and "Bubba," tracking the dog sleds on the Iditarod and exploring the Mayan culture through MayaQuest. The presenters will explain how to find current projects and make them come alive in the classroom and put the world at students' finger tips. Educational sites to visit on the Internet will be shared, listservs will be explained and URLs will be discussed. Mr. Colburn will explain extracting e-mail messages and downloading files from the Internet to the local computer station. Ample time will be allowed for questions and answers.

Project SMART: A National Distance Learning Program Via Interactive Television

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Key words: distance learning, computer, migrant students

Abstract

It is generally recognized that one of the chief detriments to student success among the children of migrant workers in the United States is the lack of instructional continuity. Moving from state to state and changing schools frequently result in mixed and confusing curriculum requirements. The resulting pattern is poorly coordinated educational opportunities for this population. Nationally available distance learning offers tremendous potential in resolving this educational dilemma. A future vision is for students who move from school to school to continue receiving the same class from the same teacher via distance learning.

In Texas, large numbers of migrant students historically have not participated in any kind of summer program. A 1992 needs assessment revealed that migrant students who travel out of state appear to perform at a higher level academically than students who are home-based or travel within Texas. Because of this alarming fact, the SMART model for in-state students was developed.

Students living temporarily in participating summer migrant programs also have access to the SMART classes. SMART Partners outside of Texas are in schools and centers that offer service to this population during the summer. Students who return to Texas before the end of the summer resume the same classes at home.

As a multi-state project, SMART will serve students in designated migrant school programs in Arkansas, California, Colorado, Florida, Illinois, Indiana, Louisiana, Michigan, Missouri, Montana, North Dakota, Ohio, Pennsylvania, Texas, Washington, and Wisconsin. As a project of the Texas Education Agency, SMART will serve migrant students and schools in Texas.

Distance learning refers to live, simultaneous transmission of a master teacher's lessons from a host classroom or studio to multiple receiving site classrooms in distant locations. The goals for Project SMART are:

- To provide quality instruction and support to migrant students remaining in Texas who are not currently being served in summer programs because of working patterns, lack of availability, or distance.
- To provide continuity of instruction for Texas migrant students who live temporarily in other states and who move from state to state or who move within Texas.
- To improve performance on the math, reading, and writing sections on the Texas Assessment of Academic Skills (TAAS).
- To offer a credit course(s) for high school students.
- To meet the challenge of the National Education Goals for America 2000.
- To support developmentally appropriate practices for young children and promote the involvement of parents in their children's education.

Project SMART instruction is delivered in two ways.

1. Televised Instruction
Live, interactive televised lessons and instructional materials are provided by TI-IN Network located at the Educational Service Center, Region 20 in San Antonio, from June 12 through August 3, 1995. Addressing five instructional levels, the program design focuses on life skills in areas of reading, writing, and math. Other developmental and curriculum subjects are integrated into the classes. Instructional levels are early elementary, lower and upper elementary, middle school, and high school. Three half-hour lessons are broadcast to early elementary, lower and upper elementary students. Middle school students receive two, one hour lessons and secondary students will participate in a credit-bearing course(s) called Algebra I A and/or World Geography A. The lessons will be provided for eight weeks. Students showing mastery of the essential elements in Algebra I A or World Geography A will earn a 1/2 unit of credit.

All of the live, interactive televised instruction is built around migrant students' homes, families, and community experiences. Lessons are crafted and designed for relevance to the students' daily experiences. Materials and resources are easily available to the students and are used as centers of suggested follow-up activities.

2. Local Instructions and Support:
A second integral component of instruction involves local teachers, called SMART Partners, employed by summer migrant programs. For students remaining in Texas the SMART Partner is frequently a home-based teacher, interacting with students in their homes. In the out-of-state programs, SMART Partners support the televised instruction in summer school programs which are school-based.

Both school-based and home-based SMART Partners monitor progress, assess student achievement, implement additional instruction, and share ideas with the television teacher via a toll-free telephone number. SMART Partners are critical team members as they provide the face-to-face interactions necessary to build self-esteem and implement activities.

On the whole, instructional staff involved in the project concluded that Project SMART greatly benefited their students. On a SMART partner survey, respondents listed the benefits as helping students learn to read instructions, acquire responsibility, increase their attention span, learn self-discipline, and learn to ask for and initiate calls in order to obtain information.

Science Research Using High Performance Computing and Communication in High Schools

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Abstract

In this presentation we propose to describe the components and successes of a high performance computing education project called EarthVision. This project is a professional development for collaborative teams of high school students and teachers with the aim to help them learn the tools of the future high performance, collaborative scientific workplace.

EarthVision is in its third year of implementation and we now have 15 collaborative teams working on environmental research projects. The teams are located in various high schools in the state of Michigan and in Cleveland, Ohio.

EarthVision project participants use Silicon Graphics workstations at their schools. These workstations are equipped with AVS scientific visualization software that is used to represent the research findings of the teams. These school SGI computers are linked to the Internet and the NESC (National Environmental Supercomputing Center) Supercomputer in Bay City, Michigan. We will describe various research projects that have been conducted by EarthVision research teams in the past three years. We will also outline the role of scientific visualizations in this process.

An innovative school curriculum that was designed to infuse high performance computing and communication in the curriculum of a school will also be described. In this "School of Environmental Research" teachers from five different departments and 65 students are currently working on interdisciplinary, collaborative research projects. Teachers utilize team teaching, concurrent planning times and block scheduling to best implement this curriculum. If the pilot is successful this integrated curriculum will be considered as a model for a district-wide integrated curriculum. Distance communication between Michigan and Ohio schools has also been considered as a model to comply with desegregation requirements in Cleveland.

Wireless Technology: A Solution to Decrease the Cost of an Internet Connection

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Key words: earthvision, wireless, radio frequency, WAN

Abstract

One of the major obstacles of connecting schools to the Internet is that of the recurring yearly cost. Leased lines dedicated to a school can cost up to $25,000 and additional funding needs to be secured for additional yearly costs. One solution for schools is to access the Internet via a node at a nearby university or corporation. Wireless radio frequency (RF) technology provides a solution to schools attempting this. This paper describes how RF technology was implemented and used in the EarthVision project in a high performance computing and communication research environment at the high school level. The necessary equipment is described and configuration and limitations are explained. The step by step installation procedure and possible problems and difficulties are also outlined.

Introduction

Internet access is becoming increasingly popular and desirable in K-12 education. Cost is the biggest limitation to Internet access. One of the most significant cost variables is obtaining a telecommunication link to an existing Internet node. The cost of an annual Internet membership can be in the $25,000 plus range. Most schools and school districts cannot afford this level of expenditure for Internet access. One solution is for schools to access the Internet through an existing node at a local university or corporation.

The problem then becomes getting the connection in place between the node with Internet Access and the school. Most approaches have used telephone lines or leased lines to connect these two points. Regular telephone lines can be used with modems (14,400 bps is readily available) however modem connection is relatively slow and does not approach the T1 capability of the Internet node (T1 is 1.544 Mbps). The cost of a T1 connection usually requires an annual leased-line charge.

One of the major problems faced by schools is coping with ongoing annual costs. It is has been recognized that it is easier for schools to pay a one-time up front cost rather than an annual cost. In order to address this problem and to provide schools with relatively high speed telecommunications access, the EarthVision program has used Radio Frequency (RF) wireless technology to establish a telecommunications link between a school and an Internet node. RF frequency rating (standard UHF 902-928 MHz spread spectrum radio band) is similar to the frequency of cellular phones and pagers. This wireless link is established by pointing two three foot antennas at each other using a clear line of site. This approach was originally piloted by NASA Lewis Space Flight Center in Cleveland, Ohio.

EarthVision Employs RF Technology

EarthVision is a cooperative venture between the EPA and Saginaw Valley State University (SVSU). The program has two primary goals: (1) to train teams of high school teachers and students to conduct environmental research using computational science and (2) to establish environmental research and computational science programs at high schools. These goals are implemented through four project phases: (1) Saturday Tutorials, (2) Summer Research Institute, (3) environmental research at high schools and (4) implementation of environmental research programs at the high schools.

EarthVision focuses on environmental research and computational science at the high school level. It employs scientific workstations and access to a Cray supercomputer at the National Environmental Supercomputing Center (NESC) in Bay City, Michigan. The program includes Saturday Tutorials, extensive outreach, incorporation of math and science reform, educational reform to facilitate the transfer of substantial in-depth knowledge of environmental research and computational science. High speed connections are significantly advantageous over low speed connections when transferring complicated visual materials, large data sets, videoconferencing and Internet exploration. Environmental research and computational science involves uses of high volumes of numerical data images and long distance collaborations.

When attempting to establish an Internet connection to Martin Luther King Law and Public Service High School (MLK) in Cleveland, Ohio and establishing a computational science lab at that school, there was a need for high speed Internet access. The closest Internet node was at Cleveland State University (CSU) which is approximately two miles from the high school. EarthVision has the objective of helping the schools to become autonomous and able to operate on their own when federal support is no longer available. The ongoing leased-line charge would have been possible during the grant supported period but would have caused the program to be eliminated when the school would be

required to subsidize the cost from their general fund budget. It was clear that another solution was required and the RF technology is that solution.

Comparison Between RF Technology and Leased-Lines

The cost for a T1 leased-line for one year in Cleveland between MLK High School and Cleveland State University is $26,500. The cost of the RF technology, which is a one time cost, is $9,265 which includes both locations. The one time cost is less than half the annual leased-line charge and once in place the cost is reduced to zero after the first year. In the table below is a comparison between a T1 leased line and a wireless RF connection.

	T1 Leased Line	**Wireless RF Connection**
Initial Cost_	$ 26,500_	$ 9,265__
Annual Fee_	$ 26,500_	$ 0__
Bandwidth_	1.544 Mbps_	2.0 Mbps__
Distance_	Unlimited_	Less than 5 miles__
Effected by Line of Sight?_	No	Yes

Implementation of the RF Technology

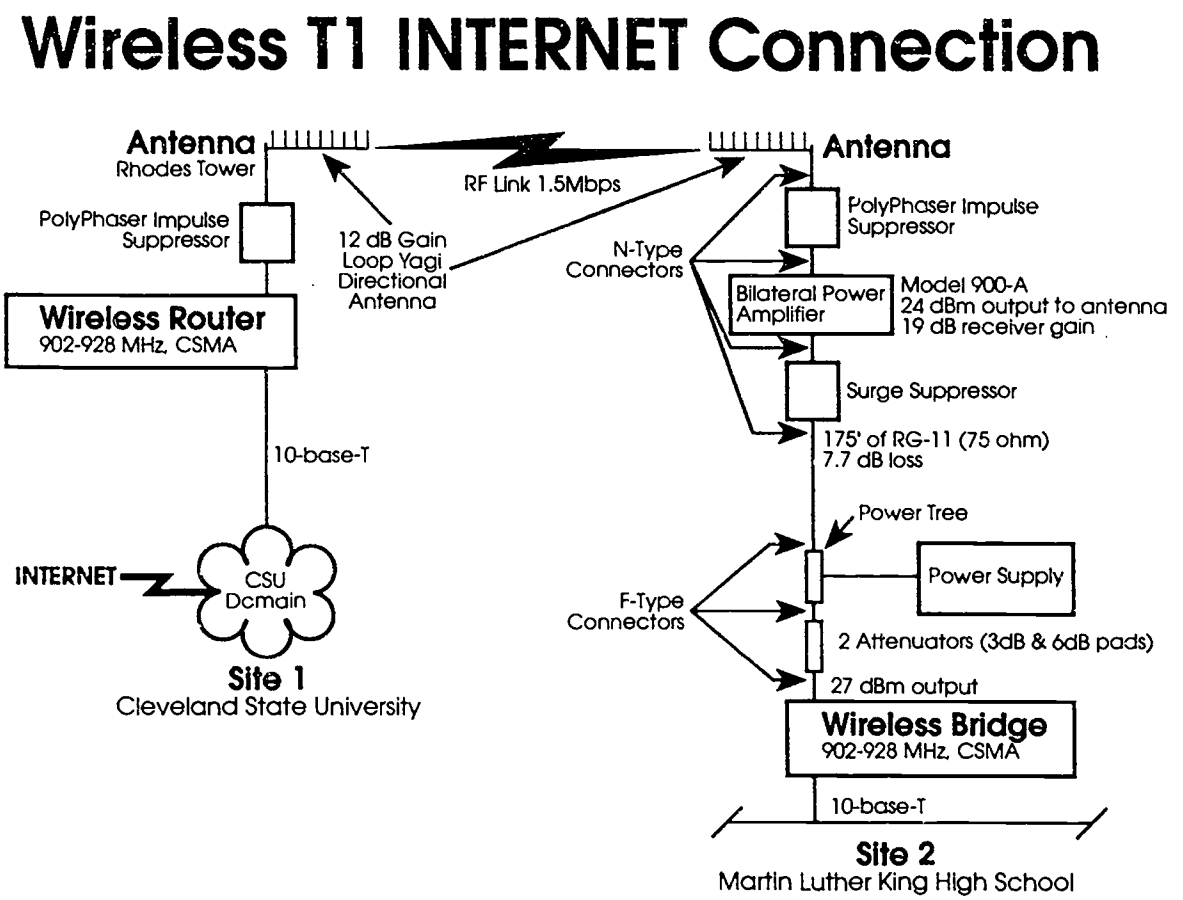
An overview of the equipment:

- Wireless bridge (at the High School)
- Wireless router (at the university)
- Cabling (from the antenna, to the various protectors and suppressers, to the bridge/router)
- Antennas at both sites
- PC to configure the bridge
- Bridge/router configuration software from supplier

It was necessary to establish an agreement with CSU which enabled access to their Internet node and for the establishment of the RF equipment at their site. The next thing that needed to be done was to apply for an IP address from Internic. This was done by sending a form using electronic mail to Internic for the application of the IP address and domain name. It was also necessary to contract for installation services required to place the equipment at both sites.

It was then essential to configure the bridge and router. The bridge and router had to be set up with an IP address, netmask and routing tables. This was done with a PC that was connected to the same Local Area Network (LAN) as one of the bridges.

Figure 1



See Figure 1 for a more detailed configuration.

The step-by-step configuration process included the following steps:

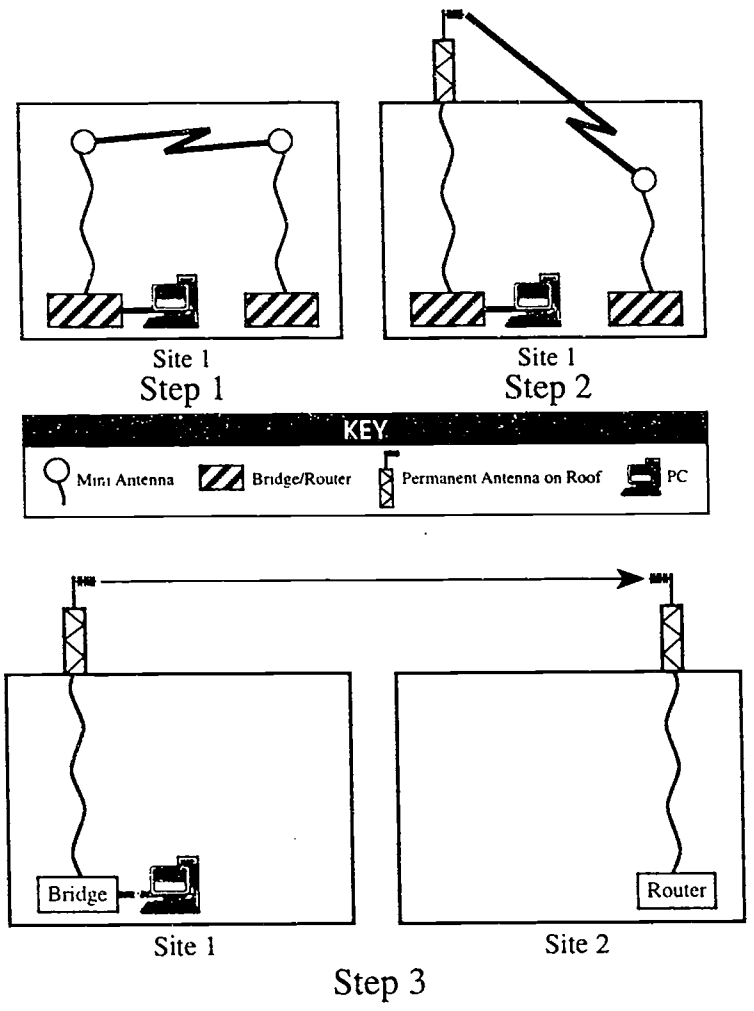
Step 1: Using the mini antennas that came with the bridge the bridge and router were set up in the same room and bench tested to verify that the hardware was working.

Step 2: The bridge was connected to the antenna on the roof and the router was taken up and tested between the permanent antenna on the roof and the mini antenna.

Step 3: The router was taken to the University and connected to the antenna and the connection was verified.

See Figure 2 for a more detailed configuration.

Figure 2



Problems/Difficulties/Limitations

Even though NASA Lewis tested the approach, the EarthVision pilot test was a replication of concept and it was not clear that the circumstances would facilitate successful operation. In order to test the feasibility of the approach, it was necessary to go ahead and purchase and install the equipment. RF technology is limited to a maximum of a three to five mile transmission distance with a clear line of site. Close proximity to a cellular telephone transmission station can cause interference with the signal.

Though the installation of the equipment it fairly simple and it has been piloted in a number of other sites it still requires some level of technical expertise. A knowledge of networking, computer technology, and a basic knowledge of RF technology is also required.

Conclusion

While RF technology has some limitations, given the right circumstances it can be a vehicle by which schools and other organizations can gain low cost access to high speed Internet connections

Mission to Mars: Integrating Technology, Telecommunications, and Literature

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Key words: telecommunications, integrated curriculum, literature-based technology projects, telecommunications projects, elementary/middle school

Abstract

Mission to Mars: Integrating Technology, Telecommunications, and Literature presents a step by step plan describing how to integrate and infuse technology into the elementary or middle school curriculum. Involving students in grades three through five, this project required developing, planning, and constructing a habitat for a colony on Mars. Students participating in the project used literature, various software programs, several curriculum guides and programs provided by NASA, and telecommunications.

Use of Telecollaborative Activities by Teachers

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Key words: telecollaborative activities, telecommunications, Internet, rural, science, math

Abstract

Reach for the Sky is a telecommunications project which has provided rural teachers access to the Internet, computer equipment, telecommunications training, and assistance in designing and writing telecurricular activities. The session will explore the design, the teaching and the results of some telecollaborative activities associated with the project.

Project Summary

The Internet and The Information Superhighway have become familiar buzz words. In some circles, access to the resources of the Internet has become synonymous with educational reform. What happens when teachers in rural, isolated schools start working together on telecollaborative projects?

Starting in the summer of 1994, 22 teachers in 15 different rural schools in Montana were given access to the Internet, and ongoing training in its use. This group includes elementary, middle, and high school teachers of math and science. The goals of the Annenberg/CPB and US WEST Foundation funded project, known as Reach for the Sky are:

- Providing teachers access to telecomputing equipment, sustainable connectivity, training, and technical support.
- Linking teachers to the Internet science/mathematics resources and databases.
- Networking teachers with local, national, and global communities of peers and experts.
- Assisting teachers to create and conduct telecurricular units and to mentor other teachers in the development and implementation of similar units.
- Showcasing teacher innovations in the use of the Internet and telecomputing which provide models of educational renewal.

The following questions are addressed in the presentation:

1. What happens when teachers who have never been on the Internet before are given access? What are the frustrations and the triumphs?

The outcomes of providing Internet access to rural teachers provided them with the exhilarating experience of having access to unlimited information and resources, the ability to overcome the isolation many rural teachers experience, and the feeling of being a part of a global community. On the other hand, the opportunities provided by access to the Internet were not without some frustrations. The time that it took to master some of the skills needed to access the Internet and integrate it into a full curriculum emerged as the primary source of frustration. Time spent on any telecurricular activity, even one linked to the existing curriculum, takes time from other areas.

2. ***How does one go about designing a telecollaborative activity? What happens when students get involved in such an activity? What are the advantages, and what are some of the possible pitfalls?***

Factors which influenced the design of units included the interests of the teacher and students, ideas that would fit the existing curriculum, and the ability to collect the data needed for the telecollaborative activity. Sharing telecurricular activities with other classrooms enable rural teachers and students to work with more diversified data and larger data sets providing a beneficial teaching tool to rural teachers. When students get involved in telecollaborative activities, the work tends to become more student centered and less teacher directed. The use of computers, Internet access, and using telecollaborative activities has proven to be highly motivational.

3. ***Can the resources found on the Internet, or access to the Internet in general, result in better classroom practice? In which way does access to the Internet change ways in which teachers teach and learners learn? In particular, did access to the Internet facilitate the design and implementation of telecollaborative activities?***

Resources found on the Internet can result in changing the way in which lessons are taught. The activities were enhanced by Internet resources and brought immediate information to rural teachers and students which was previously unavailable. The Internet was the medium of exchange for the telecollaborative activities which were designed to accommodate collaborative effort between several classrooms.

Part I: Investigating Modes of Participation in Online Teacher Communities

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Key words: telecommunications, professional development

Abstract

Interviews with 15 teachers from TERC's LabNet telecommunications-based project serve as the case study data for analyzing the ways in which electronic communities bridge some professional gaps found within the teaching community. We explore how teachers used LabNet to enhance their own professional learning. We identify three ways in which the network has supported professional development through online teacher activity by: 1) providing validation for their pedagogical method of teaching, 2) fostering intellectual stimulation, and 3) facilitating peer-peer collaborations.

Introduction

Validation, collegial conversations and work-based activities are among the hallmarks of a professional's work life. They are also frequently the missing components of a teachers' experiences. Although all teachers are leaders within their classrooms, they have few forums to utilize their leadership skills and expertise formally outside the classroom as part of their professional community. Instead, teachers most often work in isolation, demonstrating their expertise only to their students.

Participating in electronic telecommunications networks is one innovative way that some educators have attempted to fill the professional gaps they experience within their school. Discussions with teachers from TERC's LabNet project serve as the case study data for analyzing ways in which electronic communities can bridge professional gaps. LabNet has formed a science and math teaching community of 1,500 teachers using a telecommunications network, the LabNetwork, as a vehicle for collaborative discussions about teaching practice (DiMauro & Jacobs). Since 1989, LabNet, funded by the National Science Foundation, has used a network to create opportunities for experimentation with alternative teaching approaches, peer coaching and support, and reflection on practice (Ruopp, et al.).

Methods for Analysis

During June and July 1994, we interviewed 15 active network members through semi-structured telephone interviews.

The following research questions guided our interviews:

- In what ways do teachers support and learn from each other when using a telecommunications network?
- In what ways do teachers use their network-based learning to inform their proximate community, if at all?
- Through study of these questions in relation to the interview data we have identified three ways in which the network supports online professional learning.

1. Professional Collaborations

Much has been written about the environment in which teachers work— one with closed doors, lack of access to colleagues, and few opportunities to reach beyond the walls of the classroom. The telecommunications medium has frequently been used for shop talk and resource sharing among teachers. Teachers tend to respond openly and seek guidance from other teachers whom they perceive to be experts, when given an opportunity. This opportunity, when provided over a network, is frequently used for collaboration, advice seeking and giving, resource sharing etc.

One example of teachers' use of LabNet for collaboration was a grant writing experience where biology teachers used the network to conceptualize, write and submit a grant proposal to do water quality studies online. Such inter-school collaboration is not typically found in teachers' peer-peer relationships. However, the network served as a tool for teachers to collaborate and share a professional experience.

2. Validation

By participating on the LabNetwork, teachers received a great deal of peer-peer support and validation from the other members of the network about their teaching practice. One teacher, Colleen Kozumplik, talks about how she used the conversations and ideas found on LabNet to rejuvenate her teaching practice:

Occasionally, you derive a sense of validation from your peers, yes I'm good and I'm doing a good job. Sometimes I log in and I'm just looking for a little refreshment when my own well is dry. I'm just looking for someone to perk me up a little bit and make me feel like I really did make the right choices all those years ago.

Many teachers interviewed reported that they had little support within their community for alternative teaching strategies. One of the greatest rewards they cited was that by participating in LabNet, they were supported professionally by the online community in ways that their school community could not. The teachers were seeking various types of collegial relationships from peers. In some cases, they were developing alternative teaching styles and sought support; in other instances they were already doing projects and wanted to share project-based teaching dilemmas. Through LabNet, they found a community which provided validation of their project-based pedagogy.

3. Building Bridges

Networks can also support teachers' professional development by providing a community base that is different from one's local community. One advantage of having a professional community both locally and electronically is that the opportunity exists for obtaining various viewpoints and perspectives about teaching issues. One teacher, Donna Holmes told us:

I've got a couple [regional] public school teachers now online and I never even knew them. It's funny you don't even know in your own district, like DG at the Career Education Center has joined LabNet and I didn't even know who he was until he got online.

There is evidence that LabNet teachers use the network to form new professional relationships that either overlap with or enhance the colleagueships that presently exist in their local communities.

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Part II: Student Teachers on LabNet

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This work was funded by NSF Grant ESI-9155358.

Key words: pre-service teacher education, telecommunications

Abstract

We describe preliminary exploration of a use of telecommunications in preservice teacher education. For the past three years, student teachers at Tufts University have participated in LabNet (LN), a project at TERC in Cambridge, MA, to develop a community of science and math teachers who share an interest in promoting student projects and who communicate by bulletin boards, e-mail, and real-time "chats" (Spitzer & Wedding, 1995). We believe there can be benefits to this form of contact between student teachers and a professional community. We review student teachers' participation in LN in spring 1994, and suggest how it influenced them.

Student Teachers on LabNet

Like most LabNet (LN) members (Jacobs & DiMauro, 1995), the student teachers' mainly participated in LN community discussions as readers. Still, of eleven student teachers in 1993-94, seven posted at least one message to the community boards. From February-May 1994, there were 51 messages posted to LN community boards either by a student teacher (24) or by a LN member in response to a student teacher's post (27).

Michael1 was by far the most active, posting 11 messages in which he offered ideas and gave detailed descriptions of his math classes. In one post, he responded to a LN teacher who had asked for suggestions for curve-fitting lessons:

Subj: open ended curve project 94-05-08 00:16:43 EDT
From: Michael Stone
I gave an open-ended assignment recently asking that students try to think of two things that may be related, state a hypothesis of relationship, do a survey and then present their results. . . .

Michael went on to describe the students' work. For him, LN seemed mainly an opportunity to share his ideas. Other student teachers posted less often and used LN more to ask for advice. Sherman, for example, started a folder with the following post:

Subj: Oceanography 94-03-07 21:38:27 EDT
From: SHERMAN6730
Hi , My name is Sherman Jones . . . The class I am teaching is Oceanography and there is a wide variety of students in it. . . . Any ideas about activities I might use to spark some interest? There is a lot of resistance to being pushed too far, but the students are also very sensitive to demeaning busy work. . . .
Sherman

LN teachers responded with suggestions for various projects including "beach in a box" investigations and bubble habitat design; one referred him to work at the University of Connecticut; and a teacher who had joined LN as a student teacher the previous year suggested building a life-size model of a whale.

Influence on Student Teachers

Seven student teachers explicitly considered using LN-style projects in their classes. Vicky and Sherman, perhaps inhibited by traditional philosophies at their internship sites, did not follow through, although both did experiment with other progressive methods. Michael, Bonnie, Ryan, Annie and Miranda all used projects, as they described in stories they wrote for their Tufts seminar.

Ryan, for example, wrote, "I wanted to get my freshman earth science class involved in 'project learning' which I had read about through LN" and went on to describe how he brought his class to "Mill Brook," divided them into groups, and engaged them in designing their own studies of various aspects of the brook's ecology. Annie used projects extensively in her math teaching, despite her master teacher's skepticism. One of her stories recounted how a class discussion about an ad comparing long-distance phone rates evolved into a "full-fledged project." The students analyzed telephone bills to understand charges and discount plans; interviewed representatives of AT&T, MCI, and Sprint; and in some cases convinced their parents to change services.

More generally, the idea of LN-style projects became part of everyday discourse among the student teachers, who spoke of them as the most salient alternative to traditional pedagogy. Many of the students' comments showed they felt implicitly, if not explicitly, challenged to try this mode of teaching in their classes.

Influence on LabNet

The student teachers influenced LN in return, exchanging messages with 20 LN teachers from February-May 1994, and more after they graduated. Robert started a folder in July to ask for suggestions for the coming year. It was a good example of how a novice's question can spark discussion: In two months, 24 LN members posted 31 messages, discussing their approaches, trading handouts, and making the folder one of the most active that summer. Several veteran teachers reported that it prompted them to start their classes differently in the fall.

Future Directions

In sum, we believe participation in LN provided student teachers:

- advice and encouragement;
- an appreciative audience for their ideas; and
- motivation to try projects and other progressive methods.

Certainly it is difficult to distinguish the influence of LN from other components of the student teachers' program; in fact, we believe their Tufts seminar played a crucial role. We hope to build on this preliminary effort with more systematic work involving various universities, to study what forms of participation to expect of student teachers; what interaction with LN teachers; and what relationships between LN and the university programs. We see potential in telecommunications for a broader community integrating university educators, teachers in the schools, and student teachers.

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Vocal Point: A Collaborative, Student-Run, Online Newspaper

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Key words: online newspaper, student newspaper, collaborative project, publications, technology, Internet, html

Abstract

Many educators see access to the World Wide Web as a resource for their students to do research and gather information to be used in the classroom. The power of Web publishing allows the students to also become providers of information, thus presenting the results of their research and expressing their viewpoints. Online collaboration with other schools extends this power even further, allowing a wide range of students of different ages, backgrounds, cultures and regions to research and express their findings and viewpoints in a single, thematic document.

Beyond the research and writing is the behind-the-scenes, online collaborative and communicative nature of organizing, managing, assembling and presenting their cumulative product on the World Wide Web. The multimedia nature of the newspaper requires learning and using an extensive range of software and hardware. To get the job done, students must learn different tasks in parallel and from each other. This "learn, implement and teach" process occurs for each issue, allowing all the students to experience a variety of roles throughout the school term.

Vocal Point is a student-driven, electronic newspaper available to the world through the World Wide Web. This multimedia, topic-oriented newspaper is a collaborative project of students in grades 6-12 in different schools. The students research (using the Internet, CD ROM, and traditional researching media) and write about adult, real-world topics, linking their stories to resources found on the Internet. With each new issue, students extend Vocal Point to incorporate new technologies and features. This evolution is driven by the students and their viewing audience who constantly communicate and challenge each other with new ideas.

The coordinating teacher and one of the student managers will describe and demonstrate this exciting project.

Telementoring: Connecting the Learning Community

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Key words: telementoring, teaching, mentoring, telecommunications, science, mathematics

Abstract

Telementoring networks are available to support standards-based reforms in elementary mathematics and science education. They comprise a community of learners that include preservice, inservice, and teacher educators. Also, help is available from content specialists in specific areas of science and mathematics. Telementoring has the potential for linking educators to dialogue and exchange ideas on successful effective reform practices. Effective teaching practices are available on the Internet without the constraints of geography, time, or experience.

Subheads

The Telementoring Project is a collaboration of teacher training institutions in Michigan, New York, and Pennsylvania. This project will create a model telementoring environment that supports the mentor/mentee concept using the Internet. It will provide a mechanism for coaching, discussing and reflecting on effective practices that will bring about standards-based reforms in elementary science and mathematics. With the cooperation of experts in content and methods, preservice, and inservice teachers will exchange roles in the mentor/mentee relationship throughout the life of the project. In addition, the networking opportunities will build telecommunication skills for those involved in the program.

Incorporating effective standards-based reforms in elementary science and mathematics is one of the main objectives of the project. The telecollaborative teams will combine the expertise of all participants to share information, ideas, and resources for implementing new classroom techniques based on national standards for the teaching of science and mathematics.

Telecollaborative networks will change "schools" and if they are used to their fullest potential, schools will benefit in terms of energy, time, and money. These electronic networks can cross cultural and economic boundaries, providing the opportunities for all teachers to use this new resource as a lifelong tool for learning.

"Oh What a Tangled Web We Weave . . . World Wide Web That Is!"

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Key words: World Wide Web (WWW), Russia, student exchange, Internet, e-mail

Abstract

From e-mail to the World Wide Web! Discover how a USIA-sponsored international student and teacher exchange program, a state education agency, and public and private universities in three states forged a partnership to link schools over the Internet in an interactive, multi-lingual, multi-national and soon to be multimedia project.

Document

"Oh What a Tangled Web We Weave...World Wide Web That Is;" discusses the unique aspects of how a Russian American student exchange program found its way into a World Wide Web project developed between the Connecticut State Department of Education, Eastern Connecticut State University, Brown University's Russian Satellite link, and the University of Tennessee's Friends and Partners World Wide Web (WWW) site.

The desire to establish and utilize WWW sites between schools in Connecticut and schools in Russia was an outcome of two projects. The first was a physical exchange program entitled "Linking Schools Through Language and Technology" funded by the United States Information Agency under the Freedom Support Act. The second was a WWW site entitled Friends and Partners whose object is to build bridges between Russia and the United States. Under the "Linking Schools Through Language and Technology" program, high schools in the state of Connecticut formed consortia; each consortium then hosted a group of Russian students and a cadre of Russian teachers. Both Russian and American students along with teachers worked on joint projects. Throughout the initial phase of the project e-mail served as the prime source of communication. However, as the involvement of the student and teachers grew, the desire to use some of the newer technology to disseminate information about the exchange and the projects became all the more important. At this point, enter the University of Tennessee with its Friends and Partners WWW site and Brown University with its satellite link to Russia. The Friends and Partners WWW was a natural place to house the projects. Another factor was that it had a mirror site in Pushchino, Russia. Missing was the link between the student exchange program and the Friends and Partners site. That link would be provided by students and faculty at Eastern Connecticut State University.

The problem, which confronted the state of Connecticut, was the lack of hardware and software expertise to do the necessary work on the Web. Because Eastern Connecticut State University had given guest e-mail accounts to assist in the exchange of information between the State of Connecticut Department of Education and e-mail accounts to actual participants; the state department of education called upon Eastern Connecticut State University to assist in putting together the missing link....the World Wide Web connection. All along, in the background sits Brown University.....the only not-for-profit, FCC licensed satellite link to Russia. Two teleconferencing sessions with exchange students in Russia illustrated the extreme worthiness of this connection and its implications for both teacher and

student exchange projects. Because of these initial success, satellite conferencing is becoming an integral part of our planning as we continue our exchange efforts.

The project has been structured into three phases: pilot, intermediate, and final. In the pilot phase, Eastern Connecticut State University faculty and staff developed specifications from the hardware at each site in cooperation with Friends and Partners. As part of the pilot phase Eastern Connecticut State University students would develop a home page for the project. This aspect of the project also included the development of a set of workshops for the exchange participants on World Wide Web, the addition of several of the high school projects into the home page, and testing the load of the project transactions on the Eastern Connecticut State University Internet links. The intermediate phase encompassed several other activities. First, setting up a mirror site for the Friends and Partners World Wide Web site. This required downloading of the Tennessee home page and support directories. In addition, in this phase Eastern Connecticut State University students would add the unique aspects of the exchange project's home page to the mirrored site.

In the final phase of the project, the program director, with Eastern Connecticut State University assistance, would provide a link for all qualifying Connecticut state junior and senior high schools to the WWW. Likewise, we would add all participating Russian schools to the link. The final outcome of this project will provide the physical exchange participants with a repository for their projects. This repository will reside on the WWW and be accessible to students all over the world and of all ages.

Oh What a Tangled Web We Weave.....

End Notes

1 We are using pseudonyms.

Advanced Placement Physics Through Distance Education

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Abstract

Is it possible for high school physics students on opposite sides of the globe to learn in the same classroom? The Department of Defense Dependents Schools (DoDDS) operates schools that are located on or near United States military installations overseas. DoDDS are located from Japan to Panama which represents a total time difference of 17 time zones. Many of the high schools in DoDDS are small and can not support Advanced Placement courses. The small size of DoDDS high schools justifies offering some AP courses through distance education. The fact that DoDDS high schools are separated by as many as 17 time zones requires that the courses are delivered asynchronously.

In August of 1994, DoDDS began offering AP Physics B through Distance Education. AP Physics B through Distance Education includes a series of lecture and problem-solving videotapes. Students and instructors communicate through a computer conferencing system. The course also includes a laboratory component.

The model that has been developed by DoDDS for offering AP Physics B Through Distance Education has applications outside of DoDDS. School districts in the United States that have two or more high schools might find that this method is an efficient and cost effective way of offering AP Physics B or other AP courses.

AP test results from the first class of DoDDS' AP Physics B Through Distance Education were available in August 1995.

Introduction

The purpose of this paper is to describe a distance education project that has been carried out by the U.S. Department of Defense Dependents Schools (DoDDS). DoDDS offer several courses to high school students and staff members in its school which are located on or near U.S. military installations around the world. Because the schools are separated by a wide range of time zones, DoDDS offers its courses asynchronously. By asynchronously, it is meant that students and instructors use computer conferences to post assignments and responses that can be accessed by group members when it is convenient for them at their home schools. The DoDDS model for distance education has been described by William Morgan (Morgan, 1994).

Beginning in August 1994, DoDDS began offering AP Physics Level B through Distance Education at ten DoDDS high schools in four countries from Japan in the western Pacific to the Azores (Portugal) in the mid-Atlantic Ocean. This represents a span of eleven time zones. The course has included a dynamic cooperative learning component in which students in different schools and countries have worked together asynchronously in cooperative work groups. Mr. Dennis C. Edwards and Mr. Howard Beuerman instructed and managed the course for the 1994-1995 school year from their home high schools in Ramstein, Germany and Heidelberg, Germany, respectively.

Course Structure

AP Physics DE has a number of components and resources that make up the course. Student resources include a college level physics text book (Giancoli, 1985), and a complete set of the Mechanical Universe video series (1985). Students also receive resources that were developed by Dennis Edwards specifically for this course. The resources include a Study Guide that leads students through the textbook and the course. The Study Guide includes reading, video and problem assignments. It also includes labs and cooperative learning group assignments. Mr. Edwards also developed a set of lecture videos to accompany the text and a set of problem solution videos to accompany the problem-solving homework assignments.'

The telecommunications vehicle used in the course is CONFER II, a computer conference service available to DoDDS through the University of Michigan at Ann Arbor. CONFER II allows students true conference ability which means that all students' responses to a topic are displayed chronologically and are available to all members of the conference. The use of CONFER II for distance education courses in DoDDS has been described by William Morgan (Morgan, Nissen, Shriver, and Peyton, 1994). DoDDS uses CC:Mail for e-mail purposed in distance education. In the 1995-1996 school year, DoDDS distance education courses will transfer from CONFER II to Lotus Notes.

An integral part of DoDDS distance education courses is the local facilitator at each participating school. The local facilitator is a staff member at the participating school who is also responsible for maintaining integrity for sending and receiving examinations and grades. Without the local facilitator, distance education courses in DoDDS would be impossible.

Preliminary Results

1. AP Physics Level B can be effectively taught and learned through distance education. AP Physics exam results from the first DoDDS AP Physics DE class were available in August 1995.

2. Cooperative learning techniques using asynchronous computer conferencing technology can be very effective learning instruments in distance education courses.

3. Cooperative learning techniques using asynchronous computer conferencing technology can be very effective in a distance education course in establishing social presence or a "real classroom spirit" in the virtual classroom.

4. Cooperative learning techniques using asynchronous computer conferencing technology should be applied to traditional classrooms.

5. The model for AP Physics DE developed by DoDDS could be used by school districts in the United States. This model could be used to have one instructor at one school in a district teach the course to all high schools in the district. Proceedings of the Third International Conference on Telecommunications in Education; Tel•Ed 94, Albuquerque, NM, November 10, 1994. The Mechanical Universe and Beyond, College Version (1985). California Institute of Technology. Morgan, W., Nissen, K., Shriver, B., and Peyton, L. (1994). Modeling Teaching Strategies Through Distance Education. Proceedings of the Third International Conference on Telecommunications in Education.

Cyberspace Curriculum Connections

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Key words: Internet, curriculum, telecommunications, teacher training

Abstract

As more and more educators gain access to the Internet, they are discovering that this vast network of networks has the power to bring seemingly limitless resources to schools and classrooms (as well as to their homes). Teachers hear of exciting opportunities to find curriculum-related materials that will help open the world to their students. Many of those who would like to explore the possibilities and find applicable materials/resources do not have the skills that will allow them to do this successfully within a "reasonable" amount of time.

The presenters, from two Texas universities, have required both graduate and undergraduate teacher education students to search the Internet, and to find and integrate that material into their curriculum areas. They suggest a four-step approach to teaching people how to access and utilize materials from the Internet.

Educators wishing to use the Internet need to know...

- what's out there,
- where to look and how to get there,
- how to retrieve information, and
- how to use the information to enhance the curriculum.

The presenters will share specific hints, tips, and techniques that they have used with their undergraduate and graduate teacher education students. Participants will receive addresses of updated gopher materials that list education resources on the Internet. The above listed steps will be discussed and illustrated, with special attention to ways these steps can be used for teacher development to help educators learn to use the Internet as a curriculum enhancement tool. Lesson ideas as well as a bibliography of additional resources will be available.

TEECH: Building an Electronic Community of Leaders in Teacher Development

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Key words: telecommunications, professional development, community building

Abstract

TEECH is a three-year project funded by NSF to foster increased collaboration among leaders in teacher development. The presentation will share some of the successes and roadblocks that the project has encountered in fostering this electronic community. Results of a survey regarding use of the Internet will be shared.

Summary of Presentation

TEECH (Teacher Enhancement Electronic Communications Hall) is a three-year project, funded by the National Science Foundation. It aims to advance the work of Teacher Enhancement projects by fostering increased collaboration among leaders in teacher development.

Currently TEECH is in its first year. We are facing several key issues in designing a network-based community using Internet tools such as the World Wide Web. Some of these issues include forming a sense of community in the very public arena of WWW; maximizing participation; initiation of discussion groups and training of moderators from within the community.

The proposed Tel Ed project presentation will demonstrate what the project has accomplished to date. We will share some of the successes and roadblocks that the project has encountered in fostering this electronic community.

In addition, we will discuss the results of a needs survey conducted with Principal Investigators of current teacher enhancement grants. We will share data on how Is??? are currently using the Internet, what they find most useful, what would attract them to connect to an electronic community and what would deter them from doing so.

Project Description

TEECH endeavors to draw on the strengths of over one thousand principal investigators and senior staff of teacher enhancement grants from the National Science Foundation, and national, state, and local departments of education. Its purpose is to encourage communication, collaboration, joint exploration, and pooling of this community's collective resources.

The project will focus on three major activities. It will facilitate special interest groups where projects can communicate with each other about shared areas of interest; develop shareable resources that will include project descriptions, research papers, curriculum materials and resource lists; and hold a series of electronic seminars between key experts that will be made available through the Internet. These seminars will frame the issues, and encourage further discussion and debate on topics of critical importance to teacher enhancement, such as teacher change, project-based learning, mathematics inquiry methods, and evaluation and assessment of teacher enhancement projects. The seminars will be followed by community-wide participation in electronic bulletin boards and discussion groups.

TEECH employs networking technologies and information services which currently are in the midst of a very rapid evolution such as video seminars conducted over the Internet and World Wide Web. Recognizing that the technology is rapidly changing and that individual access to the technology varies greatly, TEECH will employ several different formats to meet the needs of different participants.

There are a large number of unanswered questions concerning the technical, social, and human aspects of these new modes of communication. Through a subcontract with BBN we are investigating several of these issues within two small pilot groups. By examining how communication develops within these small communities, we will add to the research base and current state of the art on community networking.

Connecting Your Classroom and the World—Changing Education

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Key words: World Wide Web, telecommunication, classroom, curriculum

Abstract

As FIRN (Florida Information Resources Network) becomes geared up to handle the Internet and World Wide Web (WWW), potential for many changes are available. This presentation examines many of the issues related to bringing the Internet and the WWW into precollege classrooms including shifts in major educational models. The WWW may well be a part of many homes in the near future. Its presence may change many things about our lives.

What materials are available?

This presentation will provide a demonstration of the type of multiple directions that are available from the World Wide Web. The presentation will include a direct telephone connection to Internet and use the Netscape browser to examine a number of options that will be online. Previously prepared materials interfacing with the Internet will be used to help make the connections. The connections will include a wide variety of such materials that are available.

What services are available? A number of online services will be demonstrated. such as search strategies and the ability to download materials. For people wanting to become involved in writing their own materials, online help will be demonstrated. Materials will be organized so that people can know where to go and what to download to get going with the whole process. Commercial companies, organizations, and educational institutions are all contributing to the WWW, and hence, have information that is easily accessible.

How could such abilities change the classroom? Within the next few months the State of Florida will have full access to the Information Superhighway at each school district through FIRN (Florida Information Resource Network). As this technology enters the classroom there are many questions that need to be pursued. For example, we can put students in charge of their own education through more of a problem-oriented curriculum. Students solve problems or gather data by searching and making use of available resources rather than simply having them feed back knowledge from a text. Students in the future will have multiple sources available to them and need to learn how to sort out critical information to help them solve problems or gather information.

How do such capabilities change the curriculum? Curriculum needs careful reconsideration to think through what are the critical concepts and skills to learn. For example, students can study social studies by going to a world map through the Virtual Tourist of Virtual Tourist II. They can point the mouse and click on a location to visit, then get whatever information on the history, culture, and current events people at that location have placed on the WWW. People can keep up to date on the latest information on children's literature by going to the Children's Literature site. New intellectual challenges, in the form of puzzles, problems to solve, and other challenges, are being placed on a number of sites. Examination will be given to whether the focus should be learning specific content for the time or whether the students should be given experiences that will help them build a foundation for lifelong learning.

How do expectations for learner outcomes and assessment change? If curriculum and the classroom environment change, then should there be changes in expected learner outcomes and ways of measuring such also change? Examination of such outcomes will be given.

How does the view of potential resources change? Commercial companies, museums, educational institutions, government agencies, and other students all will have access to the WWW in some kind of a parity form. What kind of dynamics does this bring about? A third grader no longer needs to be restricted to third grade curriculum, since he or she can move to different levels. On the other hand, some will not be ready. How are they brought into the system?

How does collaborative learning fit into such an environment? Recognizing that in most classes students are not at the same levels, how multiple levels can all learn constructively will be examined. The role of learning in a lifelong learning environment can change from the more traditional method.

High Schools on the Highway—Road Crew Required: The Information Technology Management Program

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Key words: curriculum, information technology, network management, mentoring

Abstract

How does information highway hype translate into preparing students with essential skills for their future? Certainly both educators and employers agree that having the right skills is the key to workplace success. Entrance requirements for the workplace demand literacy and technical skills sup-

ported with an ethos based on productivity in both knowledge work and service work (Drucker, 1993). The Information Technology Management Program (ITMP) addresses this need for skill development through a unique curriculum that combines hands-on information technology (IT) and telecommunications training with project and client management skill development. High school students plan, implement and manage their school's IT and telecom infrastructure, acting as critical resources for educational technology initiatives. Now in its second year of implementation, with more than 20 participating school districts, ITMP supports the school's IT infrastructure management requirements through a curriculum-based approach that replaces traditional computer science programs. ITMP is reshaping roles and responsibilities and has defined a major new learning opportunity for students and educators alike. Young adults become responsible networked systems implementors and knowledge architects in the communities they serve.

The Educational Goals of ITMP

The vision of the ITMP program is to have students provide technical support services to their school on a client-contract basis. The curriculum concentrates on combining technical content (local and wide area networks and Internet access) with an in-school work experience approach to learning. Students use project management techniques to design and implement technology. They develop skills for working in a team to effectively deliver information technology projects. They build relationships with IT industry mentors to develop their knowledge base. The program positions students for employment opportunities within the information technology and telecommunications sector, as well as preparing them for post-secondary advanced training, and university entrance.

By bringing together experienced teachers, university faculty, and industry specialists in IT, the program has tested a new strategy for creating a learning environment that provides academic content, deals in significant societal issues, and allows students to provide badly needed support for the increasingly sophisticated technology systems of the school community. The first year of implementation was a learning experience for all involved—most particularly for the educators and IT experts who wrote the curriculum content, designed evaluation instruments, and worked closely with students in the classroom. The learning has been shaped by seeing through the implementation process and the management challenges. One way of summing up the experience is to say that educational traditions met head on with industry standards. Once ITMP was up and running, it was possible to witness students developing from note-takers preparing to hand in assignments, to roving consultants providing contract services to teacher-clients. The program stretched the capabilities of teachers and students by continuously moving them into new ways of learning, working and being in school.

The program represents an ongoing integration of ideas and practices, drawn from both the IT sector and from pedagogical practice, to achieve a high level of applied skills. The curriculum encourages students to acquire new ideas and principles in information technology, telecommunications and project management and in so doing, successfully bridges the traditional gulf that exists between the worlds of school and work. For the teachers and students in this program, the learning that went on resulted in a great deal more than what they had come to expect from computer studies courses in the high school.

One of the defining characteristics of the ITMP curriculum is how it models the applied part of the program on an industry service organization that provides information technology support services in hardware, software, training and advice. This allows students to develop workplace-ready skills, as they provide essential technology support services to their school district. The pilot project helped identify the range of organizational skills which students require and pinpointed the typical gaps in their knowledge of information technology. ITMP extends the value of technology to serve, assist and benefit not only the school, but the district and the wider community as well.

In less than a year, substantial developments transpired in all the ITMP sites in the following areas, each of which is addressed in detail in this presentation below:

- A change in the role of the teacher
- Students learning through providing service
- Students learning to manage responsibility
- New tools for evaluating student progress
- Greater partnerships increasing linkages between schools and the community

We would contend that one of the strengths of the project-based nature of the ITMP curriculum, with its project focus, is that it signals to students that their work has value, that the contributions they make as service providers, does matter in the life of the school. It is further evident that service projects are giving students new reasons for using the technology, including to assist others, design and deliver workshops, and write manuals. They are connecting with other students and teachers in ways that have not been possible before in a school context. The value and motivation attached to doing useful and needed work that serves the interests of others cannot be underestimated as a motivation for adolescents' learning. What is beginning to emerge is the connection between business education and community service within a framework that allows students to take responsibility for their learning in a way that becomes personally meaningful.

This idea of taking charge, of being your own boss, is both a stimulus and a source of pride for the majority of ITMP students. As one student put it, the course is set up for students who are willing to say, I don't know this but I'm going to find somebody who does and I'll learn it. What stands out in these classrooms is that students are given license to follow their interests in information technology and telecommunications and are trusted to manage and organize their time in order to fulfill and complete a project. At the same time they are learning a host of valuable lessons: first-hand experience with work delivery deadlines, delegation of tasks, follow-through, and accountability. These are the key tools for success in the workplace and to being effective workers. Responsibility and initiative need to be promoted and supported. In these classrooms, teachers don't recede to the back of the room, they re-emerge less directive and far more suggestive as a resource, guide and model. The ITMP program has managed to tap into the potential of these students as budding entrepreneurs, capable network managers, aspiring project managers, skilled technical architects, and future consultants. Once this wick of potential has been lit, nothing but a lack of opportunity and support can stop them in finding their way in the new economy.

OnRamp Client: Telecommunications for Kids

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Key words: cross-classroom collaboration, curriculum, middle school, social studies, tele-mentoring

Abstract

This session describes a telecommunications package, OnRamp Client, developed in response to the needs of students in the province of British Columbia. We discuss the general features of OnRamp Client and present results from some of the activities facilitated by the program.

British Columbia, in Western Canada, faces some unique challenges in providing education to students. Approximately 80% of the students live in an area covering less than 20% of the geographic area of the province. One northern, rural school district covers a region of the province geographically larger than the state of Colorado in the United States, with student populations of only a few hundred students.

Providing equal educational opportunities to all students in the province has thus been a challenge. The Technology and Distance Education branch (TDEB) of the Ministry of Education has attempted to address the needs of students through promoting and supporting use of telecommunications. The TDEB funds a province-wide network for teachers and students known as the Community Learning Network, giving schools access to the Internet, e-mail, and BBS type services.

More recently, the TDEB funded development of a telecommunications software package targeted for use by younger students. This user-friendly package, known as OnRamp Client, has several unique features designed for ease of use. It has a point and click interface, a word processing interface, and drag and drop capabilities. Users can exchange mail with any other user in the system simply by dragging the name of the recipient into a recipient box, thus eliminating the necessity of knowing a recipient's e-mail address. In addition, the software allows users to include still images, video, and sound clips within the body of their e-mail message. These images and sounds can be inserted within the message simply by dragging them from a source and dropping them in any chosen spot within the

message. Users of the system can be designated as students, teachers, or administrators to allow differentiated access to features of the system. Messages exchanged within a particular site are handled by the local OnRamp server, thus reducing traffic on the main server connecting various sites.

One elementary and two middle schools were involved in beta-testing of the software during the 1993-94 school year. On the average, over 600 messages per month were sent, with traffic some months of more than 1,000 messages. Approximately 90% of the messages during this year were local, i.e. within a site rather than between sites. Students were enthusiastic about the messaging system, and computers connected to the OnRamp server were virtually all in use during any break during the school day. Students were interviewed about their experiences with the system. Interesting comments included the equalizing nature of e-mail (from handicapped students) and the enjoyment of having a "quiet means of communicating."

During the 1994-95 school year, ten different sites were connected to each other via the central OnRamp Client server maintained by the DTEB. Uses of the software have ranged from basic exchange of friendly messages between students on the system to tele-mentoring activities, where education students at the university and university faculty have interacted with the students to answer their questions and provide information to the students.

One of these activities, the Camelot project, had students study the middle ages through communicating with university students. The purposes of the project were:

1. to explore the potential of using electronic messaging as means of teaching and learning.

2. to test the application of Egan's principles of romantic understanding.

Fantasy and role-play were selected as the means of testing the principles of romantic understanding. Participants chose pseudonyms appropriate to the middle ages, and through messaging and role-play created a storyline. Students at Baysideshire (the name chosen by the middle school students) and UVicshire (the university class) discussed details of their lives and their community. University students were responsible for maintaining historical accuracy in the details of daily life in the Middle Ages and in creating an evolving curriculum related to the Middle Ages.

Results of the Camelot project were mixed. UVic students rose to the challenge and created interesting, captivating storylines for the Bayside students. They left their university course with a sense of the power of e-mail and its potential for teaching and learning. The Bayside students had a high level of enthusiasm and several students "came alive" during the project.

The major weakness was that not all Bayside students were drawn into the storylines to the extent expected. The result was a limited number of responses from Bayside students in some groups, which was disappointing for the university students who had spent much time creating the storylines.

OnRamp is a viable messaging system. It allows for interesting, non-traditional interaction between teachers and students, with the roles of teacher and learner often reversing. Users experience greater freedom of expression with the barriers removed that face-to-face interaction often places between teachers and students.

The Underserved Families Internet Research Project: A Case Study

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Key words: underserved, community, Internet

Abstract

This project examined the effect of providing Internet access to the traditionally underserved community (minorities, low income, limited English proficiency). Six families from the local community received Macintosh computers and high speed modems. Participants were trained to use their computers and the Internet. Findings from the project will be discussed.

Although access to the Internet is readily available, such access is neither universal nor equitable. Regardless of the method of connectivity, there is one constant: Access to and use of the Internet require a modest investment on the part of the user. At a minimum, users need time to learn, understand, and use the network; require a computer, modem, software, and a telephone line; and in many instances, must have the financial resources to pay for the monthly recurring charges associated with their connection.

As Internet access and global networking become more mainstreamed, we could find our society segmented into two groups who are unable to communicate with each other: The information "haves" who will be capable of accessing and using information productively and the information "have-nots" who will be prisoners in our own society.

In an effort to narrow the gap between the information haves and have-nots, the Underserved Families Internet Research Project focused on that group of people who are likely candidates for the have-nots. This group, the traditionally underserved, included minorities, families from low socio-economic areas, and those with limited English proficiency. The primary goal of this project was to study the barriers to and ramifications of providing Internet access to the traditionally underserved. In achieving

this goal, we identified: (1) strategies, activities, and materials that can be used to encourage entry into technology by the underserved; (2) barriers to access; and (3) the support services required for this group's continued participation.

Six families from the local community were selected to participate in the project. Using equipment from our home-computer loan library, participating families were loaned a computer and a modem and were trained to use this equipment. Families also underwent Internet-based training. Among others, families were taught how to use the Internet to communicate electronically with each other, resource searching strategies, and how to acquire information from the Net. The Internet connections consisted of PPP links provided by the university at no direct cost to the participants.

Our preliminary findings suggest that home computer and home Internet access can: help change the image of underserved parents about their role in education; raise the level of intelligence of underserved parents about global networking; and provide underserved parents with practical, first-hand knowledge about technology and give them the technology-based experience required to become technologically literate. It was also discovered that underserved parents developed proficiency in using telecommunications hardware and software, and used local and global resources to assist in the lifelong learning of themselves and their children.

School and research personnel volunteered their time to implement this project and equipment donations were made by local businesses in support of the project. As an extension of this project, we are now examining the potential benefits of extending this project into the community at-large by setting up several urban community centers to serve as Internet points of presence for other members of the underserved community.

Eristan! Oh, Eristan! How I love Inter(net) Active Fiction!

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Key words: Internet, motivation, reading instruction, authentic processes

Abstract

This session is a discussion and demonstration of the use of certain types of Internet resources. The demonstration has the specific purpose of showing language arts teachers who are new to the Net how to use the Frametale, which has the modern acronym of MUD, to engage reluctant readers and writers in tasks that are quickly adopted and become authentic processes. Authentic processes are those seen by the student as self-selected (NOT self-selected from a limited universe but a truly desired, motivating activities.)

IAF

When the mysterious closet door closes on the hum of a server and when that thing called a DSU/ CSU has been connected to the fat telephone cables that came skittering through the walls leaving an RJ-45 connector socket in your room (so you know you now are "on the wire"), and when you bite down on that fingernail you know you shouldn't have in your mouth, the realization seeps in like the late afternoon heat during summer school: What, exactly, do I do now?!?

As you pace the floor, trying to wrap your mind around it, you may ask questions like "How is an Elizabethean frame-tale like a language arts class?" "If the students are having as much fun as they do playing video games, there has to be something wrong with using it as an instructional material, right?" "If the students catch on to it much faster than I do, then how am I going to control the assignments and the class, much less the evaluations?"

This session examines the answers that lie in an "authentic process" this writer calls Inter(NET) Active Fiction or IAF. This writer shows why he sees traditional assignments tailored to individual interests and reading ability, use of whole language and journal writing, and the care taken with pre-reading and pre-writing experience to be excellent attempts but "near misses" in the evolution of the truly authentic processes.

Are there *really* reading experiences which adolescent boys desire so strongly that a single taste will keep them struggling to overcome their limitations, keep them searching the keyboard for the right combinations of characters, keep them staring at the screen until it begins to make sense? Is there really a way to provide authentic reading experience? In a word, yes! The same topics that have caught the imaginations of adolescents for generations have "come alive" on the Internet. Beowulf, King Author, the Quest for the Holy Grail... knights in shining armor, damsels in distress, fortunes in gold and jewels, the mysteries of Merlin and his uncommon knowledge... all these and more await. Experience shows that a single taste is enough to whet the adolescent appetite, to their overcoming any number of obstacles to return to these exciting, these promising, these foreboding lands.

Would you like an introduction?

The following HANDOUTS will be available at this session: 1) A schematic of the reading process, 2) Composition for the learning disabled student, 3) MUD-FAQ (the Frequently Asked Questions concerning the Multi-User Dimensions), 4) Internet addresses and procedures for logging onto some of the machines, 5) "These Forboding Lands," brief descriptions of some places of interest to adolescent adventure seekers.

The reading process is presented as "homonculi," for ease of understanding. Considered are the visual equipment and cognitive feedback for rescanning, cracking the code, anticipation as a semantic-syntactic accumulation, the place of the logic and belief systems, phonological scripts and vocalization.

Composition is discussed in its relationship to the creative (input) aspect of Inter(NET) Active Fiction with the premise that the reluctant reader is learning disabled, in fact if not in diagnosis. Considered are keyboarding skills (essential to Inter(NET) Active Fiction) and a method for providing single-key replacements for high-level skills, traditional "interactive fiction" contrasted with Inter(NET) Active Fiction, decision stories, and Polloway's "Model of Written Language" as a verifier of the processes is suggested.

The history of Internet sites offering IAF is reviewed very briefly, the FAQ is reviewed, and use of the term MUD is adopted as an acronym for Multi-User Dimension. A list of sites which currently host IAF is reviewed very briefly and distinguishing features of different MUD sites touched upon, then the processes are demonstrated.

Network Criteria for Successful E-mail Projects: The Global Education Telecommunications

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Key words: telecommunications, e-mail projects, curriculum, networks,

Abstract

Seven years ago the School of Education of the City College of New York developed the idea for an electronic mail network known as the Global Education Telecommunications Network (GETN) Project that would link ten primary and secondary schools in New York with their counterparts in London. Today our GETN project links more than 60 schools in New York with schools in 30 countries around the globe. Our network is centered around inquiry-based projects developed by teachers who are introduced to one another through the network. Teachers are not provided with predesigned projects that they complete with their classes. Instead, they negotiate with one another and identify ideas for projects that will best meet the needs of their students and fulfill their responsibilities to their curriculum.

As the project developed, we have come to realize its potential for improving teaching and learning in the New York City Public Schools. Giving teachers the opportunity to design their own activities spawns enormous creativity and has led to the creation of many innovative and exciting projects. These projects, in turn, help to transform often dull and lifeless classrooms into places where children are actively engaged in authentic work that they own and could share with their partners abroad. While individual projects are important for GETN's success, even more important is what teachers are learning as a result of participating in the network and in the graduate courses that support the net-

work. We developed our own education rationale for e-mail projects which has become embodied in a set of criteria for the design of GETN projects.

Examples of some of the GETN projects include:

1. The Fast Plant Project— biology students in New York and Israel participated in the Fast Plan Project using brassica rapa seeds, students shared information concerning the 35-day life cycle of these plants. At specific days in the timetable, students in both countries simultaneously planted the seeds and were responsible for collecting and sharing the data, comparing the effects of light, temperature and water on the growth of the seedlings

2. Visitors Guide to New York and London—students went on field trips to sites around their respective cities. They researched and wrote about the places and shared the information with their counterparts via electronic mail. A publication about the sites in each city was then designed. Not only did students learn about another city, they also learned more about their own city.

City College not only created GETN, it continues to provide the ongoing support so important in sustaining GETN's network and helping it to grow. Support is provided in a variety of ways including: courses for participating teachers, on-site technical training, on-line managing and monitoring of projects, recruiting new participants and sponsoring annual conferences. Many of the GETN teachers have been linked with ESP schools for the past four years. Since the structure of project development is similar, teachers have had a great deal of success in their e-mail projects.

The experience of GETN teachers has consistently been that involving students in meaningful learning activities via telecommunications strengthens instruction dramatically. Students are far more motivated to read materials that they get from colleagues abroad and are excited about responding to them through writing. They know that their work and efforts will reach a receptive peer audience. Written work that is shared through computer networks is received in a form that can be easily read, revised, and reprinted. Instruction in academic subject areas is brought to life through student-to-student dialogues.

Telecommunications is now beginning to alter the approach to education; and as the technology advances, telecommunications will play a key role in bringing the latest information to students, whether from national or international peer audiences or from the other areas on the information superhighway. It can be expected that within the next few years, with increased technological support and with increased familiarity by educators, student learning will be enhanced and enriched through active involvement in real projects, resulting in personal satisfaction and improved achievement.

Teachers report that our project is exciting and motivating for students, especially in the primary grades. They help to engage learners who have been disinterested in school by providing the occasion for real, meaningful work that is owned by students and can be shared with others. We are also curious about the extent to which GETN projects promote a change in teachers' assumptions about teaching and learning as well as changes in curriculum and instruction. We are currently investigating these questions.

At Tel•Ed '95 the presentation will focus on how the GETN project has worked collaboratively with schools in Hawaii to enhance the existing science curriculum.

Students' E-Mail Conversations from an Alaskan Village

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Key words: cross cultural, discourse, e-mail, symmetry

Abstract

When we observed e-mail messages flowing between children in Joliet, Illinois (a medium-sized city near Chicago) and Tununak, Alaska (a remote Eskimo village on the Bering Sea Coast) in Study 1, we discovered that the children wrote most frequently about the topics of weather, games, and personal details. They often repeated each other. They frequently made cultural missteps. There were individual and classroom differences in the amount of detail that appeared in messages and in the number of questions posed by writers of readers.

In Study 2, we observed e-mail messages flowing between high school students in Tununak, Alaska and a variety of adults. We looked for symmetry and asymmetry, and within the symmetrical exchanges we analyzed the elements that contributed to symmetry. Five emerged: informality, reference to family and friends, elaboration, humor, and self-disclosure.

Study 1

Elementary school students often must write because adults tell them to, and then they are evaluated on that writing. We were interested in what children would write when they did not have to write. The e-mail communications of two classrooms were observed and analyzed: Ruth, a fifth-grade teacher in Joliet, IL for 10 years, had found Chris, another fifth-grade teacher of a class in Tununak, AK for 2 years, to discuss the book *Julie of the Wolves* (George, 1972).

The cultures in Joliet and Tununak are dissimilar: Joliet is a mid-sized, midwestern city complete with malls, highways, and gambling riverboats. Tununak is a small, Yupik Eskimo village on the Bering Sea 600 miles from the nearest road. The 26 students in Ruth's classroom (half girls, half African American) wrote about their culture in terms of X-Men and other popular cultural icons. The 13 students in Chris's classroom (all speak Yupik and English and all were born in a Bethel, AK hospital) wrote about their families, hunting ptarmigan and musk ox, and playing Lap Game.

In the analysis of the e-mail data (messages written between the classes from September to October), we considered *topic*, *repetition*, *detail*, *questions*, and *cross-cultural missteps*. The *topics* that children wrote about were weather, games, and personal details (e.g., age, gender, interests). The topic that had initiated the correspondence (i.e., *Julie of the Wolves)* was a distant fourth in frequency. We found that the children *repeated* each other, rather than themselves, for the most part, and most repetition was immediate rather than delayed (Tannen, 1989). We found rich *detail* in language (Tannen 1989) used to describe familiar objects (Rock People in AK) and events (sleep over in IL). A total of 56 *questions* were posed (52 in IL) by 13 children (11 in IL) in another effort after connectedness between correspondents. We were not surprised to discover instances of *cross-cultural missteps* in the exchanges because the children were writing across large differences and distances (Riel, 1994).

Study 2

Just as certain situations support asymmetrical communication, so too do certain relationships. Parents and children, teachers and students often engage in communication where one participant is more knowledgeable and more in control (usually parent or teacher) and one is less knowledgeable and less in control (usually child or student). How symmetrical, we wondered, are e-mail communications?

We speculated that Internet writing might be very symmetrical, by virtue of what it does and does not do. It *does* bond writers to a discourse and to each other (Tannen, 1989), as turns are taken and words and ideas are repeated from one participant to another, often within a matter of minutes. It is a highly social, interactive enterprise. Because it is not face-to-face conversation, however, it *does not* make participants wholly visible to each other, except as they choose to reveal information to each other.

We eavesdropped (with permission) on the written e-mail conversations between a group of high school students in Tununak, AK and three adults who had recently moved from the village—a priest and two former teachers. Although we suspected that while in the village the students conversations with the elders were asymmetrical based on the evident power imbalance, the Yupik culture (Fienup-Riordan, 1990), and the witness of their teacher, the e-mail communications included the following elements of symmetry: informality, reference to family and friends, elaboration, humor, and self-disclosure.

Conclusions

In both studies, e-mail communications are more like face-to-face conversations with friends (or potential friends) than other forms of written communication (e.g., narratives, letters). In many ways, it is best described as "conversations written down" (Heath, 1983, p. 213).

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Bridging the Chasm: How National School Network Testbed Sites Convince Their Communities to Fund School Networks

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Key words: community, fund, network, infrastructure, school, adoption

Abstract

Schools and communities in the National School Network Testbed have made significant progress toward participation in the National Information Infrastructure by deploying networks in their schools or towns. Yet each of our 95 Testbed organizations has a unique story of how and under what conditions they have persevered to gain acceptance and funding to build their local information infrastructure. The panelists will compare and contrast their approaches and accomplishments.

What makes some school/community ventures successful in obtaining funds and others not? Why do some promising efforts lose momentum in puzzling ways? Why do so many who are plugged into the net understand its potential and think that networking computers are the only way to go, while so many other people understand its value, even after hearing all the benefits?

People's attitudes toward technology adoption differ depending how much the new technology requires them to change their behavior and beliefs. Some seek out new technology just for the pleasure of it; others envision the potential. Yet the majority require proof that the new technology will be all that it claims to be, and the most reluctant wait until the technology becomes so established they have to accept it. Witness the ubiquity of the fax machine.

Building a local information infrastructure (LII) for communities requires understanding and addressing the needs and issues of different types of people. But this can seem like an impossible task. Town meeting members ask that we quantify the benefits of a network in education, and ask for proof as compelling as improvement on standardized test scores. Yet, standardized tests do not measure the skills that the new technology brings along with curriculum reform.

Purpose

It is the purpose of this panel to address these issues, to propose a framework for "marketing" school/community networks, to hear specific examples from National School Networking Testbed members who have charted these waters, and to explore the various options for those just embarking on this course.

The member organizations in the National School Network Testbed (NSNT) have taken a wide range of approaches to working with their constituencies to build their networks and to obtain funds. The panelists will compare and contrast their experiences, circumstances with their communities, approaches, and resources. For example, one panelist will compare the experience of two rural New England communities. One community, made up of educated professionals, supports education and technology and challenges the public schools to provide the best education possible. The other does

not support technology, leading to a struggle that highlights the differences between various factions within the community. Another panelist has built bridges between incompatible groups within his district through regular communication, personal meetings, and perceptively addressing each groups needs. Another panelist, a superintendent of schools, will talk about the deliberate actions her community took to build support—forming committees, publicizing efforts, shaping a warrant article, and presenting at a town meeting. Another approach emphasizes the need for an advocate (e.g., a teacher, librarian, administrator or interested member of the community) and compelling applications (e.g., library references, new communications links, access to online data, or other classroom resources that can be uniquely and economically provided by the network technology).

To shape a framework for bridging the chasm, presentations will touch on:

- What distinguishes those communities that have been successful from others? Is it a culture that values education? Is it a wealthy community? Is it one that is remote or economically disadvantaged and needs the link to other resources? Is it one where businesses are willing to invest to improve the workforce? Or is it because there is state support for networking in education?

- Who has led the effort—the state? the superintendent? the teachers? the students? the parents? the town government?

- What are the critical factors for marketing to the different constituencies to invest in a local infrastructure? What has convinced the innovators? What is needed to convince the larger majority? How important has it been to extend the school network to community members, businesses, senior citizens?

- What types of planning are necessary to build the case? Create an inventory of what exists as compared to what is needed? Include options for equipment and support today versus maintenance for the future? Develop financial models?

- What have you learned about marketing strategies that don't work? What do you recommend trying for those that are just starting out?

Using the World Wide Web in K-12 Curricula

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Key words: Netscape, web, curriculum, home page, resources

Abstract

Elementary and secondary teachers simply do not have enough time to find all the wonderful resources that they know are "out there" for their students. While they may teach the same subject year after year, they know that there are newer, better materials that should be incorporated into their curriculum.

The World Wide Web is one easy way to add new things into their subject area. By using a home page someone else has created, a teacher can find new and exciting worlds of information to stimulate students' interest and education. And, if the teacher is so inclined, he/she can develop a home page of his/her own, tailor-made to suit the curriculum and grade level that is being taught.

This presentation will show sample home pages geared for elementary and secondary classroom teachers and media specialists. Another example to be demonstrated and explained will be a third grade home page, with links to current information about science, language arts, health, social studies, math, and other subjects. If a Netscape connection is available, this will be done online. Likewise, a middle school home page, useful for social studies and English teachers in particular, will be shown. Based on Holocaust information available on the Internet, the home page would be beneficial to secondary educators.

A benefit of creating their own home pages is that teachers can keep their students on task and focused on the subject they are researching. The subject matter level can be controlled and monitored, by adjusting the material to the students' grade and comprehension levels. Teachers can find material that fits into their curricula, and can build home pages that would lead their students to these sites which have been evaluated and found to be valuable to the students.

Speaking from a media specialist's point of view, Netscape can be introduced by showing home pages already on the Web. Students can find materials on their chosen subject by having the addresses at hand, or by using the search engines available under the Net Search button. Mankato schools' students have found valuable resources for their reports, projects, and entertainment by using the above two methods. Also, they have discovered serendipitous things that they enjoy sharing with their fellow students and their teachers. An Internet Acceptable Use Guideline, used in the Mankato schools, will be distributed and discussed. This delineates to the students and their parents what is meant by acceptable use of the Internet, and what is not acceptable. Consequences of misuse of Internet resources will be addressed as well.

Lastly, directions will be given on how to download Netscape from Internet locations, how to configure Netscape, and how to set it to open to the home page of your choice. Creating a home page will be discussed briefly, but another presentation would be needed to deal with the actual creation of a home page.

Creating Curriculum Connections Through the Internet

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Key words: telecommunications, Internet, staff development, curriculum

Abstract

This project is a product of cooperative endeavors of members of the Texoma Professional Development Center (TPDC), an organization of school districts in North Texas and the Austin Teacher Program (ATP) of Austin College, Sherman, Texas. Jefferson Elementary (K-5), located across from the campus, and the ATP have long enjoyed a close working relationship. ATP students can be found making their initial classroom observations, teaching in six- or nine-week, one-hour-a-day blocks, and interning or student teaching as part of their final semester before certification at Jefferson. This partnership provides a solid foundation for the grant application.

The group received a $30,000 grant from GTE to be awarded over a two-year period for the development of a model electronic classroom (Project GECIS) where Sherman ISD teachers and ATP preservice teachers learn to use Internet resources as well as other modes of technology to support curriculum. The grant money is also being used to fund the training of selected personnel within the district and the college, who in turn assist with the training of their peers. In addition to the GTE money, Austin College provided funding for a fiber optic connection and the installatior and configuration of a network hub to connect the Jefferson local area network to the campus network. Sherman ISD provided the location and computers needed to make the training possible.

The fiber optic network was installed on the Austin College campus last summer. A room within the Jefferson campus was simultaneously renovated to create the Telecommunications Center. In addition, each classroom at Jefferson Elementary was wired for direct access for the four computers found in each location. This was completed in time so the first of the training sessions could begin during teacher inservice in August and continue through the present.

It is the belief of the TPDC members that the curriculum must be the driving factor in the selection and use of technology. Technology is the tool which has the ability to enrich the learning environment within the school's walls. Implementation of this relationship rests in part on the ability of the classroom teacher to successfully access information on the Internet and coordinate the topics and objec-

tives of the curriculum with appropriate resources to enhance instruction for all learners within the classroom community. In addition, the classroom teacher must be able to effectively engage the learners in the telecommunications process when appropriate.

It was with this in mind that ATP students have been collecting Internet addresses containing information which correlates to current curricular topics and objectives. These are then entered into a database to be used by Sherman ISD teachers and students and the preservice teachers themselves.

The training itself was broken into different sessions with all participants first going through a general overview of telecommunications including use of TENET, the state educational network. Following sessions dealt with more specific uses for both teacher resources and ways in which students themselves could access information or communicate with others.

The first training sessions occurred with central office and building administrators and TPDC members. The next round included all members of the site-based decision making teams from each campus. These groups consist of faculty members, parents, administrators and occasionally an outside member from local industry or Austin College. It should be understood that in most sites, only one or two computers are equipped for telecommunications. The exception is Jefferson Elementary, the pilot school, where each room has a direct telecommunications link.

Presently the site-based decision making teams are in the process of working with the building personnel to determine what the most effective needs are at their location. These will then be addressed on a campus by campus basis.

Evaluation of the training is divided into two phases. The sessions themselves include a written evaluation given at the end of the day. A later evaluation is sent to help determine the degree of implementation of Internet usage. Both of these are used by the instructors to continually refine the format and content of the sessions themselves. In addition, statistics are kept on the use of the Telecommunications Center during the time when no classes are scheduled.

Preservice/Inservice Telecommunications and Teaching Partnerships: Lessons From the Classroom

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Key words: preservice, inservice, telecommunications, partnerships, telecomputing, successes, lessons

Abstract

Teachers of science from three school districts in northern Arizona were introduced to telecommunications through a course sponsored by an Arizona Eisenhower grant during the fall 1994 semester. Spring 1995, students and teachers were paired at a weekend seminar to plan team teaching opportunities. Seventeen preservice teachers taking an experimental science methods course and a technology in the classroom course during a back-to-back block of time were paired with these twenty teachers learning to prepare a telecomputing project with K-8 lessons taught by NAU students. All participants were connected via the statewide electronic mail network with access to the Internet.

Kayenta School District

Kayenta, a school on the Navajo Indian Reservation, is 180 miles from the mountain town of Flagstaff, the nearest large city. Two teachers from Kayenta Middle School and two from the intermediate school were collaborators before this project as they used their linked technology-rich classrooms to share instruction and learning opportunities. Two television monitors with video cameras mounted above them in a fourth-grade classroom in the intermediate building display a busy sixth-grade classroom of students working on a project in the middle school. Both classrooms are supplied with 16 networked Macintosh computers and a dedicated phone line. A nearby computer lab reveals a classroom of Macintosh computers, multimedia stations, and laser printers. One teacher in this team used telecommunications successfully through creative scheduling. In the primary school, a grant participant is faced with a different level of technology and telecommunications access. This first-grade teacher has to make arrangements with the office secretary to use a phone line, disrupting daily procedures.

Williams School District

Williams is a small, rural community located about thirty miles from Flagstaff, and had just passed a bond referendum at the beginning of the project, which included a technology bond for new computers and phone lines into each classroom. The Arizona network worked physically with success for the Macintosh-using teachers from the other two school districts, but once these IBM-compatible computers were installed with the network software and placed in participant classrooms, the state-wide network experienced software problems for this platform. Phone lines in each classroom did not assure success for Internet connections, since the phones could only be used after school for anything other than phone calls to parents.

Flagstaff School District

With three high schools, two middle schools, and twelve elementary schools, Flagstaff is the largest school participating in this project. A technology and school bond referendum did NOT pass a spring 1994 bond override. Participating schools do not have extra phone lines or jacks to spare, and Flagstaff teachers are struggling to convince their building administration that a computer and modem are of highest priority for their continued participation in the project. Most Flagstaff teachers must make their online connections from home.

Preservice/Inservice Collaborations

Semester two of this project resulted in exciting collaboration. Participating teachers met during a Saturday planning session on the NAU campus with seventeen education students. Students wrote a

call for participation, solicited feedback from their teacher partners for suggestions and revision, and posted the project electronically. Participating teachers registered for the project, and NAU students collected and organized data from all classrooms via a teaching lesson, and made second field trips to each school district to teach a culminating lesson.

NAU students prepared panel presentations for the 1995 Honors Week Conference on the NAU campus—a teacher education conference held for high school and university education students by NAU education faculty to experience an educational conference. These presentations provided preservice students the opportunity to reflect on their field trip experiences, as well as on teaching, and on partnerships with inservice teachers. Themes from these presentations included: being prepared as a teacher takes time; technology is a support only and can not always be relied on; cultural awareness is imperative in planning and teaching a lesson; and a course developed around a theme and with inservice partners and with numerous opportunities for real teaching provide experiences not found in traditional courses or practicum.

This project report details the successes (partnerships, field-based opportunities) as well as problems (access, administrative support) in combining telecommunications with preservice/inservice collaboration after year one of a two-year project. Lessons learned from the project, both connectivity and content, that inform the second year will be shared. Course syllabi for both inservice and preservice courses will be available.

Curriculum Resources Online: The Only The Best Web

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Abstract

Q: How can U.S. educators be assured of access to high quality curriculum materials and professional development opportunities in a timely, cost-effective manner and also increase their capacity to meet the Goals 2000 objectives for use of technology in schools?

A: Form a consortium between ASCD and state departments of education to gather and disseminate "only the best" curriculum, instruction, and assessment materials electronically via a network of Worldwide Web (WWW) servers on Internet.

How it works: ASCD will form a consortium with state departments of education, beginning with Kentucky, to create an "Only the Best" Web (OTBWeb) which incorporates ASCD products and services, such as the Only the Best database of highly rated software and multimedia materials and the ASCD Curriculum Handbook, linked to exemplary curriculum frameworks, lesson plans, and assessment strategies gathered by each state. ASCD will include additional materials, such as national

standards documents, if it can obtain copyright permission for distribution and additional financial support for creating the hypermedia links.

In order to assure a consistent level of quality, state member representatives on the consortium web management advisory board will establish a common set of criteria and standards, categories, and formats for selecting materials for inclusion in the web.

Each state will agree to create its own WWW server for the distribution of selected non-commercial multimedia curriculum materials within the state on an existing state or regional network or on one to be created—e.g. TENET, NYSERNet, or VaPen. States are responsible for establishing connectivity for schools to the state network and Internet.

Each state manages the solicitation and selection of materials, based on the agreed upon criteria, and loads the "only the best" documents onto the state's web server—i.e. each state creates its own electronic, multimedia version of ASCD's Curriculum Materials Directory. These materials will be freely available to schools within the state.

ASCD creates the links with ASCD materials that "point" to materials on each of the state web servers. ASCD "hot links" ASCD materials beginning with the "Only the Best" database of reviewed software to the lesson plans and other materials developed by the states. Web users of the OTB database can then jump to related lesson plans or other applications on one or more state web servers. The OTB database and other ASCD materials will be password protected and stored in encrypted format; password and decryption keys will be provided only to consortium members for distribution to their schools. Selected materials will be made available to non-member states at a fee per document downloaded.

In this session, participants will review current progress, future plans, and a demonstration of the OTBWeb site.

MayaQuest: Integrating Multimedia and Internet Resources

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Key words: multimedia, Internet, adventure learning, curriculum connections

Abstract

The MayaQuest Cycling Expedition took place from February-April of 1995 and provided students with an interactive learning experience while working with Dan Buettner and his team to explore and uncover clues to the collapse of the ancient Mayan Civilization. MECC facilitated an Internet center

which allowed thousands of classrooms around the world to track the bicyclists, to discuss the expedition with other participants and experts, and to create and use curriculum resources. In this session, participants will see how teachers integrated this real time event into their classroom curriculum, see how MECC is continuing this experience online, and see how students can continue their exploration of this topic using the resources in the MayaQuest CD-ROM and the Internet.

The MayaQuest Internet experience is a unique collaboration between teachers, students, Maya experts, educational institutions, and corporate sponsors. MECC coordinates the World Wide Web homepage for MayaQuest, which includes journals from the bicyclists, photos, and curriculum resources. These curriculum resources include teacher produced lesson plans organized by thematic units and links to other Internet resources.

MECC has produced a CD-ROM based on the expedition. This program has been designed specifically to provide students with the opportunity to relive the MayaQuest expedition in a simulated environment and to be able to create presentations using the multimedia resources in the CD-ROM and the MayaQuest World Wide Web homepage.

Avoiding Ethical Potholes: Student Navigators on the Information Infobahn

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Key words: telecommunications, students, ethics, WWW,

Abstract

Two seasoned teachers examine the issues that must be addressed before unleashing student accounts on the Internet. Initially, schools develop an Acceptable Use Policy and then instruct students on the fine points of ethics and etiquette on the Internet. Where should teachers be cautious when students are on the Internet and how can they manage these issues? New potholes emerge as students tap into the resources available on the Internet while in the library, at home or within the classroom setting.

Some of the issues that have confronted these two educators are listed below. Two different approaches provide participants with a variety of solutions to these problems.

1. Where should educators be cautious when students are on the Internet?

2. Account management: Should every student have an account?

3. Privacy or protection: Should students have access to all resources on the Internet?

4. Security: Are student accounts private? How can other information on the host account be protected? Are the dangers of student hackers real or imagined?

5. Firewalls or filters: How do state networks, university accounts and commercial services approach the access issues?

Two perspectives address these current issues. One teacher/librarian gives his student navigators individual accounts for use at school and at home. Another teacher/computer coordinator manages her students in a classroom setting with specific curriculum-based projects. Together they examine the resources available for addressing these issues and present solutions they have found for managing student navigators on the Information Infobahn.

Potholes on the Infobahn

Where should educators be cautious when students are on the Internet?

As the Internet becomes more diverse and increasing numbers of students gain access, educators responsible for their students' activities face a difficult challenge protecting their students from the net and the net from their students. There are places and processes that caution should be exercised. Some of those places and procedures are discussed.

Account Management: Should every student have an account?

Entire schools and school jurisdictions providing Internet access to students raises the questions of who should have access, when and how. On site, in school access is different from off site, residential access. Should the rules of access be different? The provision of access to selected students can be elitist and the provision of access to all students can be dangerous. Responsibility and trust become important variable that are discussed.

Protection: Should students have access to all resources on the Internet?

The depth and diversity of information on the Internet can be of interest to almost any individual. The plethora of search engines makes information identification an easy task. A simple Webcrawler search on sex yields hundreds of pointers. Should students have access to everything, and if not, how does an educator prevent that? Net blocking software provides technological support. The acceptable use policy provides ethical and sometimes legal support. Neither provide real protection.

The public media portrays the Internet as a vast cesspool of pornography, destructive and hate resources. This image raises real or imagined fears in students, parents and educators. Those fears can drive the limitation of access or no access whatsoever. The line between free speech and cyber censorship is becoming fuzzier and an issue of public debate. The how and what to provide students is examined.

Security: Are student accounts private? How can other information on the host account be protected? Are the dangers of student hackers real or imagined?
When students have their own accounts, the question of the degree of privacy emerges. When an educator has several hundred students with accounts, how can one monitor activities? Some students share accounts with other students, blurring the issues of privacy and responsibility.

Security on the host computer is not the sole responsibility of the system administrator. Firewalls can provide some security, but firewalls can be penetrated, especially by a talented student hacker. Once through the firewall, the hacker is likely to engage in disruptive or illegal activity on the network. The signs an educator should watch for to detect student hacking on the host system or the Internet are reviewed.

Firewalls or filters: How to state networks, university accounts and commercial services approach the access issues?
Each host computer provides whatever technological environment administration considers appropriate. Firewalls have become a very common feature of many host systems that provide student access. Similarly, individual PC net blocking software is emerging in the marketplace. Private access suppliers provide varied levels of access. The characteristics of firewalls, filters and private suppliers, that should be reviewed from technological and procedural perspectives, are considered.

The Electronic Emissary: Research Results and In Progress

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Key words: electronic mail, subject matter experts, mentoring

Abstract

What happens when subject matter experts are electronically and longitudinally available to teachers and students in K-12 classrooms? Results from six studies of the nature and participant perceptions of such computer-mediated exchanges, and their place within the Information Age classroom, will be offered during this collaborative session.

The "Electronic Emissary" is an Internet-based "matching" service and research project that brings subject matter experts (SMEs) into K-12 classrooms virtually so that students can explore curriculum-related topics in inquiry-based contexts via electronic mail. It has been online since early 1993. The Emissary helps teachers who have access to the Internet locate other Internet account-holders who are experts in different disciplines, then provides ongoing assistance with creating productive electronic teaching/learning environments involving the remotely located SMEs.

To date, approximately 230 "matches" have been arranged and followed by Emissary staff. All messages exchanged are logged (with participants' permission) for later analysis. Interviews with and observations of participants from 21 teams were done to discover what their perceptions of the process, worth, and nature of these online exchanges were. These data were used in six different research studies, each investigating different aspects of the "subject-matter-expert-comes-to-K12-classroom" scenario. The studies' foci follow.

1. "What's going on here?"
This naturalistic, multiple case study of six Emissary teams revealed the importance of the expert creating a well-formulated and authentic, mediated personal presence, cooperating closely with the classroom teacher, who functioned as the SME's "eyes and ears" on behalf of the students. Helping students to narrow their topics of inquiry, while assisting their comprehension of the topics' depth and breadth, were reported by adult participants as considerable, but essential challenges.

2. "What message flow patterns and functions can be identified?"
This qualitative, discursive study of ten teams' electronic interactions revealed that adults communicated online more than students, and that interaction roles (e.g., subject matter expert, teacher, student) were related to varying frequencies of different of message purposes. Overall, more *reporting* of information occurred than *requesting* of information, but personal and general information, along with ideas, opinions, and emotions, were reported more frequently than content-related information. This was a surprising pattern, since the communications were organized around the exchange of curriculum-related content.

3. "What message flow patterns and functions occur with and without online facilitation?"
This was a qualitative, discursive study of twelve (other) Emissary groups' electronic exchanges that, unlike the teams above, had ongoing facilitation provided by experienced classroom teachers and Internet users. When compared with the interactions of the nonfacilitated groups, these teams displayed earlier peaks of interaction frequency, more reporting of content, general information, ideas/

opinions/emotions, and resources, less requesting of content-related information, and more requesting of ideas/opinions/emotions.

4. "What and how do students learn in this context?"

This naturalistic, multiple case study of six teams revealed how Emissary teachers incorporated telecomputing activities into whatever teaching practices or structures they were already using, rather than dramatically changing their instructional strategies to accommodate online work. They viewed telecomputing as beneficial to students due to the immediacy of information access, the variety of perspectives available, and less dependence on a textbook or the teacher as an "authority with the answers." The personal interaction with the content experts was valued by the students and their teachers. The students particularly noted how the SMEs challenged their thinking and facilitated the generation of new ideas about authentic problems or issues.

5. "What and how do teachers learn in this context?"

This naturalistic, multiple case study of seven classrooms revealed that most teachers felt that they had developed professionally, albeit in different ways and to different degrees, as a result of having helped their students to communicate with a subject matter expert. They also saw their students reaping benefits from these exchanges. Interestingly, several teachers whose teams showed less frequent interaction expressed the strongest awareness of professional development, when compared with other teacher participants.

6. "How does this fit into the larger context of the classroom?"

This is an action research study of one elementary and one secondary classroom that is ongoing during the 1995-1996 academic year. Preliminary results, which were not available when this document was prepared, will be shared during the presentation.

The results of these studies begin to suggest how best to use asynchronous, text-based teaching/learning contexts to virtually bring subject matter experts as telementors into students' academic lives.

Collaboration: The Best Network Utilization Strategy

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Key words: telecommunications, networks, collaboration, interactive technologies

Abstract

Presentation address "human" and "political" factors influencing success and growth of telecommunications networks bases on presenters' experience with developing education networks for teleconferencing and distance learning. Specific strategies for overcoming resistance to change, "recovering" from technical and application errors, and facilitating collaboration are presented with examples from practice. The architecture of several interactive networks and their application strengths are discussed.

Effective Networks

The effective utilization of telecommunications technologies by educators, public and private professionals, business/industry management and staff, and the average computer-literate citizen requires not only a well-planned and carefully deployed technical infrastructure but also a solid web of applications information and support. Unfortunately, in the rush to embrace new technologies and receive their much-touted benefits, attending to the myriad human needs of program developers and program users are often considered only after the hardware is installed. As a consequence, one of the most important keys to successful network utilization is collaboration. (Another essential ingredient in long term network success is staff development.)

Collaboration can mean different things, depending on the level at which an individual—or a network—operates. Many professionals are, in fact, reluctant to begin any collaborative process because it is seen as a threat to control and quality assurance. The collaborative process may be time intensive, but the results in all areas of network utilization, funding, and marketing make the investment in time worth every second. Although several collaborative models exist (i.e. TQM, strategic planning), collaboration at its simplest means including network customers, program providers, site managers, and other staff in the network's decision-making process. Program selection, technology choices, staff hiring, specification development, and service evaluation are all instances where collaboration can be a resounding positive for the network. And, while the bottom line for any network's survival is quality products and services at reasonable cost, the ownership and support engendered through an effective effort to build collaborative relationships can make a profound difference in how a network is perceived and used.

In this "collaborative" presentation, presenters share their experience in managing, building, and redefining state and national education networks for videoconferencing, teleconferencing, and distance learning.

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Telecommunications for Change: Three Case Studies by the Center for Children and Technology

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Abstract

The Education Development Center's Center for Children and Technology proposes a collaborative presentation that will focus on three distinct telecommunications projects. The presentations will focus on the role that telecommunications can play in supporting educational reform initiatives. We will discuss different ways of building a telecommunications architecture to support students, schools and communities.

Designing Online Mentoring Environments to Support Young Women in Science and Technology
EDC's Center for Children and Technology is collaborating with the Department of Energy's Office of Scientific Computing and Bolt, Beranek, and Newman's (BBN's) NSF-funded National Testbed Project, on a three year national project to develop "telementoring" environments that encourage young women to pursue careers in engineering and computing. This project draws on the strengths of telecommunications environments to link high school girls with female professionals across the country who can be supportive and constructive in addressing the conflicts and concerns young women experience in computing fields. The project is also developing online resources to help parents and teachers effectively support the academic and career pursuits of young women. Drawing on pilot research with students, parents, and teachers in the first year of the project, this panel will explore design issues that have emerged in the development of this online mentoring model.

NYNEX Distance Learning Project

The NYNEX Distance Learning Project is a two-year research project that explores the use, design, and effectiveness of distance learning technology (two-way, interactive video) in New York City and Dutchess County, New York high schools. Presenters will discuss the characteristics of effective designs for distance learning in public high schools and the consequences of distance learning for student's motivation and achievement. The presentation will also highlight ways in which distance learning technologies both impede and enhance issues that are central to a reformed pedagogy.

Union City Interactive Multimedia Project

Union City is one of the most densely populated urban locales in the country. Its student population is 97% Latino and may families have recently arrived in the United States. Schools in Union City have had a history of student transience, with families moving from school to school or out of the district.

This population is often the last to receive the benefits of technology. What makes Union City unique is its commitment to an extensive program of educational reform. For the last five years Union City has undertaken a district-wide program of reform, rewriting the curriculum to support thematically integrated and research-oriented approach to learning and restructuring the school day. Union City is a critical partner in New Jersey's Statewide Systemic Initiative to Achieve Excellence in Mathematics, Science and Technology Education. Additionally, for the last three years Union City has participated with Bell Atlantic and the Education Development Center in "Project Explore" an innovative technology trial that links students, teachers, and parents to local and wide area online resources at home and at school using ISDN and Frame Relay technologies. Project Explore offers a unique opportunity to view the connection between the use of elaborate and high bandwidth networking infrastructure and educational reforms.

Electronic Academia: Academia in the Age of Telecommunications

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Key words: Computer-Mediated Communication (CmC), discourse analysis, Internet, ListServer, telecommunications

Abstract

The "Net" is popular in a dual sense: its usage is increasingly democratic, and it is cherished by its users. The purpose of this paper is to describe ListServer usage, in particular how this tool mediated the activity of an international academic community, hence the reference to this phenomenon as Electronic Academia . Findings are derived from a three-year, ethnographic study using Soviet Activity Theory and a Conversation for Action model of communication as framework for analyses.

Background

Three areas of research intersect as background in this study: the development and design of telecommunications technology; reports of telecommunications technology usage in education; and inquiry where computer-mediated communication (CmC) is the object of analysis. The first area scans traditional industrial-based research and development. These efforts are focused in three ways: on the expansion of telecommunications activity in terms of speed and diffusion (EDUCOM and The National Science Foundation, 1992); on the theory and development of friendly designs (e.g. WWW-The World Wide Web; Norman, 1992) and finally on the development of mega-network management tools (e.g. search tools such as the Gophers and FTP; Harris, 1993a,b.). The practical results of this area of research in the United States, coupled with the political momentum of the 1992 presidential elections, are exponential. In 1968, the ArpaInternet was created by the U.S. Department of Defense with restricted uses (Quaterman, 1990). In 1995,-surfing (Armour-Polly, 1992-93), cruising (Fraase, 1993) and hitchhiking (Kehoe, 1993) the vast highways of the sky are popular activities (e.g. Petitjean, 1995).

The second area of research—usage in education—reflects this general trend towards the democratization of telecommunications technology (e.g.; Stout, 1995). Reports of usage in education scan the educational spectrum both horizontally and vertically: horizontally across disciplinary boundaries and vertically from primary to academic levels (e.g.; Kearsley, 1993). Projects exist linking children with children in the United States and across the world (e.g.; KIDS-91, 1991; KIDS-92, 1992; The Copen Family Fund Inc. 1991; Riel, 1992; students with students, Sutherland and Black, 1993); linking children with professionals (Foster et al. 1988; Brienne et al. 1989; Harris, 1995) ; linking children to databases and archives (e.g.; Riel, 1995), as well as to the activities of their own local communities (D'Ignazio, 1995) .

Taking a step back to reflect on usage, a third area of research arises where the use of telecommunications technology is objectified. Theorizing telecommunications in education, the post-modern classroom is both constructed and analyzed (Barker and Kemp, 1990; Haswisher and Selfe, 1991; Selfe and Wahlstrom, 1989; Susser, 1993). Inquiring into the characteristics of CmC, the properties of this new form of mediated language use are identified linguistically on an oracle-literacy continuum (Murray, 1991; Duranti, 1986); in contrast to aural/oral discourse occurring in classrooms (Black et al., 1983; Quinn et al. 1983;) and for its socio-psychological features (Keisler et al.; 1984) . Finally, there is also interest for the study of CmC in attempts to circumscribe the social coherences it supports online; coherences such as gender relations (Herring,S. in press); patterns of conflict resolution (Thomspsen, 1994; Syverson, 1994); COPs- Communities of Practice (Kahn, et al., 1993; Deimling, K. et al., 1994); and virtual worlds of play and simulation (Turkle, 1994).

This study falls within the third line of research—inquiry into an object called CmC.

Overview of the Study

During three years, I logged on to ten, subsequently five, electronic mailing lists referred to collectively here as the *x-lists* . In this structure of communication, users posted messages to a list which was received by all other subscribing users. Users were an international community of academic scholars who shared a declared interest for "issues in education in modern technological societies and a special concern about ways in which educational systems are a source of socially engendered inequalities." The lists were embedded once, with a top level list regrouping all members of the community and the other lists corresponding to different interest groups within it. Thus, for example, there was an X-Comp list (the computer list) for all members interested in the use of computers in educational settings; an X-Act list (the Activity theory list) for all members interested in Activity Theory and everyone subscribed to X-Main (the main list).

The *flow* of online communication generated by lists usage and as it appeared on my computer screen was the focus of this study.

Identification of a Problematic Situation

How do you make sense of the *flow* of online ListServer communication generated by a large community of users? And how do you make sense of this communication in a way that differentiates it from other instances of online ListServer communication? This study was an attempt to answer both of these etic (i.e.; theory driven) questions using an emic (i.e.; insider's) perspective on the activity of a group of users, an international community of academic scholars based in Southern California.

Method

A progressive participant observation method was used including interviews and a small survey posted online for triangulation purposes. In this way, I moved slowly from reading only to responding

to posted messages; and from responding to posts, to writing an article collaboratively with four other members of the group and posting my own messages on the lists.

About 75, 400k diskettes containing copies of the messages posted to the lists were collected. Online survey responses (25) were collected. And individual interviews (30) were conducted online, in person and by phone.

This method turned out particularly adequate as it enabled me to experience some of the ways in which users functioned in the community as active observers (lurkers), contributors, and side-channeled participants.

Analyses

First, I borrowed from Soviet Activity theory two notions: the notion of activity system (Engeström, 1988; Leontiev, 1981 and Wertsch, 1981) and the metaphor of the water molecule (Vygotsky in Moll, 1990) whose elements hydrogen and oxygen are functionally irreducible to the whole (i.e.; hydrogen and oxygen both function separately as combusters). Using both of these notions, I determined, that viewed in its totality, online communication was an activity system in its own right. This activity system I called *electronic academia*

Viewed in its parts, I then looked for the kinds of tasks and actions that were being performed in the messaging occurring online. For example, I looked at the series of tasks that were invoked by tool usage; tasks such as logging on and off; downloading and saving messages. And I looked at the actions that were being performed in the messages, actions such as requests to subscribe and calls for papers, conferences, applicants and jobs.

Secondly, looking for relationship (i.e.; structure and function) among tasks and actions I borrowed from the discursive model of communication Conversation for Action, the notion that speech acts cluster into recurrent patterns communication called conversations (Winograd and Flores, 1986) and the notion that conversations cut across modes and media of communication (Murray, 1991). Using this model, I looked at how the tasks and actions of messaging might also be seen to cohere into recurrent patterns online. Three such conversational patterns were identified: administrative, academic and community building conversations.

Findings reported in this paper are succinctly illustrative of two of these patterns of communication : administrative and academic action.

Findings

Conversations for Administrative Action

The online flow of communication contained requests to subscribe; requests to be permanently and temporarily removed from the lists; requests for other members' e-mail addresses; and updating information regarding permanent and temporary address changes. Even as an X-family person existed to handle these administrative concerns, these requests appeared online in public postings. And conversely, messages originated by the X-family person appeared in the flow of communication to provide members with updated membership lists and member addresses; to forward misdirected messages with captions such as "Can someone help this person? and "I believe that this message was meant for x-list"; to provide e-mailing tips such as "How to find someone on the Internet"; to alert users of the existence of potential viruses; to remind members of x-list protocols such as the "buggy reply mode" and system maintenance schedules; and to supply "How to information" on notable occasions such as when the x-lists changed to a fully automated ListServer program and whenever new uses of this program were activated (e.g. for the archival and retrieval of manuscripts).

Administrative action messages varied in length and content. Without speculating on the causes of this variation as it might be related to different styles and norms of interaction, some members disclosed their backgrounds and interests more than others, and some members supplied their on and off-line connections and paths to the lists. Similarly, when members requested their permanent and temporary removals from the lists they did so with more or less explanation with the notable exceptions of instances functioning in community-building conversations (e.g. the contrast between "Can you remove my name from this mailing list?"; "Please remove my name from the mailing list. Thanks." and "I shall be on vacation between" indicating care and responsibility for activity on the x-lists. Finally, some of the introductory messages were introductions in a dual sense as these members were introduced by other members to the x-list community through commented and un-commented forwarding of messages.

These messages prompted various responses from the community ranging from silence to prompts for further disclosure of interests, purpose and background; to mild annoyance over the cluttering of mailboxes with messages that did not contribute to an ongoing forum of discussion.

Linguistic realizations of administrative action indicated a fluctuating familiarity with the medium of electronic mail, alternatively unstabilized language use and guidance in the use of e-mail with many different terms used to refer to the discussion forums and access. Introductory requests to participate, for example, included such ***unordered*** diversity as:

- I would like to join your group.
- I would like to browse your network xc.
- I wish to join the symposium for my research purposes.
- I am interested in subscribing to X-list.
- I would like to be put on the distribution list for both x-class and x-work.
- Please add me to your e-mailing list.
- I would like to be connected to the network X-list.
- I am interested in the methodology discussion and would like to join x-class.
- Please sign me up on X-list.
- Subscribe x-list Harry G.
- Let me join!

Administrative action also crossed over into the public forum of discussion when there were attempts to *regulate* the flow of online communication. Rounds of messaging thus cycled on the lists where attempts were made both to conventionalize and reset guidelines for issues such as message length, the coordination and summarizing of discussions, and the negotiation of expert status. Finally, administrative action took precedence over academic conversations when the ten lists were collapsed into five lists which included a change in supporting telecommunication technology.

Over time, with the automation of both subscription procedures and archival functions; perhaps also with an increased familiarity with the medium and the continued support of an administrative X-Family person to side-channel these kinds of conversations, administrative conversations became less salient in punctuating the flow of online activity. These types of conversations, however, continued to exist because users periodically took steps back to re-organize themselves, re-negotiating and re-iterating the rules that operated in the community; and because, in the world of telecommunications speed is tightly coupled with movement and change, both of which need to managed.

Conversations for Academic Action

Conversations for academic action spanned a broad range of activity and they constituted the essential part of the flow of online communication. There were calls; the sharing of materials and references; discussion and review events; net-based activism; advertisements; structured, student participation as part of seminar course work and collaborative writing groups. Examples of each of these are:

Calls
for conferences, papers and contributions
for job and program applicants
for workshop and conference participation

Discussions and review events
of books and articles
of concepts and topics (e.g.; formal and informal education, gender differences versus brain sex; creativity; goals, tasks and strategies; ADD-Attention Deficit Disorder; identity)

The sharing of materials and references
papers and manuscripts (drafts, summaries, table of contents, abstracts and extracts); bibliographies and references; policy statements; course outlines; guidelines/advice for classroom activity; field notes; research findings; reports of conferences and workshop activity off-line.

Net-based activism
The Mattel's Toys controversy
The Bell Curve controversy
Apple's personnel policy controversy
Lobbying in the legislative process (e.g.; the taxation of graduate students; and issues of network monitoring and censorship-the encryption "clipper" chip)

Advertisements
of new books, journals, relevant ListServer and electronic archives

Structured student participation as part of course work
Summaries of readings and seminar minutes
Paper outlines
Introductions with statements of research interest

Collaborative writing groups
side-channeled groups
public forum groups warranting the creation of a new list

The conversations though which this activity was realized included messages of varying length (a few lines to several hundred lines); messages containing files; messages containing forwarded messages

and messages containing parts of messages. For example, messages containing files might contain a conference program complete with registration forms; the copy of the notice for a new journal; the advertisement of a program or job call; an article, article summary, the copy of a table of contents; excerpts from a catalogue of courses; copies of course outlines and handouts; coursework in the form of article summaries and project outlines; field notes. Messages containing forwarded messages might contain excerpts of relevant one-to-one, side-channeled and personal communication; messages containing the request "Please post", "Please pass the message on..", "Please forward liberally", "Widest dissemination is requested" (in a virus alert); misdelivered messages re-formatted care of X-family; data in the form of messages; and messages that might have been mis-addressed. Finally, messages that contained parts of messages occurred as a way of structuring the dynamics of online communication since one interactant might be addressing several other members in a discussion group and specific aspects of their points of view. Thus, in addition to direct address in a message (e.g.; "Gordon and Jay, I am a little uncertain as to what an "ideal" educational system is in your view(s)"; "Bill- I am no longer sure who has said precisely what in this discussion.."; and indirect address (e.g.; "While I agree with the spirit of Jay's commitment to cultivating diversity in children's development, I see...") an interactant might also quote part(s) of the addressee's messages prior to, and during engagement in a focused response, for example:

> Arne's comments this morning about my paper are here germane.
> >Only in rare cases is it possible to characterize an activity system by<
> >exclusive use of certain (then non-proliferating) means. These are the<
> >rare case when[...]" <
> I would differ, concerning the rarity. While on the social field means proliferate...

Academic action conversations compared to administrative ones were both complex and salient in the flow of online communication with several conversations overlapping in time and conversely some particularly interesting conversation (measured by the number of turns and the volume of messages) coming to taking over on one and several of the lists simultaneously. For example, an ongoing conversation focused on a topic or concept of interest might be overlapped by calls for jobs, conference participation and the beginning of another discussion focused on the review of an article or book on another list, while conversely, one conversation focused on a topic of interest might cross over lists as it was picked up by different interest groups and when interactants cross-posted copies of their messages to different lists.

To the factors of personal memory context identified by Murray (1991a) and multi-speed, multi-levels of communication identified by Romiszowski and Haas (1989) several additional factors were found to account for the complexity of the flow of online communication, among these 1> the creative declaration of message topics; 2> material conditions of production; and 3> the open-endedness of communication (Herrmann, 1994).

Finally, the structure of conversations for academic action was found to function three ways: as *episodes* in a larger communicative context; as *completed* conversations; and as *temporarily exhausted* conversations. As completed conversations the genesis, growth and closure of action could be tracked online. Messages clustered into events with clear, temporal boundaries. For example, books and articles were reviewed; bibliographies were compiled; data and experiences were shared. As episodes in a larger communicative context cycling on and off line, posted messages were relatively independent (i.e.; they were un-negotiated publicly). For example requests dangled; jobs were offered; conferences were announced; books, articles, relevant listservers and archives were advertised; help was solicited; study, work and conference sessions were reported; side-channeled conversations were initiated.

A function of messaging that correlates with the nominalization of messaging as in "posts" and the term "article". And a function that perhaps prompted one interviewee to compare some messages to "paper airplanes launched over the Grand Canyon" with the following reflection "Where it actually goes I have no idea of". Finally, as temporarily exhausted conversations a cyclicity of activity existed. For example, concepts and topics re-appeared for discussion (e.g.; Brain sex and gender differences; informal science learning and scientific/everyday concepts); un-marked closure was declared as in " While the group is considering coming to terms with terms, I wonder..."; dangling conversations were re-activated (e.g.; "Re: ADD another gasp) ; technically un-explained message truncations clarified; award nominations were announced and seasonal greetings sent. As one interviewee pointed out referring, explicitly, to the cyclicity of intellectual activity "The elders tend to re-invent the wheel and the young ones wonder whether there is a wheel at all". A reflection echoed in both Grumet's words (1993), "We speak in a world that has been spoken. We see in a world already seen" and the hyphenation of the term "re-search" in a call for making visible priorities of this activity with respects to the study of child development. The functional states of completeness, episode and temporary exhaustion thus co-existed as structure in the flow of online communication.

Discussion

Arising out this study of the flow of online communication in electronic academia, many issues appear. One of these, methodology, is discussed selectively.

In the methodological area, this study appears incomplete on several counts. First, it would be appropriate to precisely quantify such terms as "several" and "some" when referring to messaging by categories of action. This would ground the analysis and bring out the proportion of messages belonging to each of the categories. Secondly, and in the same line, a fully exploited dialogue between quantitative and qualitative methods would supply complete lists of subject headers pertaining to one conversation, indexed by time, date, sender, origin and message length to provide both visual support and additional texture to the findings. Thirdly, a set of criteria have been explicitly stated elsewhere to explain how messages and the utterances within them were distributed across categories of action. This lends additional systematicity to the findings reported in this paper, while turning the study upside down in its design, since the criteria were derived à postiori. None of these methodological options were originally used, however, simply because they are time-consuming, supportive details to generate and insignificant without the stand-alone statements used in, and for the characterization of activity.

Finally, the findings presented here also circumvent a focus on the individuals that make up the community. Holding constant such variables as list and user, the characteristics of different online voices could be brought out so as to supply further insights into the specificity of this community. As several interviewees pointed out, the difference between the x-lists and other electronic mailing list groups lie partly in the founder of the community, its individual members and the host institution. This aspect of online communication is clearly visible and captured, however, in community building discourse (reported elsewhere) varying styles of posts function to create identity and presence in a world of absences.

Conclusion

In this study there was an attempt to seek answers to two questions: How do you make sense of the flow of online communication generated by a large community of users and how do you circumscribe these meanings in ways that differentiate them from those arising in other contexts?

The answers found and constructed are the following:

1. The flow of online communication may be characterized by three recurrent patterns of communication: administrative, academic and community building, two of which have been succinctly illustrated here.

2. These patterns of communication together invoke a wide variety of activity which seen holistically constitutes an over-arching system called *electronic academia.*

3. The specificity of these patterns of communication is a function of the relationship between the group of users and their tools through which things are accomplished in the world.

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The Garden Apple, Tried and Still Enjoyed: The Apple II

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Key words: available, useful, simple to operate

Abstract

Because of the availability of Apples in most schools, despite the advance which newer and faster computers might provide, it is important to provide projects which utilize technology which students can access. Fancier, more complex computers are not readily available for a great number of students, but there are many Apples still around. Because of this, it is essential to continue to originate projects which can be done on the Apple. The Apple is important to consider, also, because it allows students to learn basic computer skills which they can use later on other computers which might be more complex, but which still require the computer knowledge which the Apple teaches. Individual students' creativity and originality shine using Apple II technology.

Projects shared will include creating maps including map legends, writing adventure stories on the theme of Carmen Sandiego (the detective simulation) and designing art portfolios with samples of art skills of line drawing, shading and book production skills.

One of the basic objectives of these lessons is to give students opportunities to learn in various ways. Students are, therefore, encouraged to use visual, textual, and oral applications of their creative projects produced on the computer. Such projects might include producing stories or programs with graphics, scenery, theme songs, poetry, puzzles, and other such results which would enhance the students' application of the technological aspects of the Apple software while inspiring the student to create something from his or her own imagination.

Because children are such natural imitators, it is easy to stimulate their creativity in these projects by providing suggested models and parameters for their individual interpretations. Having learned basic word processing and drawing skills on the computer, each child can then apply those skills to solve the stated problems in his or her own distinctive way. If, for example, a student selects to create a profile of a person. he or she might choose to perform that task in a number of original ways—a riddle, a newsletter, or map of that biographical data.

Rather than simply reiterating facts, these projects will encourage higher learning by asking children to summarize, synthesize, analyze, and reform information. This higher ability to reshape information

and to look at it in new and personally relevant ways, is the true objective of these projects and the essence of creativity. Computers should be more than mere typewriters and storehouses of data. By stimulating students to use their imaginations to create documents of their own, hopefully they will begin to view the computer, any computer, as a tool for their own creativity, a tool which will provide them with many options and possibilities as they perform the creative process.

Plumbing, Planning, and Plugging In: Statewide Connectivity in Utah's Schools

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Key words: Internet, connectivity, education, funding, resources, network

Abstract

A system for all Utah public schools, UtahLINK is the educational data network service which provides users with Internet connectivity, a full compliment of Internet software tools, and online access to electronic educational materials and information resources around the world. With on-going. legislative funding, by the end of the 1997-98 school year, all the state's secondary schools, school district offices, and institutions of higher education will be connected to UtahLINK —totaling over 350 sites. UtahLINK is an evolving service whose goal is to become a model for the rest of the nation in providing top-quality, electronic, educational services designed to empower students and teachers in the classroom.

Plumbing

Utah's Educational Technology Initiative (ETI) began in 1990 with the passage of House Bill 468 and a $15 million initial appropriation. This was meant to be a multi-year partnership involving state government, public school districts, colleges of education and private businesses. The mission of ETI was to:

- enhance the teaching/learning process,
- empower students to become literate, self-directed learners, and
- empower students to be problem-solvers and productive members of a technological society.

To date, the legislature has allocated $60 million to ETI for purchasing hardware, software and inservice training, and approximately $6 million to repair, replace and upgrade the installed base.

Presently, the mission of ETI is to provide funding for establishing and enhancing local area networks (LAN) in public schools capable of connecting to the UtahLINK network. Schools are funded on a formula basis established by the appropriations legislation. The Educational Technology Initiative has been a significant pioneering effort in bringing the vision of technology to the educational process in the public schools.

The history in the state of Utah is rich with networking pioneers. The most recent effort began in 1993 with an unprecedented cooperative relationship between higher and public education resulted in a network design which connects all institutions of higher education, schools district offices, and secondary schools in the state. Briefly, the network design topology has three components: schools are connected to district offices, district offices are connected to regional institutions of higher education, and lastly, all of the higher education institutions are connected to WESTNET (our regional Internet provider). This networking model has proven most successful in providing Internet access to the entire education community in the state of Utah.

Planning

At the Utah Education Network (UEN), planning is a major key to success. The UEN has incorporated a planning model that defines strategic, operational, and tactical levels. The overall strategic mission and guiding principles of the network outlined in the plan form the framework for all levels of planning within the organization.

The document actually guides the efforts and schedules of the entire staff. Adequate and careful planning instills an invaluable sense of preparation and provides a foundation for UEN's commitment to service the state's educational community.

The planning document has been used by the governor and his staff, the state legislature, the legislative analyst's office and other constituents. The plan is directly tied to the budget request and allocations, and provides specific assurance that the funding will be utilized for its intended purpose. It also guarantees a level of accountability that is critical to the network's mission of serving students, teachers, staff, and the educational process in general.

The assurances, then, which result in state funding, are directly derived from a well structured planning process. UtahLINK, Utah's education connection to the world of information is helping prepare today's learners for the demands of tomorrow's world.

Plugging In

The focus of UtahLINK is to provide access to world-class educational experiences for the state's students. Through UtahLINK, students and teachers have access to collaborative projects, educational experts from around the world, current research, online journals, and a myriad of curricular supports for classroom instruction. Utilizing this great potential, teachers may participate in listservs, shared lesson plans, and content-area newsgroups made available on the network. In this way, UtahLINK is striving to build bridges throughout the education community and eliminate the perceived barriers which rural and economically challenged schools often encounter.

UtahLINK, and the ever-expanding community of users, is an extremely powerful tool which greatly impacts the learning potential of students, motivates them to learn and think more independently, and acts as a valuable teaching resource as well. As a result, UtahLINK is taking the leadership role and paving the way for further planning and development of quality, educational opportunities delivered by our data network. In addition, state and local involvement has been the key to developing UtahLINK's World Wide Web page and gopher server, thus assuring that the unique needs and interests of our educators are being met.

How Technology Changes the Role of the Teacher

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Key words: technology, teacher's roles, change, reorganization

Abstract

Technology utilization fundamentally alters the role of the teacher in the classroom. Technology has three ways to impact teaching and learning. The first way you can use technology is to do the same old things we have always done in a different format, e.g., ditto and drill and practice on a computer. This is an ineffective way to use technology. The second way technology impacts teaching is to give teachers and students productivity tools to do work faster and better. Teachers can total customize and personalize their curriculum by using these tools. The presenter will share proven techniques and show the range of products that can be produced. The third way to utilize technology is to open new frontiers to teaching and learning. This is the most powerful and important way to use technology. This area includes video discs, interactive multimedia and more. The presenter will share some of the ways these technologies change the process of education.

An instructor has traditionally been a purveyor of information and final authority on knowledge to students. When an educator uses technology tools in these ways, his or her role in the process of education undergoes reconstruction. Teaching becomes decentralized. Children, even very young children, become researchers able to access information from a wide variety of sources. Teachers become guides to students as they undergo the journey called learning. Teachers find they must utilize cooperative learning techniques due to the scarcity of the technology available in each classroom. Teachers need a system of classroom management to track what each child is doing, and thus begin to view each student from an individual perspective. Technology has also enabled educators to have multiple views on a learner's progress with technology assisted assessment. The presenter has undergone this process of reorganization/reconstruction and will share the benchmarks on this voyage of teacher change.

Technology Assisted Assessment

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Abstract

What impact does technology have on authentic assessment? The presenters will share the methods, shortcuts and results from a two-year long project on video report cards with kindergarten students, a two-year long middle school portfolio project, and a year long research project with PDAs The Newton Message Pad. Selected cuts from the children's videos will be shown and the progress seen is spectacular. Also, the presenter will share ways to use the Newton Message pad with the Learner Profile software in grades K through 12. Actual results from a year and a half long research study

with 120 teachers (a wide mix from classes in kindergarten, multi-age primary, middle school music, art, computer science, high school lab science, 5th grade math, etc.) will be shared. Feedback to students and self-reflection will be discussed. The parents, child and teacher form a working partnership with such valuable data. In the videos, the teacher is modeling good teaching techniques, the students are presented feedback in the medium that is the most important in their lives, and the family celebrates learning. Techniques to be shared include how to get children to set goals, review goals and achieve goals. It is possible to have everything positive and inspiring and still call it a report card. Other methods of parent communication will be shared, including frequent letters merged with a data base and calendars. This will be a multimedia presentation with a handout about the video report card, the Newton project and samples of calendars and merged letters.

Intended audience: K-12 educators, principals, central office staff

V.I.E.W.S. Worldwide Project

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Key words: project, global, video, exchange, student

Abstract

V.I.E.W.S. Worldwide Project is a student-oriented, video exchange program that fosters greater understanding of similarities and differences of cultures around the globe. It is important for students to collaborate with other students around the globe. Eventually the students will be working in a global marketplace environment.

Student Project

Elementary, middle, and high school students in France, Romania, Denmark, England, Japan, and the United States produced videos depicting a day in the life of a student. Depicting their homes, community, and school life provide students with a greater insight into the similarities and differences among countries. After receiving the videos, each student group is asked is fill out a form noting their observations and understandings from each video. Exchanging videos was an idea to overcome the lack of or high cost of telecommunications for some schools around the globe. Contact with a person in the city or country was conducted via telecommunications. However, in some cases, the students did not have access to telecommunications.

Students designed and produced their videotape to exchange with other students around the world. The V.I.E.W.S. Worldwide project allows students to be users of information and also valuable sources of information. The project has students around the globe working together using Tropical

Elementary School as a clearinghouse. In order to be a successful central clearinghouse, Mrs. McKinney applied for and won a Brevard Schools' Foundation grant with funding provided by the Canaveral Council of Technical Societies to provide high quality videotape, portfolios, and postage.

Problems

After using a multi-formatted VCR to convert video formats at Kennedy Space Center, we purchased our own Panasonic AG-W1, multi-formatted VCR. Knowing the exact video format for each country was a problem. Although a local communications corporation provided us with a list of countries and their respective formats, we found that not all stated formats were correct. Sometimes the schools didn't know their video format. Our editing VCR's broke down and took months to get repaired.

Distance was a problem. Whenever possible, we used Internet to telecommunicate messages back and forth and send the videotapes via air mail. Sometimes we had to send several different video formatted versions to some schools until we came upon the correct video format. This involved more time than expected. Our schedule was flexible, yet demanding. Our original goal was to exchange all videos before January 1, 1995. However, due to the many problems, this was not possible. Therefore, due to the distance, time, and problems in other areas around the globe and at our end, the project became more ongoing and will continue through the 1995-96 school year.

Successes

Monica Cucoanes, computer expert for CEPES-UNESCO and the V.I.E.W.S. Worldwide coordinator in Bucharest, stated that benefits to Romanian students were: (1) the importance of studying foreign languages in order to be able to communicate and having the feeling they belong to the world student community; (2) the process of design for a presentation; (3) creation of the video in several phrases; (4) a possible student exchange in the near future.

From the video exchange, a short-term project developed on the topic of drug education with the Danish students and Tropical students. Danish students and Tropical students sent each other questions and answers, and the Danish teacher forwarded information from Russian e-mail friends requested from Tropical and Danish students. This off-shoot of the video exchange project was very beneficial to both Danish and Tropical Elementary sixth grade students. A new project will be underway this fall involving the Danish and American students, and perhaps others.

Conclusion

Our students must learn to respect and understand other cultures around the globe. Despite the time and communication problems, the students around the globe benefited in many ways from the project. Our students need to learn about cultures in order to succeed in today's global marketplace. In this project, students use technology as a tool to learn about other cultures. Phase II has begun. We welcome more schools around the globe to participate in this project.

What Are Teachers Learning? Views from the National School Network Testbed

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Key words: teacher development; testbed; team teaching; modeling; teaching interns

Abstract

Schools and districts in the National School Network Testbed place high priority on teachers' development. Yet each of our 140 Testbed member organizations and their 250 affiliated schools has a different view of why ,how, and under what conditions teachers find networking productive in their own learning, work, and professional development. The panelists will compare and contrast their approaches and accomplishments.

Teachers in the National School Network Testbed

The world of teacher networking is full of contradictions. For some teachers, participation in networked communities has opened worlds of opportunity for professional and personal development. Yet countless networking projects designed to involve teachers have failed to achieve even a minimal level of teacher participation. What makes the difference?

The member organizations in the National School Network Testbed have taken a wide range of approaches to both using telecommunications to support teacher development, and to helping teachers take advantage of networked communities and resources. For the 300 teachers in Princeton Regional Schools, Ferdi Serim models creative use of Internet through collaborative learning, team teaching, and inquiry driven projects. Randy Souviney in the Teacher Education Center at UCSD has been developing communities of science teachers who communicate online and share modeling software they use in their instruction. He also connects teacher interns with instructors to provide support structures during professional preparation. In Florida's SY2000, classroom teachers are designing new learning strategies and producing new instructional products that are technology intensive. Some of those products will support collaborative, constructive learning among learning communities that span schools and districts. Janet Murray, librarian at Wilson High in Portland, Oregon, has for several years been developing and refining strategies to enrich teachers' instructional capacities through telecomputing. Joan Williams in the Pan-Education Institute has analyzed training evaluations collected from 3,747 teachers over the past four years regarding the effectiveness of their networked activities. Hundreds of teachers have been queried regarding technology-related needs to advance education and their own training, what do they see as "barriers" to infusing technology into their disciplines, etc., and what kinds of professional development would they expect and like to participate in. Al Rogers has been investigating the strategies of Testbed schools and teachers, identifying key factors affecting their success, and facilitating the sharing of know-how among Testbed schools.

In this panel, we will reflect upon factors that have affected the successes and failures of attempts to take advantage of computer networking in support of teachers' development in diverse school settings. We will take advantage of systematic studies of teacher development, such as the teacher evaluation work of the Pan Educational Institute and the Oregon statewide planning study.

Comparing Experiences

The panelists will compare and contrast the experiences and circumstances of their organizations, approaches, and resources. We will address questions such as the following:

- What proportion of teachers in your school or district have clearly benefited from participation in networked communities?
- What are the most important contributions teachers are making to the building of productive networked communities, resources, and collaborations?
- What distinguishes those teachers from others with the same opportunity who have not found networked communities and resources to be helpful in their development?
- What are the roles of expert mentors online in supporting teachers' development?
- What are the critical factors in terms of access to computing resources and telecommunications capabilities? How important is home access? bandwidth? user interface?
- What kinds of technical assistance are available to or needed by successfully networked teachers?
- What has been most valuable to your teachers: communication within the school, the district, the state, across the country, or around the world?
- Can you cite beneficial changes in teaching practice that are a consequence of teacher networking?
- What have you learned about teacher development strategies that don't work? What is worth trying as we are scaling up to more universal participation in Internetworking?

Beverly Hunter is Senior Scientist in the Educational Technologies group at BBN. She is working on several projects involving teacher networking, such as the National School Network Testbed and the Teacher Enhancement Principal Investigator Network (TEECH). She is author of numerous books and articles on educational computing and networking. Previously as Program Director for Applications of Advanced Technologies at the National Science Foundation she initiated NSF's program of support for networked applications in science and mathematics education.

Ferdi Serim is Computer Coordinator for the Princeton Regional Schools, New Jersey. He is a national leader in the Consortium for School Networking and has established a nationwide teacher development collaborative via Internet, called the Online Internet Institute (OII).

Janet Murray is Librarian at Wilson High School. She serves on the executive committee planning statewide connectivity for Oregon. She is co-founder of K12Net, a global educational telecommunications community.

Al Rogers is a national leader in school networking, having founded the FrEdMail Foundation and Global SchoolNet Foundation to support teachers' development of networked communities and classroom innovations. He serves as Director of the Teacher Support Desk for the National School Network Testbed.

Randy Souviney is Associate Coordinator of Teacher Education at UCSD. He is a key developer of such innovative teacher development projects as Community of Explorers and InternNet. He has been a key contributor to the National School Network Testbed since its inception in 1992. He is currently working on the Visualizing Earth from Space and KidSat projects that are developing instructional applications of earth sciences databases and shuttle images.

Owen Gaede is Professor of Computer Science at FSU and Associate Director of the Center for Educational Technology. The center is collaborating with the Florida Department of Education and Florida School Districts in the development of the Florida Learning Support Systems. The FLSS is being co-developed with a number of commercial partners and will be a networked performance support system for all members of the learning community. It will rely on wide-area networking to support client-server applications in a distributed information environment.

Joan Williams is Executive Director of Pan-Educational Institute and a founder of the ShareNet Association. PEI provides connectivity to schools in a 10-county area of Kansas City, and teacher training programs for these schools. ShareNet was the first educational network to foster collaborative curriculum development by teachers across school districts.

Computer-Based Telecommunications Training, Including the Internet

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Key words: telecommunications, CBI, simulation, instruction, Internet, tutorial

Abstract

With limited phone lines, modems, and networking capabilities for large group instruction, the idea of teaching telecommunications offline is an attractive and effective alternative. Several universities and companies have designed computer-based tutorial/simulations to assist with telecommunications instruction. These include the University of South Florida, California State University at Fullerton, and Analysis and Technology.

In 1992, the Florida Department of Education sponsored the development of a computer-based tutorial/simulation to teach Florida educators how to use the Florida Information Resource Network's e-mail system, FIRNMAIL. The tutorial/simulation was designed and programmed at the University of South Florida. The tutorial/simulation was a huge success, allowing group training to take place without the need of multiple telephone lines and modems, worry of down time, or system overload at peak hours. In addition, educators could take the diskette home. This provided the educators with additional guided practice and review of the material. The tutorial/simulation continues to be updated to match the changes that take place in FIRNMAIL.

This year, the California State University at Fullerton awarded a grant toward the development of a computer-based tutorial/simulation designed to teach students and educators how to use CORE/ GINA, a telecommunications system sponsored by the California Department of Education and the California University System. In addition to an overview of telecommunications and sending and receiving e-mail, the computer-based tutorial/simulation also provides training on using the Internet via CORE/GINA. Sample projects for integrating the Internet throughout the curriculum are also available on the diskette as simulated activities. Parts of the CORE/GINA tutorial/simulation's design are based on the FIRNMAIL tutorial/simulation.

Analysis & Technology, a multimedia production company located in Orlando, Florida, is also developing a computer-based program about the Internet. Its goals, like the other tutorial/simulations mentioned, are to help demystify the world of telecommunications and to provide an effective alternative to the demands of online instruction.

Strategies and Activities for Integrating the Internet Throughout the Curriculum

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Key words: telecommunications, activities, strategies, instruction, Internet, curriculum

Abstract

A variety of strategies and activities has been developed by the authors to assist educators in exploring and integrating the use of the Internet throughout their curriculum. These activities have been designed to use the Internet as an instructional tool, encouraging educators and students to participate in worldwide and timely events, data gathering and analyses, and cross-cultural exchanges. Activities have also been created to teach learners how to use a particular site. Each activity has a stated objective(s), grade level, and research level (basic, intermediate, and advanced). Each activity also provides educators with the necessary Internet paths, procedures, extension activities, and answers (when applicable).

More and more educators are connecting to and exploring the many facets of the Internet, overwhelmed with the many resources and amount of information available. These activities are designed to guide and assist educators and students with finding, sorting, and deciphering the information available on the Internet. Activities are provided for various sites and access methods. The emphasis of the activities is on curriculum integration and various information skills.

The Internet can offer educators instant access to educational research, curriculum sources, lesson plans, online experts, discussion groups, and teacher forums. It can provide students with resources they might not otherwise have, open doors to multicultural education, establish real-world learning experiences, invite higher order thinking skills, and can provide purposeful and motivational learning activities. This new wealth of information is opening doors for teacher collaboration, changing the way teachers teach, and influencing what teachers teach in a manner that benefits both the teacher and the student. Providing guidelines, assistance, and sample activities in the use of telecommunications are some of the ways that we can help educators become more familiar with the many possibilities of using the Internet as an instructional resource.

New Ways of using the Internet to Teach Technical Writing

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Key words: writing, technical, curriculum, Internet, Web

Abstract

The Internet is a powerful development in telecommunication technology that has inspired new ways of teaching and learning. This project presents an innovative strategy for college teachers to use the Internet to enrich their teaching of technical writing and professional communication.

At the Chinese University of Hong Kong, we have been exploring new ways of teaching ESL courses since the Campus Backbone Network was put in place in 1992. By integrating the information

superhighway into a writing course, Technical Communication, we have made students excited about technical writing in the form of memos, minutes of meetings, letters and technical reports for authentic communication purposes. The main theme of the writing activities is about new ways of using computers and Internet resources for English language learning. The highlight of the course is the electronic publication of a Web newsletter of the class.

The presentation will come in five parts: first, the course objectives and syllabus design; second, arrangements of workshops and introduction to Internet tools required; third, assignments and assessments; fourth, the planning and organization of the class newsletter. Finally, there will be discussions of pedagogical implications and future development.

The course objectives and syllabus design aim at helping science students communicate effectively in technical and professional situations with a variety of audiences including both specialists and non-specialists. The syllabus covers 13 weeks of classwork and takes a collaborative learning approach. Students work in teams to complete a term project—putting together their writing samples and technical reports in the form of an Internet class newsletter.

Second, a brief description of five workshops on computer tools required in the course: e-mail; CALL; Newsgroup; WWW and CD-ROM workshops. They give students opportunities to learn useful computer tools. The ultimate goal is to help students use these tools to build a class newsletter on uses of the Internet.

With the assignments and assessments, students are trained to write reports to their department heads to introduce interesting software or Internet resources. In writing and by oral presentations, students report on their favorite CALL software, applications of e-mail, newsgroups, home pages useful for language learning and for their academic disciplines. Students learn to edit their own writings and select the better ones for their class newsletter.

In the planning and organizing of the newsletter, details of the publication procedure will be described including the 6Ms: tiMe, equipMent, Manpower organization, Method, Money and hypertext Markup language (URL http://www.cuhk.hk/csc/demo/).

Finally, there will be discussions on the pedagogical implications of the project and challenge of future development in four main areas: instructional capabilities of the Internet; research capabilities, publication opportunities and interaction capabilities. New ways of using the Internet have challenged us to re-examine our ways of thinking about teaching and learning. If we are to update and upgrade the ways we teach and learn, shouldn't we think about alternative modes of instruction and compare them?

Traditional classroom mode	Internet-assisted mode
•teacher-centered	learner-centered; teacher talks, student listens; teacher facilitates and advises
•lecture to a big class	small group tutorials
•top-down, authoritative	peer-to-peer, collaborative.
•teacher as an authority figure	teacher joins students to become a community of learners
•more in the "tell/sell" mode	more in the "consult/join" mode

•one-to-many	many-to-many "broadcast paradigm" "network paradigm"
•lock-in-step with the whole class	individually paced learning
•passive with little expected of learners	active; greater learner responsibility
•learning by listening	learning by doing
•face to face (F2F)	F2F plus virtual community support

Mere presence of computers and the Internet, we must emphasize, does not automatically improve writing, thinking or learning. It is up to people who design projects and learning tasks, to think critically of the Internet and to make careful use of it. The potential benefits and dangers are great. The Internet easily overloads students and teachers with information and lends itself to abuses. Information is not knowledge but critical selection and coordination of information is. If we are to improve the quality of our technical writing instruction, we must reflect on critical issues such as:

1. What do you want to use the Internet for rather than what the Internet can do?

2. Why choose this particular technology? Is there instructional necessity for it?

3. What potential benefits and dangers are there?

4. What modes of teaching/learning are more productive in a network-assisted environment?

5. What are important variables in the pedagogic dynamics of collaboration on the Internet?

6. How do you use the Internet to connect the knowers with the learners?

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Newbies to Navigators: Designing an Internet Staff Development Program

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Key words: Internet, staff development, training, authentic learning, world link

Abstract

Building capacity and infrastructure are essential for incorporating information access skills into the curriculum. The World Link Project is a grassroots effort to provide teachers, library media specialists, administrators, and curriculum supervisors with the vision and professional development needed to begin this process. Initially funded by a grant from the Martha Holden Jennings Foundation, the World Link Professional Development model has continued to evolve through several phases. During Phase I, the curriculum manual was designed, a newsletter was launched, and hands-on workshops were conducted for teams comprised of administrators, teachers, and library media specialists from each building. Phase II contains several ongoing support components—follow-up, users group, help desk, and additional teacher learning workshops on advanced Internet skills. Phase III will focus on authentic learning opportunities with teacher-guided, student projects that will include partnerships with other schools, information sharing, and publishing on the net.

The on-ramp to the Information Superhighway was more like traveling down a winding country road than cruising down an interstate highway. Many individuals had to be convinced that this was a worthwhile endeavor. Nearly a year (1992-1993) was spent presenting a "Road Show" at administrative and teacher meetings to show the value of Internet access and its use in the curriculum. A major breakthrough came with the Martha Holden Jennings Foundation Grant (September 1993). Once the prototype was established and results disseminated, the project mushroomed into a full-scale undertaking. At the same time the project was beginning to take off, a second grant was received from the Columbus Foundation (February 1994). This funding provided a modem in each school library, start-up funds for the Greater Columbus Freenet, and hands-on summer workshops. Connecting to the Greater Columbus Freenet gave Columbus Public Schools a gateway to the Internet.

By the end of the 1995 school year, over 550 district staff had completed six hours of hands-on professional development on the following topics—communicating with others (e-mail), accessing information (gopher), and retrieving information (downloading). Several of the newbies have become navigators and guided their students in online collaborative activities. These include student participation in projects such as the study of the environmental habitat of Pillbugs, engineering a package to mail a raw egg to another school (Egg-A-Thon), tracking the Iditarod dog sled racers, and corresponding with other students via e-mail.

The process of change does not happen overnight. It has taken three years to lay the foundation and will take several more to be fully implemented. We have found that you have to work with educators at their comfort level of knowledge and move them forward from that point. Lots of practical and technical support is needed as well.

Telecommunications, Technology and Collaborative Educational Reform in the San Francisco Bay Area

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Key words: systemic educational reform, telecollaboration, networked multimedia, public-private alliances & partnerships

Abstract

This panel highlights four related San Francisco Bay Area educational technology projects which are collaborating in the development and use of advanced telecommunications networks to support systemic educational reform in California: Multimedia Makers, a major education project of the Institute for Research on Learning (IRL) and the Bay Area Multimedia Technology Alliance (BAMTA); the education projects of the California Research and Education Network (CalREN), a major advanced high bandwidth telecommunications applications showcase initiative of Pacific Bell; the San Jose Education Network, one of the largest educational networking projects in California; and the Smart Schools and related education initiatives of Smart Valley, Inc. (An affiliated initiative of the Joint Venture: Silicon Valley Network), a national leader in facilitating new kinds of public-private partnerships and alliances around using computers, telecommunications, and multimedia technologies to catalyze regional economic, cultural and educational innovation in the Silicon Valley area. Commentary on all of these efforts and their relation to national education and technology agendas will be given by Joe Oakey, President of the Autodesk Education Foundation.

Technology and Telecommunications as Catalysts for Regional and National Educational Reform

The greater San Francisco Bay Area is home to Silicon Valley birthplace of many of the major technologies that have created entirely new industries and transformed global businesses practices, as well as those in widespread use in education and training. At the same time, this area now has one of the most diverse populations in the nation, and its schools are now in great need of systemic reform in order to support the learning needs of all students-especially those who have not been traditionally successful in academic studies in mathematics and science. During the past few years, a number of regional initiatives have emerged to support utilizing technology in accelerating the Bay Area's regional economic development and educational reform. All of the projects on this panel are examples of these new kinds of collaborative, public-private partnerships, involving active involvement of multiple stakeholders in educational change: business & industry, government agencies, educational research and development organizations, schools, and community education institutions. The purpose of this panel is thus to not only discuss each individual project and initiative, but also to show how their relations to each other in leveraging common resources and learning from one another in developing more effective ways to use technology to reform and revitalize education, both in and out of the K-12 classroom.

San Jose Education Network

The San Jose Education Network (SJEN) is a public-private partnership dedicated to building one of the largest educational networks in California. SJEN will link every classroom in San Jose public

schools, train teachers and develop new programs that explore the potential of telecommunications to fundamentally change classrooms. SJEN is the a result of a task force effort and $1 million in support sponsored by the Mayor and City of San Jose, as well as over $6 million in local corporate support. The project is a systematic effort to integrate technology into all 24 high schools, as well as all the other K-8 schools, in San Jose, through providing a common network infrastructure and Internet access to all participating schools. The SJEN project has involved extensive collaboration between the schools and local business and industry, especially through a major grant from 3COM Corporation and a variety of collaborative efforts with Pacific Bell, and is developing new ways to engage teachers, students, and other school and community personnel in planning, training, and implementing a systemic vision. The project focuses on a number of Internet-based sub-projects in the skill areas of critical thinking, written and verbal communication, team participation, research, and effective presentation. It is also exploring how technology resources can be shared and leveraged by multiple schools and school districts in a region of increasing diversity.

During the last two summers, SJEN has trained over 1000 local teachers in a month-long summer institute designed to provide teachers with technology training and assistance in developing curriculum for their classrooms.

CalREN

The California Research and Education Network (CalREN) is a major initiative of Pacific Bell designed to build and demonstrate exemplary high bandwidth telecommunications applications for the communications and information superhighway. As a special trust created by Pacific Bell in 1994, CalREN has awarded 55 grants , totaling over $25 million to projects in education (30 projects), healthcare, community, government, and commercial business applications. Telecommunications technologies used in CalREN projects include SMDS, ISDN, Frame Relay, and ATM. The CalREN education projects include numerous Internet-based educational applications, distance learning, connections between regional science and art museums, schools, and homes, collaborative design of interactive multimedia materials by and for schools, and development of systems to share electronic student records to assist students with special needs. The CalREN projects began in the Summer, 1994, and will continue until June, 1996.

BAMTA, IRL, and Multimedia Makers

Multimedia Makers is the first educational project of the Bay Area Multimedia Technology Alliance (BAMTA), a new public-private global alliance formed in cooperation with the National Aeronautics and Space Administration (NASA), Smart Valley, Inc., and business and industry partners to accelerate the development of networked multimedia technologies and applications. The Institute for Research on Learning (IRL) was one of four founding members of BAMTA and developed and directs the Multimedia Makers project. Multimedia Makers is creating a new kind of virtual educational multimedia design studio. It is a collaborative enterprise in which students and teachers design and create professional quality interactive multimedia products and services for use in K-12 science and mathematics classrooms. This project brings together a number of outstanding and award-winning projects in mathematics education reform (IRL's NSF-funded Middle School Mathematics through Applications Project (MMAP), animation (Rowland Animation- La Puente Valley ROP, Rowland Heights, CA), electronic arts and multimedia (Abraham Lincoln High School, San Jose), and a number of education projects from NASA Ames Research Center. Using the advanced networking facilities and collaborative development environments from BAMTA's Collaboratory, a state-of-the-art, virtually-addressable networked multimedia facility, participating schools in the Multimedia Makers project will be engaged in a new kind of virtual multimedia design enterprise-one which directly mirrors emerging trends in professional filmmaking, multimedia, and the development of new

forms of interactive education and entertainment. In so doing, this project will be providing a "hands on" approach to media literacy by directly engaging them in the professional practices of creating multimedia for use by teachers and peers in their own and other schools.

Smart Valley

Smart Valley, Inc. an affiliate and initiative of the Joint Venture: Silicon Valley Network, is the facilitative organization dedicated to rapidly advancing a regional approach to the National Information Infrastructure (NII) in the San Francisco Bay Area. Smart Valley's vision is to help create an electronic community based on an advanced information infrastructure and the community's collective ability to use it. Smart Valley has helped facilitate numerous regional projects with national impact, including CommerceNet, the Bay Area Digital Geographic Resource (BADGER), the Bay Area Multimedia Technology Alliance (BAMTA), and the Palo Alto Community Network. Launched in February, 1994, Smart Valley's Smart Schools Internet Project was designed to bring the Internet and communication technologies into Santa Clara and San Mateo County schools. By focusing on removing difficult infrastructure and support issues, Smart Valley is accelerating the integration of technology in education. Smart Valley is leading a number of projects, partnerships, and working groups toward achieving this goal, including: The Smart Valley Technology Guidelines, specifications for LAN and WAN connectivity that will accommodate new technology growth and development in many areas (Internet, video conferencing, cable TV, satellite, and multimedia); The Smart Valley Technical Guidebook for Schools (to be published in Fall, 1995, as well as available electronically); Smart Valley Technical Support Working Group, which is designing a comprehensive technical support plan which includes training high school students to manage school networks; and the Smart Schools Resource Bank, which will make accessible donations of hardware, software, and technical support personnel to those schools adhering to the Smart Valley standards for education.

Smart Valley has also been active in three regional education partnerships and alliances—Challenge 2000 (an initiative of Joint Venture: Silicon Valley Network's 21st Century Schools Initiative), the San Jose Education Network, and BAMTA.

Autodesk Education Foundation

Joe Oakey, President of the Autodesk Education Foundation and an Autodesk Fellow, will comment about the relation of these projects to other regional and national education, technology, and telecommunications agendas. The Autodesk Education Foundation promotes the use of technology to support project-based learning, and is supporting a community of innovative schools teachers, and districts in integrating technology with implementation of systemic education reform.

World Wide Web Home Page IRL's

Autodesk Foundation: http://www.autodesk.com
Bay Area Multimedia Technology Alliance (BAMTA): http://www.bamta.org
Institute for Research on Learning (IRL): http://www.irl.org
Pacific Bell's CalREN Program: http://www.pacbell.com
Smart Valley and Smart Schools: http://www.svi.org

Perspectives on Network Security in the School Environment

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Key words: computer security, computer networks, access to information

Abstract

For educators, Internet access is associated with benefits for classroom instruction. The Internet also presents challenges that include protecting the school's computing environment from network invasions and preventing student access to materials deemed inappropriate. In this presentation, the multidimensional aspects of network security are examined. Procedures for minimizing security vulnerabilities, developing safeguards for network–based information access, and implementing a security policy responsive to user needs and school requirements are described.

Introduction

Computer networks support innovative educational applications that include distance learning, electronic field trips, telementoring, and videoconferencing. As a result of these capacities, computer networks can transform ways in which students, teachers, media specialists, and school administrators communicate, interact, and discover new knowledge domains. The communications technologies enabling school users to reach beyond their desktops, to take advantage of the Internet and other online services, create two distinct yet related security challenges:

- Protecting the school's computing environment from invasion initiated at other points along the information superhighway.
- Evaluating and establishing procedures and policies to prevent access by students to materials deemed inappropriate.

This paper includes reports of my case study research with educators throughout the country on this multidimensional problem.

Technical Security Problems

Security problems happen with more frequency than we are willing to acknowledge. Security incidents can occur when authorized users import corrupt software or select poor passwords. The security of information owned and/or maintained by a school can also be compromised by cybercrackers infiltrating an operating system through security loopholes.

USAF Major William F. Conroy III (personal communication, January 13, 1995), System Software Engineer with the United States Transportation Command, commented: "The most significant threats to systems connected to the Internet are not related to damage to particular files, rather the greatest threat relates to loss of system control." According to Conroy, read–only files provide no protection against actions of a cybercracker who gains operating system access via the Internet and takes over control of the computer system, thereby gaining the capability not only to read any system file but also to overwrite or destroy these files (Littman. 1995).

In January 1994, the College Center for Library Automation (CCLA) in Tallahassee identified a disruption in the LINCC online system connecting Florida's 28 community colleges. The problem was traced to a public access terminal in the library at St. Petersburg Junior College. Susan Anderson (personal communication, January 12, 1995), Library Director at St. Petersburg Junior College, indicated that through the use of this terminal, students broke into a little known portion of the LINCC program. Subsequently, they issued a system command to identify and save all titles starting with the word "the" in a file they created on the college's mainframe. According to Anderson, this action reduced system response time and potentially could block operations throughout the entire network. Anderson added: "I can only imagine what could happen when we are connected to the Internet."

Alan Liddle, Lieutenant Commander, Royal Navy and Professor of Systems Management at National Defense University (NDU), remarked that intruders "visited" NDU very soon after NDU went on the Internet (Littman, 1995). Liddle (personal communication, January 20, 1995) stated: "We took appropriate action. Collecting the evidence on how big and frequent break–ins are is extraordinarily difficult; but even a conservative extrapolation from those reported indicates the problem is significant."

Crackers penetrate computer networks with lightning speed. Often we cannot detect who commits security violations. Eddie Williams (personal communication, January 14, 1995), Director of Systems and Administrative Services, University Libraries at the University of Southern Mississippi, said: "A hacker accessed our GEAC system via the Internet; escaped through a loophole into UNIX, the operating environment in which GEAC is mounted; modified software and group permissions; and set up his own directory on our network." Williams added that by pretending to be an authorized system user, the unidentified hacker could potentially do a great deal of serious damage both to the university network and to remote locations (Littman, 1995). According to Liddle (personal communication, January 20, 1995), if your network is used by a hacker to penetrate other networks you could be responsible for damages incurred and "the dollar amount could be excessive."

Viruses

Another threat to network security is a computer virus. A virus is a malicious code that is buried within a program. After the program is executed, the virus code is activated and replicates itself by infecting other programs in a computer or throughout a network. Viruses require a host and can originate in new or repackaged software, freeware, shareware, leased computers, or computers recently returned from a repair shop.

Internet bulletin boards are also a source for disseminating various viral strains that can crash computer networks. Reportedly, thousands of users of *alt.binaries.pictures.erotica* unknowingly downloaded sexually explicit shareware infected with the kaos4 virus, posted by a cracker, that resulted in lost data and file corruption (Anthes, 1994). This kind of experience becomes ammunition for those objecting to a school's involvement in online activities.

Jeanine Gendron (personal communication, March 16, 1995), Technology Specialist at Coconut Creek High School in Coconut Creek, Florida, pointed out that an effective method for preventing potential viral attacks is loading an anti–virus software package on a computer as soon as it is deployed in the school setting. Donald Hyatt (personal communication, March 15, 1995), Director of the Computer Systems Lab at Thomas Jefferson High School for Science and Technology in Alexandria, Virginia and administrator of the school home page (*http://boom/tjhsst.edu/*), commented that as part of the virus prevention plan at Thomas Jefferson High School students are not allowed to bring floppy disks from home containing computer games to the school computer lab since computer games are often a source of viruses. The publicity accompanying such viruses as Michelangelo underscores the importance of adhering to virus prevention policies.

Following the introduction of the Jerusalem virus into the CD–ROM LAN at the Broward County Main Library, Brett Kemper (personal communication, January 13, 1995), head of Automated Systems for Florida's Broward County Library System, related: "We locked the floppy drives. This action created an uproar among patrons who preferred to download data onto diskettes instead of sitting at terminals and printing everything out." This experience illustrates the challenge of balancing restrictions through physical security barriers on the one hand and optimal user access on the other.

Privacy Assaults

A computer network supports the exchange and distribution of sensitive information such as home addresses, telephone numbers, social security numbers, and medical records. Without effective safeguards, this information could be made available improperly to governmental organizations and law enforcement agencies in violation of an individual's right to privacy. Intentional interception of electronic communication and the use or disclosure of the contents of an electronic message are violations of the Electronic Communications Privacy Act (Rose, 1995).

William Piotrowski (personal interview, March 15, 1995), Chief of Information Services, Leon County (Florida) School Board, commented:

In Leon County, only users with a direct and legitimate interest or a need to know can access confidential information on our school network subsequent to signing a binding agreement. This access must be consistent and appropriate with job functions. For instance, a guidance counselor can access student records only in his or her high school. A school administrator can access financial records for only that center at which the individual is responsible.

Internet Invasions

From its origins as a U.S. government research project sponsored by DARPA (Defense Advanced Research Projects Agency), the Internet now links millions of users in an estimated 150 countries. The goal of the Internet is worldwide connectivity. A consequence of global Internetworking is that every network linked to the Internet is vulnerable to invasion. B. R. Black (personal communication, March 15, 1995), Director of Information Technology of the Polk County (Florida) School System, asserted: "The problem with Internet access is anytime I can get out I know crackers can get in."

Greg Rivera, Jr. (personal communication, February 15, 1995), Systems Librarian for the Tampa Bay Library System Consortium, commented: "A good hacker could probably break in to our system and from there infiltrate other areas of the Internet. Internet gateways used by organizations to connect internal networks to others serve as open doors to intruders as well."

In an educational setting, an Internet link provides access to valuable information and an instant communications pathway. The risks, however, can be high. John Scigliano (personal communication,

October 4, 1994), Professor of Information Systems at Nova Southeastern University (NSU), stated that crackers using Internet utilities such as FTP, e–mail, Telnet, finger, the World Wide Web, and Gopher try to invade the NSU network. Identification and authentication services aid in blocking these assaults. He noted that a combination of network management products and software tools are used routinely to monitor the university system.

An Internet penetration into a school network could result in such incidents as:

- Deleting whole topics or time periods in lesson plans online that do not reflect a particular point of view on such subjects as capital punishment, abortion, gun control, constitutional rights, or civil liberties.
- Using the network as a gateway to infiltrate confidential school transcripts and records.
- Stealing student and faculty research.
- Violating copyright and software licensing agreements.

In response to my query concerning the frequency and seriousness of incursions on the Internet, Liddle warned that an individual intent on causing damage could readily place a DUI (driving under the influence) charge on your driver's license (Littman, 1995).

Planning for Hardware and Software Security

Deployment of a technical security program is essential for safe computing. Whether this implementation is baseline or large scale, we must become informed consumers in order to develop a security program that accommodates current and projected school requirements.

Jane Anne Hannigan (personal communication, March 7, 1995), Professor Emerita, Columbia University, stated:

We must carefully track advances in this domain so that we can deploy security solutions without being subjected to the pressure and flimflam artistry of vendors trying to dazzle us into making unwarranted acquisitions. A good approach is to create a watching brief or an annotated file of information that tracks the seemingly endless flow of innovative technology and service offerings. This brief can be kept on a World Wide Web home page, in an online directory, or in diary–format in a desk drawer.

The role of a teacher, media specialist, or school administrator in the security arena can be as basic as making users aware of security guidelines at a computer terminal or as complex as designing a comprehensive school district security policy. School personnel with security–related responsibilities should become familiar with security technology in order to resolve security problems; recommend and develop procedures for safeguarding computer hardware, software, and electronic information resources; and help build secure systems.

Building a Secure System

A secure network system supports data confidentiality and reliable information delivery. Security involves safeguarding data integrity and privacy and minimizing exposure of assets and resources to modification, corruption, and unauthorized disclosure. Cheswick and Bellovin point out that "security is keeping anyone from doing things you do not want them to do to, with, on, or from your computers or any peripheral devices" (1994, p. 4).

Generally, network security is a tradeoff with expedience. Most users seem willing to accept a higher level of risk rather than forego network access to global resources. Yet, security policies that protect information resources from assaults are indispensable. In pointing out that prevention is the best security approach, Scigliano (personal communication, October 4, 1994) noted: "You have to determine what level of damage is acceptable and then build your security system from there."

Authentication

A security system allows authorized individuals to access network resources. Physical access to a school computer lab or media center can be controlled through the use of photo identification badges.

Provision of network access control, particularly in a distributed computing environment, is challenging. Since any security scheme can be broken, the notion of security products protecting a computer network from all forms of unauthorized access is illusory. Noted Piotrowski (personal communication, March 15, 1995): "The prudent thing to do is try to be proactive. Because of the nature of the technology we are dealing with, I don't think anybody's network is truly secure."

Electronic messages can be monitored and picked up at unsecured gateways. Traffic analyzers can be used to capture logon and password sequences. Break–ins can also be initiated over dial–up phone lines so that intruders can capture confidential information on legitimate users.

Since a determined hacker can successfully infiltrate even a well-protected network, procedures for distinguishing between users and computer services that may be trusted and those that may not are essential. Authentication mechanisms such as passwords, encryption, and digital signatures allow users and resources to identify themselves as trusted entities. Schools prohibiting dial–up connections to their networks can enforce this sanction with tools that scan telephone lines for unauthorized modem tones.

Passwords

Almost all systems require passwords; yet, many users do not take their passwords seriously. Passwords are often considered an inconvenience rather than an indispensable security mechanism.

A password is a code that identifies an authorized user and indicates which network operations can be performed. A password should not be placed in an online file, easily guessed, written down and hidden in a top desk drawer, or pasted on a computer monitor. Unencrypted passwords sent through unsecured e–mail can readily be captured by network monitoring tools or sniffers.

When selecting passwords, computer users are remarkably uncreative. Typically, users select passwords such as names of family, friends, pets, and cars that are meaningful in terms of their lifestyles. Careless password selection and use are leading causes of network incursions.

To identify passwords, cybercrackers can run commercially available password cracking programs such as NETCRACK or PASSTEST or try every entry in a dictionary. Crackers can also penetrate systems by using borrowed or shared passwords, capturing passwords through a network analyzer as users log onto the system, or tapping into accounts for a "visitor" or "guest" which do not have passwords assigned. Users should be instructed never to leave their terminals unattended while logged on since an intruder can then quickly access information resources without having to go through the password guessing routine.

Password interception is becoming commonplace on the Internet. As a result of break–ins at Rice University and the University of California at Berkeley, thousands of passwords were stolen. A team of intruders invaded the Texas A&M University network with the aid of a password cracking program and then set up their own bulletin board on the university's network for information exchange.

Tactics for ensuring network integrity against password attacks in an Internet environment include deactivating old accounts, password encryption, restricting users to one log–on at a time, prohibiting the re– use of previously selected passwords, and establishing a mechanism for reporting password violations. At Rutgers University, users are required to change their passwords periodically or else they are dropped from the network. An individual accessing the Internet via the Polk County School System is advised that account and password misuse can lead to termination of network access.

Rivera (personal communication, February 15, 1995) noted: "At the Tampa Bay Library Consortium, we depend upon our operating system to monitor network activity and generate passwords. Once you are on our system, you cannot change your password within 14 days of getting a new one."

Melvin Zeddies (personal communication, March 13, 1995), Dean of the Business and Technology Academy at Claremont High School in Claremont, California, remarked that students at Claremont High School change their passwords on an irregular basis. Said Zeddies:
"We are torn between letting users choose their own passwords and generating random character strings which are difficult to remember. Rather than run the risk of our students writing down their passwords, we instruct them to use passwords that are not too elaborate."

Another technique minimizing network damage is limiting the number of inaccurate log-on attempts. With password management tools, the number of log-ons before a potential cracker is locked out of the system can be defined. At NSU, users are limited to three incorrect log-ons.

Intruders who break into one part of the Internet can rapidly gain access to much of the rest of the network. With a valid password, a cracker can pretend to be an authorized user, log on to the Internet from an untraceable point, and utilize a false identity to destroy or gather confidential information. According to Rose (1995), the fraudulent use of passwords across interstate lines is in violation of the Computer Fraud and Abuse Act and can lead to prosecution.

Creating a Security Policy

A security policy reflecting your school's goals and objectives should be clearly delineated and rigorously administered. There is no single solution for countering intrusions. Mechanisms for safeguarding network security incorporated into your school's security policy depend upon information sensitivity, mission–critical applications supported by the network, and guidelines endorsed by the school district.

The goal of safeguarding an entire network against all incursions is unrealistic. A security policy indicates limits of acceptable behavior in the electronic networked environment and defines responses to violations. Sanctions for failing to comply with security guidelines are appropriate to infractions committed.

In creating a balanced security program consistent with real world priorities, computer network vulnerabilities are identified through risk analysis. Procedures for reporting security breaches and reacting quickly when under attack are indicated. The security policy also specifies tactics for backup to prevent catastrophe and delineates methods for disaster recovery. The security policy serves as a guide to the user community and acts as a deterrent to cyberinvaders.

Initially, in developing a security policy, you should delineate who is in charge of protection, determine network operations that are and are not allowable, identify resources susceptible to attacks, setup a security budget, inventory network security mechanisms, and forecast the need for additional security devices. Security education for all users is essential.

Network changes should be reflected in modifications to the security policy. In order to maintain information confidentiality, restrict data access, and prohibit information tampering, the security policy should be reviewed regularly and updated periodically.

Guidelines for Internet Access

An important component of the security policy in the school environment is developing guidelines for Internet access and exploration and determining rights of students in cyberspace. Dwight Butler (personal communication, March 13, 1995), lead fourth grade teacher at the Virginia L. Murray Elementary School in Ivy, Virginia and curator of the school home page (*http://curry.edschool.virginia.edu/murray/*), stated:
The issue of security is also one of ethics and morality. There are whole sections of *Penthouse* and *Playboy* on the Internet that could be devastating to a group of pre–adolescent youngsters. The Internet is an uncharted territory. The environment is constantly changing.

How can we promote student responsibility in cyberspace when inadvertent access to visual images and printed matter may contradict family and local community values? Are specifications restricting student access to the Internet to obtain material for learning and research a form of censorship and a limitation of personal freedom? Educators participating in research interviews during this study indicated responses to these questions are being examined with the development of network access policies and security plans for their school systems.

Black (personal communication, March 15, 1995) noted:
"Security is more than passwords and technical measures intended to keep crackers out of our school networks. Even as we enable our youngsters to expand their horizons beyond our school walls, we must recognize that the Internet provides access to material that may not be suitable for school aged children. We can't keep our schools bolted down like Fort Knox. We must find a reasonable balance in preparing our students to participate responsibly in a global information society."

Making Internet access available in the school environment carries with it the potential that students might find inappropriate or offensive material, such as pornography and hate messages targeted at specific religious and racial groups. How can we facilitate student exploration of the Internet and responsible use of electronic information in the educational setting? What restrictions, if any, should be placed on students' access to Internet materials? How can we alert youngsters to dangers in online communications with strangers who may be child abusers or pedophiles? How can we walk the line between intellectual freedom on the one hand and protection of minors on the other?

Regulations

My research indicates the degree to which Internet access policies reflect the philosophy of a given school system. The data which follow illustrate the diversity of approaches for monitoring student use of the Internet.

Patricia Kistenmacher (personal communication, March 14, 1995), Library Director at St. Thomas Aquinas High School in Fort Lauderdale, Florida, remarked:

"Because of the sensitive information on the Internet, our students' usage of Internet resources is carefully restricted. Right now we have just one log–on to the Internet and that is through my password account. I personally log each student on to the Internet and monitor their activities. Each student has a maximum usage time of 30 minutes. Future plans call for putting Internet policies in place and requiring students to have forms signed by their parents permitting Internet access."

Zeddies (personal communication, March 13, 1995) reported:
"At Claremont High School, we have completely cut our students off the Internet unless their access takes place under direct physical supervision of a faculty member. In this way, they can't get into the triple X stuff. Our decision is based on a long term view. If we ran into a problem and the community got up in arms, we could lose funding. We don't want to have to fight that battle and have it ruined by a few for the majority."

From the perspective of the elementary school setting, Butler (personal communication, March 13, 1995) maintained:
"We must teach children to be responsible. If technology is embraced and brought into the classroom we must accept the fact that our youngsters may stumble across things they shouldn't see. Our children should learn if they find something that is wrong they should exit the program. We want our children to be free to use technology to find things they need. Although we supervise our youngsters we cannot monitor them every minute. The more restrictive we are the less independent they become. If their behavior is inappropriate and they learn from their mistakes that's fine. If their behavior is titillating but wrong they should lose their privileges. We cannot afford to spend our tax dollars in education in monitoring our children's irresponsibility."

Hyatt (personal communication, March 15, 1995) related that at Thomas Jefferson High School for Science and Technology:
"All students sign an agreement before they come on to the network indicating that they will abide by certain rules including respect for privacy and copyright. If students violate the policy, they will lose access to the computing facilities. We try to treat the Internet as a valuable learning resource rather than yet another toy."

According to the Minnesota Coalition Against Censorship (MCAC), Internet access should be freely available to all public school teachers and students. In its statement against censorship on the Internet (1994), MCAC indicated that rather than focus on techniques for controlling the information environment we should concentrate on developing methods for equipping users with online skills that accommodate their individual educational requirements.

In commenting on the polices of some school districts offering censorship options as part of their Internet access guidelines, Mary K. Chelton (personal communication, March 15, 1995), Associate Editor of *Voice of Youth Advocates*, stated:
"It amazes me there is an automatic assumption that if students are allowed unfettered access to the Internet they will directly access forbidden material on *alt.sex.practices* as if nothing else of interest is available. We have a listserv at Rutgers for science fiction lovers that is not only innocent but quite intellectual and brings people of all ages together. Adults have a responsibility to tell students how to protect themselves in person and how to protect themselves from dangerous strangers on the Internet. They also need to inform students about ethical safeguards so they don't hack away for the fun of it, destroying private records in the process."

Responsibilities

Through providing information on a galaxy of topics ranging from astronomy and archaeology to equality, pollution, immigration, and multiculturalism, the Internet can enrich and expand classroom instruction. Yet, Internet connectivity in the school environment poses risks for students. The capability to share ideas and resources on the information superhighway is accompanied by potential exposure to sexual harassment, threatening relationships, and pornography.

Child Safety on the Information Highway (1994) highlights common sense approaches for dealing with the hazards of going online. Although this brochure asserts that crimes committed online are not valid reasons to stop using online services, potential dangers may supersede the willingness of some schools to enrich their students' lives through computer technology. How can we provide the leadership and vision that are needed in addressing the ethical and social ramifications of computer networking?

Consideration should be given to sponsoring workshops, symposia, panels, and discussion groups by school officials for students and their parents or guardians on benefits, drawbacks, and individual rights and responsibilities associated with the Internet. Guidelines for online safety relating to the confidentiality of sensitive personal information, data security, the freedom of expression, and handling material deemed inappropriate should be presented and discussed.

Written procedures such as those contained in the *Telecommunications and Network Access Policy* (1994) adopted by the Polk County School System should delineate fundamental user expectations, obligations, and responsibilities in the electronic environment. Among other subjects, guidelines for acceptable operations, network etiquette, and password management should be described.

Students in Polk County Public Schools are informed that Internet use takes place under teacher supervision and is monitored as any other classroom activity. Prior to going online, students are required to sign network application agreements along with their parents or guardians. Violations can culminate in termination of access privileges, school disciplinary actions, and/or legal sanctions.

Gendron indicated that before accessing such online services as SEFLIN (SouthEast Florida Library Information Network) and America Online, students at Coconut Creek High School and their parents or guardians must sign authorization forms. Gendron (personal communication, March 16, 1995) declared: "We want to be up front about expectations of the students (no obscene language) and the dangers of getting into inappropriate information."

Professional school personnel charged with security responsibilities must also pay attention to new security developments and proposed legislation. The Communications Decency Act of 1995, now appended to the telecommunications bill, is considered by some a direct threat to free speech on the Internet and the First Amendment. If enacted, this legislation would impose fines and jail terms on individuals or companies who originate online material deemed lascivious, filthy, obscene, or lewd. It could severely limit the free flow of information and communication on the Internet and other online services.

Professional school personnel can track network security advisories and warnings by sending an e-mail message to *cert-advisory-request@cert.org* and joining the CERT (Computer Emergency Response Team) mailing list. The CERT Coordination Center at Pittsburgh's Carnegie-Mellon University is responsible for responding to Internet crises, identifying and repairing security vulnerabilities, and transmitting security- related information to the Internet community. Information on

such topics as censorship and access to electronic information networks and services can be acquired from the Office for Intellectual Freedom of the American Library Association as well.

Conclusion

Protecting a school network from cyberinvasions involves constant vigilance. Alerting students to responsibilities in the online world requires multiple approaches. Equipped with an understanding of technical security requirements, we can promote the selection of security mechanisms and foster the design of reliable safeguards for network–based information transmission. Through user education and training programs, we can facilitate the development of formally adopted policies and procedures promoting responsible student access to information resources in the Internet environment.

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Today and Tomorrow on the World Wide Web

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Key words: World Wide Web, K-12, curriculum, brainstorming, future

Abstract

Educators play an important role in the development of the World Wide Web for education. In this session, we'll start our exploration of the WWW today at the Education Center, a joint publication of Houghton Mifflin, McDougal Littell, and the Global Network Navigator. As a group, we will continue to discuss and imagine the possibilities of educational Web servers for the future. The goal for this session is to inspire educators to create or promote the creation of Web servers for K-12 education through collaborations.

In the Education Center and out on the Web, the participants will discover the types of Web resources that exist today and how they might be integrated into their curriculum and instructional needs. The current resources on the Web fall into categories; the following is one possible categorization of these resources: interactive learning tools, curriculum materials, virtual field trips and museums, student Web publishing, and professional development materials.

All of these resources are in their infancy. Along with many educators and organizations, the Houghton Mifflin/GNN Education Center and Songline Studios are interested in further developing Web servers for K-12 education. With educators, they are exploring ways to create dynamic learning resources on the Web.

Educators can play an active role in the development of such tools and curriculum. Participants in the session will brainstorm on the following questions: What types of resources and materials would you like to see on the Web? How would you use them in your curriculum? How can we create these resources? Who are the potential partners? What is the value of having these resources available online rather than through another medium?

During this discussion, we will highlight some important aspects of creating a Web server.

Participants in this session will be encouraged to continue their use of and contributions to the Web. Together with organizations, educators and students will create the future of the Web by publishing on the Web and designing innovative learning materials.

CyberPuppy Software

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Abstract

CyberPuppy is now in the development stage of a revolutionary online exploration and communication product for children. The product enables young people to connect to the Internet within an engaging, graphically- rich environment. Kids create an identity for themselves and then navigate through an environment where they can visually identify each other. They can exchange information, engage in live chatting, establish relationships, join clubs, as well as explore information on the Internet.

Features:

- Real-time graphical representations of users online.
- Communication in the form of people browsing, e-mail, and live chatting.
- Edited Internet content.
- Forums and Clubs administered by professional educators.

A prototype is currently available.

Offices:

- CyberPuppy Software, Inc. is headquarted in Palo Alto, CA.

Management:

- Neill Kramer, President
- Chris Haupt, Chief Technology Officer

Implementing Telecommunication From Scratch with Overworked, Reluctant Faculty!

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Abstract

This 30-minute project demonstration will consist of three parts: Part I deals with the productive ways of planning and implementing a telecommunications curriculum so that the Carmody Middle School faculty became active in telecommunications even with limited budget and time resources. An administrator will share concerns about how the project was set up and implemented. Specific strategies will be shared on how the project was initiated. Procedures will be shared on how to begin working with your faculty for implementing telecommunications at both school and home. A pre-test survey was designed to better understand the needs of the Carmody Middle School faculty of Lakewood, Colorado.

Part II deals with individual curricular examples of productive surfing on the national bulletin boards: Included will be instruction on modems and software applications of the "Classroom Prodigy" curriculum along with its companion newspaper generator, "Journalist" and Prodigy's Internet applications of e-mail and the World Wide Web via Classroom Prodigy and the Internet on Colorado SuperNet. Curriculum applications will include teaching applications in 1) communications, 2) fun and games, 3) geography, 4) math and numbers, 5) teacher's corner. Lesson plans will be provided where appropriate as models for teachers. Internet online functions include e-mail, news, Telnet, file transfer, and resource search tools (Archie, Gopher, HYTELNET, Veronica, WAIS, etc.). The real power of the Internet is found on computers around the world through online libraries, statistical data, geographic weather servers, programs and documents including valuable technical guides. A listing of Internet resources for educators will be included as well as suggestions for using the Internet to enhance instruction in various areas of your school: language arts/writing, social studies, science, mathematics, music, and others.

Part III focuses attention on positive faculty incentives of obtaining software and hardware for examination and implementation without having a substantial budget. Without such incentives, it can be difficult to motivate faculty members to try new areas of instruction and personal development. The authors of this project have become adept at procuring instructional software and hardware for staff members to explore. Successful procedures will be shared in this presentation.

Project Infusion: Teachers, Training, and Technology

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Key words: teacher training, staff development, technology integration

Abstract

Project Infusion was funded by the U.S. Department of Education's Fund for Innovation in Education. The Educational Computing and Technology Department at Barry University, in collaboration with Dade County Public Schools in Miami, Florida, proposed a training of trainers model to conduct system-wide teacher training in the use of technology to enhance teaching and learning across the competency-based elementary curriculum. This presentation will focus on the Infusion model, training methods, materials, and results. Two Infusion participants will describe their school's staff development action plan and key elements for successful integration of technology.

Introducing Telematics in the Dutch High School Curriculum: a Multimedia Strategy

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Key words: email, telematics, multimedia, CD-Rom, curriculum development

Abstract

A national core curriculum for basic education was introduced in the Netherlands in 1993. The current curriculum for information and computer literacy in Holland includes practical knowledge of the subject and the use of telecommunications in relation to information technology. A multimedia strategy was devised with a view to facilitating the introduction of the innovative curriculum. The multimedia approach draws on such sources as BBS-technology, CD-Rom as well as on professional journals for teachers and youth magazines. The development of a comprehensive Internet connection is under way. This presentation will give examples of educational resources. In addition, a video production, experimental educational CD-Rom ("Mystery Island"), and result of ongoing research will be presented.

Useful Contents for Teachers and Students are the Key

Support for teachers and pupils in a school in Bosnia, an exhibition of Art Spiegelman's Mouse in the Jewish Historical Museum in Amsterdam, discussions about the question whether to commemorate the World War II after 50 years, and discussions about the death penalty (in cooperation with Amnesty International) were some of the topics on SLO-Lijn (pronounced "SLO-Line") over the past year. SLO-Lijn is a free national educational information system for secondary education (BBS orientated with an Internet E-mail link) in the Netherlands, run by the National Institute for Curriculum Development (SLO) in the Netherlands.

One of the main objectives of SLO-Lijn is to show how the use of telematics can be integrated in the curriculum. To achieve this SLO-Lijn works closely together with several existing printed media such as Primeur, a unique weekly news magazine for adolescents between the ages of 12 and 18. Primeur (the Dutch word for scoop) has a paid circulation of 450,000 copies. Through SLO-Lijn teachers have weekly access to Primeur articles about all kinds of educationally interesting news topics in ASCII- or WP-format. These articles go together with specially developed lesson ideas from the teacher/moderators. High school students run an area for school newspapers, in which they exchange the content of their papers in a digital form.

In the publication of the Dutch translation of Spiegelman's brilliant 'comic' about his parents' vicissitudes during the Holocaust, a discussion took place about ethnic persecution in present times. Publication about this discussion in Primeur led to contacts with a school in Zernica through the so-called Dutch Bat, a division of the UN-troops in Bosnia. At the same time, SLO-Lijn was used during the exhibition of Spiegelman's original drawings as an medium to enable people to give their personal impressions of this impressive exhibition in the Jewish Historic Museum. From research we know that the availability of new information technology and its technical possibilities is in itself not a reason for educational change. We do believe that useful and interesting contents for teachers and student are the key for making relevant use of telematics within the curriculum.

New Media to go Along with Printed Media

The use of existing printed media play a crucial part in our innovation strategy. In the areas of telecommunication and education, all kinds of information about the educational use of telecommunication are available to teachers and students. In a column in the teachers magazine COS (Computers in the School) teachers can read about new developments, lesson material concerning telecommunications and SLO-Lijn. COS is read in about 5,000 schools all over the Netherlands.

About 20 teachers and a few students work together in running and maintaining the SLO-Lijn system. At this moment, almost all the subject areas of our core curriculum are represented on SLO-Lijn with a file and message area. Several areas are moderated under the responsibility of a national teachers' association (e.g. physics teachers and political science teachers). SLO-Lijn is a project developed in cooperation with the Dutch telecom company, PTT Telecom. For off-line practice we developed an experimental CD-Rom that offers the students an environment to explore several means of telecommunication in the form of an adventure. At this moment we are also working at the development of an experimental SLO-Lijn/Internet connection.

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Technology and Teacher Education

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Key words: teacher education, technology, networks, integration

Abstract

This panel will present four different research projects that have focused on exploring ways to integrate advanced technologies, especially wide-area network technologies, into teacher education, both at the preservice and inservice levels.

- The Teaching Teleapprenticeship Project at the University of Illinois has been exploring new interaction frameworks for involving education students as mediators of network activity outside of their classrooms, activity involving K-12 teachers and students in interaction with people outside of education. It has explored ways that these frameworks can provide more authentic contexts for learning, while at the same time benefiting the K-12 and other participants. This group will report on the results of a three-year study of the integration of a variety of Teaching Teleapprenticeship frameworks into the teacher education programs at the University of Illinois, analyzing the successes and failures of these framework. The group will also make recommendations for other efforts to integrate advanced technologies into teacher education.

- The Mathematics Learning Forums at the Center for Children and Technology at EDC have involved practicing teachers in electronic interactions that extend the "advisement model" developed at Bank Street to involve a wider range of teachers in productive distributed learning environments with the structure of a university course. This project will report on several cycles of implementing this model, each of which has used different communications technologies.

- The Electronic Emissary Project at the University of Texas involves graduate students in education as mediators of productive interaction between K-12 participants and outside subject matter experts. This Internet-based "matching" service and research project has been available since early 1993. Teachers with access to the Internet can use the Emissary's online database to locate other

Internet account-holders who are experts in different disciplines, for purposes of setting up curriculum-focused, inquiry-based electronic exchanges among the teachers, their students, and the experts, with online assistance from staff facilitators. In this way, the interaction that occurs among teachers and students face-to-face in the classroom is supplemented and extended by exchanges that occur among teachers, students, experts, and online facilitators asynchronously. To date, approximately 200 "matches" have been arranged and followed by Emissary staff. The staff members' facilitative experience has generated a set of practical recommendations to share with others interested in assisting computer-mediated educational dialogues.

- The InternNet Project at the University of California, San Diego has involved student teaching interns interacting via networks with each other, with the faculty at the university, and with K-12 participants. The UCSD Interns have used the network to submit journals of their teaching to their university supervisors, to keep up with university and program news, to access and help create online electronic resources like lesson plans, and to draw upon network resources for their own learning and teaching.

This panel will compare and contrast these different approaches to using technology to improve teacher education with the goal of determining general principles that can guide future efforts. The attendees at this collaborative presentation will be actively engaged in this analysis and synthesis process.

A Testbed for Networking Infrastructure for Education: A Collaborative Approach to K-12 Networking

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Key words: teacher training, k-12 networking, networking connectivity, integrating into curriculum

Abstract

This panel will present the different components of a collaboration between the National Center for Supercomputing Applications, the College of Education, and the Computer Science Department at the University of Illinois at Urbana-Champaign in an effort to provide assistance to K-12 schools in Illinois that were interested in exploring a variety of computer networking solutions. This collaboration bridges the gap between laboratory science and classroom education to enable students to learn and perform science and mathematics with the same tools used by researchers.

The speakers will discuss the goals of the project, how schools were selected for this program, the different networking models and lessons that were learned. Two teachers will also present information on how their school is implementing networking and integrating its use into the curriculum. This information is currently available on the World Wide Web at: http://www.ncsa.uiuc.edu/edu/nie/

As the project continues, a variety of information continues to be made available on the World Wide Web. This information includes sample technology plans, networking designs for small and large

school buildings, wide area and local area networking terminology, curriculum materials for training teachers, pointers to educational resources on the Internet and much more.

Implementation of Radio Frequency Internet Connections

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Abstract

One of the major problems faced by schools is coping with the ongoing annual costs of an Internet connection. It is has been recognized that it is easier for schools to pay a one-time up front cost rather than an annual cost. In order to address this problem and to provide schools with relatively high-speed telecommunications access, the EarthVision program has used Radio Frequency (RF) wireless technology (standard UHF 902-928 MHz spread spectrum radio band) which is similar to the frequency of cellular phones and pagers to establish a telecommunications link between a school and an Internet node.

In the first part of our presentations, we propose to describe what situations RF technology is most suitable for Internet connection. We will describe what equipment is needed and discuss configuration, cost and logistical issues of RF technology setup for Internet connection. We will then give a hands-on demonstration on how to set up this equipment using a wireless connection that we would create in the room. This would be accomplished by using a connection to the Internet, two wireless bridges, two mini antennas, and a PC.

Global Education Revisited

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Key words: global education, language translation software, world community, databases, international news, special interest group forums, CNN

Abstract

Global education takes on new meaning in the 90's as teachers, curriculum supervisors, and library media specialists learn how to help students go online to develop and reinforce global issues and themes. New teaching strategies are emerging as new online resources offer opportunities for individual and classroom based research projects. Infusing global education across the curriculum, an approach developed in the 80's, is becoming a reality in schools that make telecomputing accessible to students.

This session will demonstrate a variety of services on CompuServe that are used for both research and communication activities that link students directly with people all over the world.

Demonstration of Global Education Services and Resources

Specific types of services and examples include:

- international news sources (CNN Online);
- database search services with full text of articles retrieved (Information Access Corp./Magazine Database Plus, et al.);
- special interest group forums (Earth Forum, Issues Forum); and
- real time conferencing opportunities (Education Forum, Students Forum, Foreign Language Forum).

In addition, the demonstration will include a visit to the new World Community Forum, which features language translation software that allows members who log in from all over the world to type messages in English, Spanish, French, or German. Both the translated message and the original are included.

The audience will be encouraged to interact and ask questions throughout the session. CompuServe's latest graphical software that integrates CompuServe services with Internet services will be used during the demonstration. Traditional communication software programs such as ProComm and automated software programs that utilize script files can also be used to access CompuServe.

Handouts will be prepared and distributed to participants. The handouts will include 1) a "Guide to Global Education Resources on CompuServe;" 2) literature about specific forums on CompuServe; and 3) free intropaks including client software provided by CompuServe.

Chuck Lynd is the forum administrator or "Sysop" of the Education Forum on CompuServe, and has conducted many workshops and presentations on telecommunication networks and online resources for educators. He is the founder and director of Creative AdVentures in Education, a nonprofit group that disseminates information and helps both educators and artists to explore new media and information technologies.

SIG/Tel's 1995 Telecomputing Project Winners

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Key words: telecomputing projects, international, classroom activities, curriculum integration

Abstract

Creative teachers are pioneering the use of telecommunication networks in today's classrooms. Each year since 1991, a contest to identify innovative lesson plans and classroom-based curriculum activities has been sponsored by SIG/Tel. The winning entries are invited to present at both Tel•Ed and the National Educational Computer Conference. Teachers also receive a complimentary one year membership in ISTE and prizes from online services provided this year by CompuServe, Dialog, the I*EARN Project, IRIS, and Prodigy. A panel of judges selected five winning projects and awarded honorable mention to seven projects.

5th Annual Telecomputing Activity Plan Contest Winners

Not all of the contest winners will be able to present at Tel•Ed 95. However, a full description of each project will be published in SIG/Tel's journal, *Telecommunications in Education (T.I.E.) News*.

Winners

"International Conservation Continuum," Michele Flores-Ward, McKenney Middle School, Canton, New York

"Math Pen Pals: Communication through Number—Winter Solstice," Leisa Winrich, North Middle School, Menominee Falls, Wisconsin

"Outhouse Challenge—Antarctica," David Grott and Joe Phaneuf, Alden Place Elementary School, Millbrook, New York

"Utopian Visions," R.W. Burniske, International School of Kuala Lumpur, Malaysia, and Lowell Monke, Des Moines Iowa Central Academy.

"ESL Writers Online," Susan Lindell, Jones Avenue Adult New Canadian Centre and York University Faculty of Education Teachers-in-Training, Toronto, Ontario, Canada

Honorable Mentions

"Network to Network Through the Voices of Youth," Bill Burrall, Moundsville Junior High School, Moundsville, West Virginia

"Technopals Novel Study," Aaron Benarroch, Brock Corydon School, Winnipeg, Manitoba, Canada

"DOR-WEST Network: ESL/ESD Conferencing Project," Carmelina Crupi and Natalie McNamara, Westview Centennial Secondary School in Toronto and Ecole Secondaire Dorval in Montreal; York University Faculty of Education, Toronto, Ontario, Canada

"Sharing the Community Resources_From LAN to WAN," Nancy Barkhouse, Atlantic View Elementary School, Halifax County, Nova Scotia, Canada

"The Reservoir Project," Cheryl Barner, Tri-Valley Elementary School and Ulster BOCES, Grahamsville, New York

"Taming the Tube: TV Watching Habits of 10-12 Year Olds," Dalia Naujokaitis, St. Elizabeth School, Ottawa, Ontario, Canada

"Signs of the Times," Donna Marie Locasio and Janet Calvert, Franklin School and Bruce St. School, Newark, New Jersey.

Three Perspectives on Gender in Distance Education

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Key words: gender, interaction, learning environment, continuing professional education, computer conferencing, instructional television

Abstract

This session presents data from three studies of gender differences in post-secondary courses delivered via distance education. The first examines whether remote-site instructional television students differ in interaction from on-campus students in relation to gender. The second focuses on gender and student participation in classes taught via computer conferencing. The third explores gender as an attribute of biology, psychology and/or surrounding domain, as in stereotyped professions like engineering and nursing.

Interactive Instructional Television-(Malone) In a study of interactive instructional television [ITV], Brehm and Bruwelheide (1994) surveyed both on-campus and remote-site students' opinions regarding the importance of interacting with students at other sites. Although their sample size was small, the results indicated that such interaction was significantly more valued by the remote-site students and important to their learning.

The first study included in this paper addresses a similar study of 119 ITV college students, aged 16 to 54, and was designed to see if remote-site and on-campus students differ in interaction according to gender. Using 12 hours of videotaped classes on 'Interpersonal Communication' and a modified version of the Bales Interaction Analysis instrument (Bales, 1950), student interactions were coded within 12 categories in 4 major areas: positive/negative reactions, questions or answers. These interactions were then analyzed by sex as well as by location. Regardless of location or category of interaction, females were found to interact significantly more often than males. In addition, remote-site females interacted more often than on-campus females, while remote-site males interacted least of all. These results indicate no statistically significant differences in interaction between ITV students in relation to location yet there are significant differences related to gender.

A follow-up study comparing traditional college classes to their counterpart classes in the ITV format using the same instructors is recommended. Such a study would be in the interest of developing a clearer understanding of gender differences in interaction related to distance learning. This will assist in the development of a more appropriate and complete training manual for instructors who are moving from the traditional classroom environment into the technological environs of distance education.

Computer Conferencing-(Bachman)

Knowles' Andragogical Model (1990) considers the learner's experience to be a critical ingredient of adult learning and a rich resource in the pursuit of that learning. If that resource is to be fully realized, then all members of any given class must feel free to make verbal contributions and participate in discussions as equal partners. Research has shown that in the traditional, face-to-face classroom that is not the case. Most often the dominant members of a class are males who can easily stifle women and other groups who have been taught by society to express themselves politely and cautiously (Hall, 1982).

The normal classroom setting is masculine in tone, with valued speech patterns that include: assertive language, impersonal style, and competitive debate. Much of higher education is based on an argumentative model using masculine metaphors pertaining to war, which seriously conflict with women's preferred ways of learning (Ebben & Kramarae, 1993; Kramarae & Treichler, 1990). Women appear to prefer a learning environment of calm conversation, collaboration, cooperation, and interaction (Maher, 1985) and choose to withdraw and be silent rather than contribute to a heated debate (Lewis & Simon, 1986).

Computers are gaining widespread acceptance as facilitators of more egalitarian communication since nonverbal and visual cues such as gender, race, age and the trappings of power are diminished (Short, Williams & Christie, 1976). McGuire, Kiesler and Siegel (1987) verified this in their study of computer conferencing in the workplace. They found that it greatly reduced social cues that inhibit communications and enabled more equal participation among all members of decision groups, regardless of gender or race. With the use of computer conferencing in delivering distance education, it may be that more equal participation is achieved in the online classroom as well (Peterson, 1989).

The second study included in this paper was to investigate whether or not the online classroom generates a more gender- neutral learning environment. To do this, 75 computer conference transcripts from 59 students (38 male, 21 female) in six classes were studied. Each message was coded to record the traffic flow and measure the participation of each individual. Messages were also examined for any occurrences of 'flaming,' male domination, and/or silencing of females.

Flaming is defined by the networking community as the display of extreme emotion in an electronic message. It is a common method used to intimidate or silence others, but there was no indication of any flaming within the 2,649 messages reviewed for this study. Nor was there any hint of sexual harassment; only courtesy and positive reinforcement were observed. This evidence is supportive of a more gender- neutral environment.

To determine if men and women participated equally in the online classroom, both the number and total length of messages sent were calculated and compared. Although female participation averaged lower than male in both categories, the results were not statistically significant at the 5% confidence level. This also supports the contention that the online classroom is more gender-neutral.

The data were also examined to see if the highest and lowest participators included a representative mix of both sexes. The results did not support the gender-neutral contention, since the top five performers in all categories were male. Females were under-represented at the top and over- represented at the bottom in such matters as the number and length of messages sent.

Domination can be a serious issue in the face-to-face classroom, since a very vocal individual can effectively control the discussion while others wait politely for a turn to speak. Because no turns were needed and everyone could send messages freely while others were doing the same, silencing of others did not occur in the online classrooms studied here. In spite of some very active students in the courses, the rest of the students could still participate at a high level. This diminished the importance of the most active participators being male since it does not mean that others did not participate as much as desired.

Lewis and Simon (1986) reported that women become increasingly quiet as a face-to-face class proceeds and by the end of the course they are nearly silent. If this were true in the online classroom, the bulk of the women's messages would be skewed heavily toward the beginning of each course. Since all message traffic in the courses were skewed toward the early part of the semester, a compari-

son with the timing of the males' messages was examined. Courses were broken down into ten-day increments and the cumulative percent of messages sent was investigated for each. Although the female percent was always higher, it never exceeded the males by more than 10%. The 10% difference occurred only once in the 13 periods of comparison, with the difference averaging 4%. This provides no indication of any progressive silencing of the females and again supports the contention that the online classroom provides a more gender-neutral learning environment.

Gender as Biology, Psychology and Domain-(Magotra)

The last project included in this paper explored gender as an attribute of biology, psychology and gender domain, i.e., stereotyped professions like engineering vs. nursing. This study examined whether distance learners differ in their preferences regarding ideal learning environments in relation to their biological sex, psychological gender, gender domain, or any interaction of these.

The issue of gender in distance education [DE] has not been studied extensively but several authors have described how DE is failing to serve the female population. Even at well- established DE institutions in Europe and Asia, enrollment patterns remain static and stereotypical, with women underrepresented in science and technology. In spite of its potential, DE has yet to render any significant social change (Carter & Kirkup, 1991; Kanwar, 1990). The issue of gender is not addressed; the learning styles and needs of women are not considered (Kirkup & von Prummer, 1990; von Prummer & Rossie, 1988; von Prummer, 1994).

Defining the issue of gender could, however, be part of the problem, since gender is not necessarily a synonym for biological sex. In communication research, experts differ on the concept. Some, like Tannen (1990, 1992), write of the sexes as male and female communication cultures with distinct conflicts in the values they represent. Other researchers, e.g. Rakow (1986), see gender more as a verb than a noun or adjective. That is, what we 'do' is the gender we 'are' so we create gender via communication behaviors. Communication creates gender which creates communication, and so on. This would mean that a masculine domain would create masculinity and vice versa, while a feminine domain would function likewise.

Still other communication researchers endorse the concept of psychological gender, most notably the androgyny scale of Bem (1974). The Bem Sex Role Inventory [BSRI] treats masculinity and femininity as complementary dimensions, with independent scoring for each. If one scores above the median in masculinity and above the median in femininity as well, one is termed Androgynous. If one scores above the median in masculinity and below the median in femininity, one is termed Masculine. If the inverse is true, one is termed Feminine, and if neither score is above the median, one is termed Undifferentiated. After the creation of the BSRI in 1974, much of communication research replaced biological sex with the BSRI and found it to be more appropriate in measuring communication similarities and differences (Pearson, 1985). It has also been used to classify the communication styles of classroom teachers and succeeded in accounting for more distinctions than did sex (Stephen & Harrison, 1985; Stewart, Stewart, Friedley & Cooper, 1990). Communication has been widely acknowledged as crucial to the educational process, hence the phrase 'Socratic dialogue.' This study adopted a communication stance that gender has three facets: biology, psychology and domain. Any of these 'genders' may account for the disparities in learning preferences long attributed to sex.

To survey distance learners regarding their ideal learning environments, this study used five scales of the College and University Classroom Environment Inventory [CUCEI] (Fraser, Treagust & Dennis, 1986). Three of these CUCEI scales assess Relationships in the learning environment, one focuses on Task Orientation and the last measures Individualization.

For this study the BSRI and CUCEI surveys were distributed to distance learners enrolled in either engineering or nursing courses at any of 13 different DE institutions. Responses came from 482 individuals, aged 18 to 67, with 50.2% in engineering and 49.8% in nursing, 54.3% female and 45.7% male. Although there were no empty cells in the population distribution across the variables of Sex, BSRI and Domain (engineering or nursing), the student population of each discipline were primarily sex-typed and skewed as expected.

A three-way analysis of variance was performed on the CUCEI scales to see if the students differed by Sex, Gender [BSRI], and/or Domain regarding Relationships, Task Orientation and/or Individualization in describing their ideal learning environments. Due to the unequal numbers across the cells only the variance uniquely attributable to a factor or interaction could be treated as significant so all overlap was dropped from the analysis. Even with this conservative unique approach, sex was found to be significant with females placing higher value on Relationships in the learning environment than males. Gender [BSRI] was also significant with both the Feminine and Androgynous individuals valuing Relationships more than those who were Masculine or Undifferentiated.

Regarding Task Orientation in the learning environment, only Gender was found significant, with Androgynous students valuing it significantly more than those who scored as Undifferentiated. The same was true of the Androgynous and Undifferentiated groups concerning Individualization, but this time Sex was also meaningful. Females were found to value Individualization in the learning environment more highly than did males.

In conclusion, it seems evident that gender remains a very real and potent educational issue in need of further investigation. These three studies offer valuable insights but also evoke more ideas that must be explored in the interest of educational equity. Distance educators now have the technologies available to provide education worldwide for everyone. Soon there may be international competition to provide better person-environment fit in a buyer's market. The learner may soon be able to choose from an assortment of educational products. Therefore, it is imperative that distance educators learn more about distance learners in order to meet their needs.

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Was the AT&T Learning Network Successful in Hong Kong?

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Key words: writing, e-mail, global learning network

Abstract

In September 1993, ten Hong Kong schools were sponsored to join the AT&T Learning Network. This presentation will summarize their feedback obtained from (1) a team evaluation questionnaire; (2) a student evaluation questionnaire; and (3) telephone interviews. It will also suggest some directions for future study.

Background

The AT&T Learning Network (LN) was first introduced to Hong Kong in 1993. Twenty local schools were sponsored to join the LN from Sept. to Dec. 1993, but only nine secondary schools and a university actually participated.

Nearly 100 students studied a range of curricular, such as Global Issues, Mind Works (creative writing), Social Problems, etc. Most schools chose F.6 and F.7 classes to join the LN, owing to the students' English standard and the flexibility in the F.6 curriculum. Five schools joined the LN as one group, while others split their classes into groups of about four students each. Half of the schools joined as extra-curricular activities (such as English Club, Computer Club, etc.) and half took it as part of the mainstream teaching (English Language, Computer Science, and Geography).

Attempts have been made to investigate whether the LN was well received in Hong Kong, and whether the curriculum which originated from the USA, suited the Hong Kong schools. Two questionnaires were distributed to participants in Spring 1993: one for the teacher or a class representative (team evaluation form) and one for each student (student evaluation questionnaire). Telephone interviews with some teachers were also conducted for in-depth analysis.

What did they gain?

Generally speaking, the majority of the schools found the LN motivating and beneficial. Most students were grateful to have a chance to break away from the traditional classroom which emphasizes rote-learning, drilling, teacher-control and examinations. They were happy to enjoy freedom, be creative, and learn autonomy in the LN. Most important of all, they had a real audience to write to and interact with.

The teachers were happy because the LN opened a window to the world, enriching their students' world knowledge and understanding of other cultures. They found increased student awareness of social issues and world problems. They observed improvement in students' skimming skills and fluency in writing. They had reservations because the curriculum was not directly relevant to the Hong Kong context. LN could not equip students for the public examinations (e.g. University entrance examinations).

The general impression of the LN was positive: 46.7% found it enjoyable while 40% said it was useful. Over half of the students found the chance to contact people overseas was the most important benefit. When asked to rank the most important skills gained, 48.2% reported improvement in writing skills, followed by reading and then computer skills. They also learned library search skills, more knowledge about their own countries, and some global issues. They gained different perspectives and improved their critical thinking skills.

What were their major difficulties?

The major obstacle was the lack of dedicated telephone lines and technical support. Most Hong Kong schools have no phone lines in the computer room and just a shared line in the staff room. Some participating teachers had to send and receive mail at home. This also inhibited some schools from joining the LN. Limited access to the computer was another problem. Though most secondary schools have a computer room, they are mainly for computer lessons. Unless with the computer teacher's support, it is not feasible for other subject teachers to join e-mail projects of this kind.

Heavy workload was a major hindrance too. In Hong Kong, teachers are responsible for a range of duties besides teaching: counseling students, organizing extra-curricular activities, etc. They found it difficult to squeeze time to help students upload, download and print messages. Lack of training in e-mail and knowledge of the LN was an added disadvantage. Though there was a leader in each learning circle, most Hong Kong teachers got little support from them.

Students disliked the insufficient time to prepare for the projects, and the inability to get immediate feedback from overseas. Many thought the LN was too demanding and time-consuming. The workload was very heavy. Some schools complained there were too many sub-teams in a circle, and too many students in one team. Thus, it took a very long time for every student to read the incoming mail. Students also had difficulties in allocating responsibility.

Conclusion

Most students treasured the freedom enjoyed in the LN. However, Hong Kong students were not used to so much freedom in learning and some found it difficult to rely on their own. More preparation and guidance were needed before students could work on their own. Teacher support is crucial in many aspects. Students want teachers to take a neutral role, encouraging and offering guidance when needed, while at the same time not putting too much pressure on them. They have enough stress from the public examinations! However, it seems the teachers themselves did not have sufficient information and support from the LN. They were too busy to provide enough support to students, especially those in the interest groups.

Suggestions for further studies

This paper is only a preliminary evaluation of the global learning network. In-depth studies may be conducted with reference to other studies done in this field in the following directions:

1. Examine the contents of each learning circle and analyze the group interaction pattern (Riel and Levin, 1990).
2. Compare the writing and feedback of students from various countries, both in the same network and across the network, to discover if any cultural differences exist.
3. Contact some student participants for follow-up interviews to analyze what actually happened in their circles.
4. Compare with face-to-face teaching (Hiltz, 1990) to examine what e-mail contributed to classroom learning.

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Discovering the World Community Online: Creating an Appropriate Environment for Using Multimedia in Education

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Key words: appropriate environment, networking, Internet services

Abstract

This paper describes the process of setting up a large scale computing system (200 PCs) in a construction department which enables multimedia learning and teaching. The main tool is a Web server. Issues such as (1) planning the system, (2) essential components (hardware and software), and (3) human resources will be highlighted.

Introduction

The Department of Building and Real Estate is one of the largest departments in Hong Kong offering comprehensive degree and sub-degree programs in construction, surveying and real estate. It has become one of the most intensive users of information technology in teaching, learning, administration and collaboration with industry at the Hong Kong Polytechnic University. It is considered that an appropriate environment is essential to enable this to happen. This paper will describe the process of setting up/renovating a computing system over the last two years to create such an environment. Several issues, including planning, essential components and human resources, will be discussed.

Planning the System

This stage defines the aims and objectives of the system. Considerations have to be given to (1) the physical network, (2) the operating system, (3) Internetworking devices, (4) protocols, (5) software and tools, (6) user interface, (7) application interfaces, and (8) training.

With the emergence and growing importance of the Internet, some of the issues can be fairly straightforward, e.g. the adoption of the TCP/IP as one of the main, but not only, protocols. We are still using Netware 3.12 as our first-line server, providing log-on process and the majority of the software packages. This robust operating system provides much of the needed security and management we require such as remote booting process, and a centrally administered print charging system.

While the concept of having powerful PCs to process and handle multimedia information is not entirely wrong, it is argued that the infrastructure is far more important. The new and popular client/server technology being widely used is the 100Mbps switched ports to our main servers (3 Novell, 2 Unix and 2 NT). There is also a dedicated 100Mbps fast Ethernet link to our campus backbone, which is running ATM at 155Mbps.

Essential Components

To enable multimedia teaching and learning to be launched, several components are essential to avoid pitfalls and potential complaints. On the server side, it requires (1) a World Wide Web server, (2) an e-mail system, (3) a news server, (4) a remote access system, and (5) preferably a WAIS server. While it is more efficient if a Unix machine is used as the main server, some components have PC counterparts which can also be run on a LAN file server such as Novell. Other components include a scanner, a video digitizer and graphics software packages.

The use of a WWW system is obvious due to its hypermedia capabilities and therefore requires no further elaboration. The e-mail system is also important in that it provides an immediate feedback route by the students so that the students do not feel alone while learning through this relatively new and cold medium. To make it effective, e-mail links need to be embedded in strategic locations in the Web pages.

E-mail has a characteristic which is unique among the other Internet services in that it provides a one-to-one or private conversation between two individuals (though it also allows broadcasting of messages). Therefore, a news server should be set up to supplement and complement discussions among students and teachers. Students can post queries and/or comments to the news server which can be read and in turn reply by any or all authorized users. The teacher can eventually summarize all the contributions to a special topic and incorporate them in the learning materials in the Web for the next batch of students.

The remote access system (RAS) is essential if users are allowed to access the system off campus. This can be full time students reading news at night from home or distance learners, relying entirely on the system for the course of study. Experience shows that setting up a robust RAS is not easy. It has to fulfill such functions as authentication, restricted multiple concurrent access, high speed, simple for the client to set up and operate, and handling multiple protocol such as PPP/SLIP.

Lastly, the power of WAIS server (Wide Area Information Server) should not be understated, though it is more difficult to set up. WAIS is primarily a full-text indexing system and allows users to search for documents based on words (the words that have been indexed). We are running a WAIS-sf (an extension of the original WAIS) and have many of the documents/collections held in the departmental research center indexed and searchable. Documents that can be indexed can be HTML, text, and even graphics files. One of the inherent problem of the WWW is its lack of hierarchy. This can be remedied by the WAIS appropriately.

Human Resources

Human resources include not only technical staff such as technicians, but also academic staff who need to contribute to the multimedia courseware development and production. The staff needs to have the basic training for producing HTML documents, either by HTML editors or simple ASCII editors. The trend now is for staff to learn HTML editing rather than to learn a commercial word processor.

Conclusion

The application of computer assisted learning packages will reduce routine and other workloads of the teacher . However, it requires more inputs from the teachers and other commitments such as preparing multimedia courseware, reading, and answering e-mail, moderating news groups. A re-engineering process is required so that both teachers and students do not perceive the new technology to replace one another. Rather, the new technology should be seen as reinforcing relationships between the two parties by passing the routine and tedious tasks to the machines.

Building a Learning Community: Ideas from California's Telemation Project

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Key words: telementor, training, staff development, elementary, middle, secondary

Abstract

Getting 438 Telecommunications mentors (Telementors) online in California has changed practices in many classrooms. The Telemation Project focused on the development of an online learning community, and the creation and implementation of K-12 curriculum projects which include telecommunications resources. School site factors which contributed to and hampered implementation efforts are discussed.

Funded by the California State Department of Education through Senate Bill 1510 in 1993, the California Technology Project developed a special model for telecommunications staff development. Each of eighteen partners throughout the state, mostly county offices of education, selected a Telecommunications mentor, called a Telementor. These state Telementors were trained on the use of telecommunications resources in the curriculum, with heavy reliance on state curriculum and reform documents. Each state Telementor developed a curriculum project using Internet resources. In the second phase of the project, between May and October, 1994, each state Telementor trained 24 local telementors in 5-day sessions utilizing the TeleLearning Mobile Unit (TMU). The TMU is a large truck which houses 26 computer work stations: 13 DOS and 13 Macintosh machines. Each local telementor worked at one of the machines, while the state Telementor could use one of two presentation stations (DOS or Mac). The machines are all networked; the TMU carries a satellite dish for online access. Local telementor administrators were also trained in two half-day sessions as part of the five-day training. Partners played a tremendous role in the success of the training and the follow-up support offered each local telementor. After several months, a new round of training for local telementors began. Each state Telementor conducted a two-day follow-up session for his or her local telementors in which the participants extended their online skills, solidified the structure and content of their classroom projects, and enjoyed the camaraderie of their community of peers. Lessons developed by state and local telementors are available online and as part of a CD-ROM published by California's statewide technology educators' organization, Computer-Using Educators (CUE).

Formative and summative evaluation took place which details what happened and how successful it was. Responses to a variety of questionnaires were tabulated, including brief forms filled out at the end of each training, the answers to reflective questions distributed a short time after the statewide training took place, as well as a detailed, comprehensive questionnaire distributed to all participants at the end of the project. Evaluators also visited each state Telementor's institute for at least a day, interviewed key people involved in educational telecommunications project nationwide, and put together a meta-analysis of the literature on such projects.

During this session, samples of data collected through the evaluation phase of the project will be shared, as well as original research based on the project. Perspectives of project Partner, Project Trainer, State Telementor, and Project Evaluator will be shared. The focus of the session remains on the community of learners and teachers which has developed, including Project staff, state and local telementors and their students, Partners, administrators, evaluators and researchers. What worked, what didn't work, and suggestions for future projects will be shared, as well as specific information that focuses on the changes that occur in terms of learning when telecommunications resources are included in classroom instruction.

eWorld: A Teacher's Easy On-Ramp to the Information Superhighway

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Key words: eWorld, resources, staff development, curriculum, collaborative, Internet, Apple

Abstract

"eWorld: A Teacher's Easy On-Ramp to the Information Superhighway" provides not only the "how-to's" but also the resources needed to bring telecommunications into all K-12 classrooms. The session focuses on the ease-of-use and the wealth of educator and parent resources available through eWorld, the online service from Apple. Participants will master the system in minutes and take home free software and an educators' idea book.

Join other educators as they tour eWorld's clean, well-lighted communities. Where education and learning are priorities. Where educators are making a difference.

The eWorld Tour

A school administrator leads the audience through connecting and using the online system. Serving as a mini-course for using eWorld in schools, the tour highlights the community atmosphere, intuitive navigation, supervised environments, and the emphasis upon education that eWorld provides. Participants travel through eWorld "neighborhoods" and beyond—stopping for brief tours of the Arts Leisure Pavilion, the Newsstand, and best of all, the Learning Center and the Internet On-Ramp.

Once in the Learning Center, educators will get a glimpse of interactive student projects (virtual field trips to exotic locations and student as authors and playwrights); real-time conferencing (with leaders in education, classroom teachers, software developers, technology leaders, and parents)· students' fun and learning areas (art, poetry, mysteries, music, essays, jokes, and online interaction for all students); teacher resources (lesson plans, software reviews, parent suggestions, free and inexpensive resources, grant and contest information) and teacher and student connections (e-mail, conferences, discussion, on-going activities) worldwide. They'll find the Learning Center with its Educator Connection to be a unique place where teachers have instant access to the resources they need, and where they become a vital part of this information service. These are resources designed for educators by educators—resources that work and that teachers appreciate. eWorld's Educator Connection serves as a teacher's

planning and resource community that is continually growing through the efforts of educator-colleagues throughout the world.

After a visit to the Learning Center, participants will experience how simple it is to make Internet connections from eWorld. Using the eWorld Internet On-Ramp, they'll find more K-12 information and connections to the Smithsonian, NASA, and more.

Although time will not permit travel to all the neighborhoods and buildings of eWorld, an overview of other locations will be provided through hand-outs and discussion.

What Participants Will Gain from the Session

- information on why eWorld is a natural, easy, and robust telecommunications experience for teachers and school administrators.
- demonstration of eWorld's easy-to-use on-ramp to the World Wide Web and special resources that help educators navigate this vast electronic smorgasbord.
- a fun-filled tour, both virtual and actual, of the exciting eWorld neighborhoods.
- live online demonstration, audience participation, small-group activities, and discussion.
- information on how educators can become part of the eWorld writing and communicating team.
- eWorld software.
- an idea book filled with lesson suggestions for use of telecommunications in the classroom.
- handouts that educators can put to use right away.
- mastery of navigating the system (in a few minutes). Guaranteed!

Student-Directed Multimedia Classrooms! You Can Do It!

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Key words: multimedia, restructuring, school improvement, student centered, technology, at-risk, integrated curriculum

Abstract

Are your students bored with school and learning? Let your students take charge of their learning. Turn them into active learners who think critically, manage information, and implement solutions. Change the way you'll teach—you'll love it!

Learn how to set up a student-directed, project-oriented, multimedia program that infuses technology into the regular classroom, not the computer lab. A step-by-step approach on how to organize student projects will be given.

Christa McAuliffe Elementary School restructured the traditional setting of its 3rd through 6th grade classrooms, transforming them into technology-rich learning centers. Students actively direct their learning using multimedia for an extended period of time, daily, in a regular classroom equipped with 6 computers. Students work in cooperative groups, choose topics to study, and design their own integrated curriculum. They research, plan, produce, and present multimedia projects using Linkway, Hypercard, and HyperStudio. Students also use CD-ROMs, laserdiscs, and other media. Teachers manage group explorations, solve problems with students, and encourage creativity. The project received and NFIE Learning Tomorrow award for educators experimenting with using technology to restructure teaching and learning. It was awarded a three-year US Department of Education grant in 1994.

Project CHALLENGEr

Project CHALLENGEr is a school-based technology program that changes the way that stimulates systemic change by restructuring the learning environment. The project infuses technology directly into the classroom, exposes students to it for an extended period of time ev' y day, and provides extensive, in-the-classroom teacher training on the effective use of technology. The project interconnects all facets of teaching and learning, placing the learner at its core, with everyone sharing the dual role of teacher and learner. The program restructures the learning environment by infusing the regular classroom with technology. Students work in groups on multimedia projects for up to two hours daily. Its project-oriented focus changes the role of students and teacher. The program empowers students to be responsible for their own learning, promotes high expectations, and meets individual needs and learning styles. Learning is interesting and relevant for all, especially the at-risk and exceptional students.

The primary goals of Project CHALLENGEr are:

- To improve student attitudes toward school and learning;
- To fully integrate technology into the instructional environment; and
- To involve students in actively directing their own learning.

To implement the program, we establish one CHALLENGEr Center for every two classrooms in the school. Each center is equipped with six computers and a variety of multimedia software and hard-

ware. All classrooms are networked together and have access to the district's wide area network, telecommunications, and the Internet. Two classes share these centers for up to two hours daily.

In these centers, students actively direct their own learning, using multimedia technology to work on projects. Students work in heterogeneous cooperative groups. The teacher initially selects a broad theme to investigate. Groups then choose a topic related to this theme. They research and plan their project under direct teacher supervision. All of the students in the group then help plan, design, produce, and present a multimedia project using authoring programs such as Linkway, Hypercard, or HyperStudio. Group projects must integrate all subject areas. The students must also contact an outside source for information on their topic.

Within each group, each student maintains a project folder that tracks individual student and group progress during the time that students work on their topic. The folder contains a project timeline, a topic web, storyboard, any research or results of investigations, and journal entries.

During project implementation the teacher is busy managing group explorations, solving problems and learning along with the students, and providing overall project direction.

Staff Development

Project CHALLENGEr's design incorporates a comprehensive professional technology development module. Two full-time teachers, partially funded through a US Department of Education grant, support the program. Ongoing teacher training focuses on the project implementation and the effective use of technology in the classroom. Both staff members spend considerable time in classrooms in instructional and teacher support capacities.

Teacher training is two-phased: outside the classroom and in the classroom. The majority of the training occurs where the impact is most needed—in the classroom, with the teacher and students present. Teachers can receive immediate assistance, with follow-up support later on. This project component is a vital link for effectively integrating technology into the classroom.

Initial training outside the classroom focuses on computer basics and software applications that will be used in the classroom. Each teacher receives seven to ten hours of instruction on word processing, graphics, and multimedia basics, and learns about running a project-oriented classroom. Each newly trained teacher then teams up with one of the project staff members as part of a mentor-peer team. Training then shifts to the teacher's classroom for what we call d ct impact training i.e., training done in the classroom, with students present. This type of training targets the students and the classroom teacher at the same time. Students learn how to use and apply the software; the classroom teacher sees the mentor model instructional applications of the technology. Over a one-to-two week period, instructional activities are passed from mentor to peer. During this period the mentor is often present to provide necessary and immediate support..

Support

Most of our funds for technology purchases have come from Florida's Technology Incentive Awards program and from aggressive school fund raisers such as our schools Math-a-thon.

Project CHALLENGEr is currently funded by a three-year grant from the Fund for the Improvement and Reform of Schools and Teaching (F.I.R.S.T.) at the US Department of Education. Previously, we were awarded a grant from the National Foundation for the Improvement of Education (NFIE) as part of their Learning Tomorrow program.

Toss the Text: Towards a Secondary Social Studies Revolution

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Key words: social studies, telecommunications, Internet, curriculum design

Abstract

This purpose of this project is to develop a 21st-century curriculum and classroom in social studies. This includes integrating computer and telecommunication technologies to give students the breadth and depth of contact with, and experience in, the real world that they need to compete today and in the future. The project includes a learning center's approach to teaching social studies. Our presentation will provide details of this curriculum in the areas of curriculum design, lesson planning classroom design, management, technology integration, the one computer classroom, and social studies Internet resources. There will be a short video documenting the implementation of this curriculum for nine weeks in the spring of 1994 in Las Cruces, New Mexico.

Participants in the session will have the opportunity to redesign their classroom using Computer Assisted Design (CAD) software and sample social studies software. Then participants will discuss its integration into traditional and non-traditional curricula, and view fun and interesting Internet sites social studies classes.

A major focus of this project is integrating telecommunications technologies in the classroom and the curriculum. Examples of some of the material available on the Internet and the ease of acquisition provided by World Wide Web browsers such as Netscape will be demonstrated. In addition to the wealth of information available, issues involving student control over finding and retrieving that information will be discussed. The use of a modem and online service (America Online) in the classroom will be covered, as well as the pros and cons of direct Internet access versus commercial services.

This model emphasizes student-centered learning and the ability to reach all the students in today's diverse classroom. Within a general focus on cooperative learning and practical application, technol-

ogy and telecommunications are featured as tools to achieve the desired outcomes. ADA compliance is also included in this model. The ability of students to work at their own pace, do research in other languages, have contact with professionals in every field, and easily access primary and secondary source documents in a variety of forms (text, pictures, sound, movies, etc.) allows students to take control of their learning. The role of the teacher changes as well, into more of a moderator and a group and individual facilitator. The teacher is no longer the primary source of information; rather he or she watches over and guides their students' progress, instead of controlling it. This approach requires a change in evaluation and assessment, which will also be examined. This approach can, and probably should, be implemented gradually. Also, today's classrooms, especially secondary social studies classrooms, continue to lag behind in their access to the latest technologies. We will cover ways of maximizing your resources while steadily integrating more technology.

As technology continues to advance, continuing teacher training becomes essential. This is addressed in respect to new teacher training, continuing education, and inservice training and workshops. Well-known shortcomings of these methods, as well as solutions to the problems will be looked at. Free handouts outlining this model of instruction, social studies software and Interne site listings, and personalized classroom designs using Computer-Assisted Design (CAD) will be available.

Classrooms in Touch with the World

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Key words: district, wide-area, network, large, urban

Abstract

In September 1994, Dade County Public Schools initiated a Wide-Area Network (WAN) program allowing four area schools to join the "information superhighway." This presentation will include a description and visual display of the project. Several telecommunications projects will be discussed. Participants will receive detailed handouts.

Classrooms in Touch with the World

Modern technology is changing the ways we interact with one another and the way we learn. Teacher-centered, textbook-oriented education is becoming obsolete and students are being offered a wealth of

information to be gathered and shared electronically. Schools in Dade County are currently connected through an administrative terminal network while many individual schools house local-area networks. This presentation will describe a plan to build upon this structure and open our classrooms to the vast information resources available through modern technology.

In this presentation, Mr. Sam Blank, Assistant Superintendent of the Office of Information Technology and Ms. Chris Master, Executive Director of the Division of Instructional Technology and Media Support Services will describe in detail the plans and progress of a model for school districts to bridge the gaps between Management Information Systems (MIS) operations and curriculum offices.

As more and more schools are being equipped with Local Area Networks (LAN), it is becoming increasingly possible for these LANs to communicate with district computer centers as well as the entire world. In September of 1994, Dade County Public Schools initiated a Wide Area Frame Relay Pilot Program to allow four area schools to join in the resource rich network called, the "information superhighway." Schools involved in the Wide Area Frame Relay developed project-based curriculum and performance-based assessment systems outlined by Dade County's Competency-Based Curriculum. Involved classrooms completed projects through the use of information infrastructure, networked computers, software tools, video, and CD ROM as key elements within the organization of the classroom. Projects were ultimately shared online with peers throughout the world.

The schools considered for this project had to have a large area Local Area Network installed. In addition, the principal and the staff had to be interested and willing to participate and ready to devote the time necessary for training and evaluation. The schools chosen in Miami were Avocado Elementary School, Cutler Ridge Middle School, American High School, and William Turner Technical High School.

The information resources made available to these schools included access to the Internet, the Florida Information Resource Network (FIRN), and Intra-LAN communication between the pilot schools. Individual students, as well as classes, were able to use these resources. Teachers and students exploring the Internet together developed skills for questioning, researching, analyzing, discussing, hypothesizing, and proposing. These capabilities are gradually replacing the traditionally valued skills of objectification and memorization increasing the need for Internetworking between schools.

This presentation at Tel Ed '95. will include a brief description of the Internet and descriptions of the vast resources available on the Internet, such as Archie, Veronica, Web Crawlers, Gophers and Web Worms. In addition, several student-oriented telecommunications projects will be discussed and participants will be given detailed handouts, including ready-to-implement classroom activities. Ms. Master and Mr. Blank will provide valuable information on the benefits of networking, planning a district-wide network, and a technical model for networking.

Training Online Educators: The Five C's

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Key words: distance learning, professional development, online education

Abstract

Recent research indicates that learning environments must be created where students are immersed in thoughtful interaction facilitated by access to 'mindtools' such as databases, hypermedia, and expert systems (Cooper, 1993). In this way, technology can provide the foundation for knowledge construction. "It (technology)... gives us access to vast amounts of information and provides the tools to acquire it, to manipulate it, and to develop insights from it" (Braun, 1993, p.14). Can true change come about without the use of technology in the "Information Age? "... it is unlikely that schooling can be reorganized without broad and careful planning to use current and emerging technologies well" (Hawkins, 1993, p.31).

The integration of technologies for "learning at a distance" into an intelligently designed learning environment by a teacher/facilitator who serves as an "information manager", closely parallels the restructured K-12 school model. Holznagel, (1988) in discussing "the promise of distance education" emphasized the needs of the learner when considering the use of distance education techniques. He then listed seven reasons for the implementation of such programs. Two of those will be considered here.

1. To bring new perspectives or experiences to students from places that are not accessible for reasons of cost, time, distance or other factors.

2. To add expertise of information of a more current nature than available from the teacher or community(p.1).

Using distance learning to "complement" face-to-face education, (as Harasim (1993) refers to as "the adjunct mode") is the most prevalent in K-12 classrooms (p.23). Though the traditional model of distance education is typified by a teacher at a remote site instructing a class over distance, that paradigm, too, seems to be changing as the walls of the traditional classroom come down. In the document "Linking for Learning" the Office of Technology Assessment reported, "...that while distance education initially served isolated rural schools and some urban systems, current uses go beyond these needs. They (distance learning systems) link learner communities with each other and bring a wide array of experts and information to the classroom (O.T.A., 1989, p. 11). Dr. Robert Threlkeld (1993) echoed this idea when he predicted, "We will move away from what one rural administrator describes as "full course delivery" to support the direct assistance of local courses" (p.173).

Effective professional development will surely drive this type of classroom. During the summer of 1995, concurrent graduate level educational computing courses were taught at West Texas A&M University and East Texas State University. The students in the class included K-12 teachers and administrators, as well as higher education faculty and graduate students. Theories and strategies

involved in the application of microcomputers and related technologies in the learning environment were examined. Hands-on experiences with integrated and educational software titles, as well as multimedia delivery systems and Internet activities were offered in support of effective teaching practices. Students worked on joint, as well as individual activities in support of the development of online educators.

In preparation for this course, the review of the literature pointed to five issues which must be addressed in the training of online educators: connectivity, communication, competency, collaboration, and continuity. Further, interaction within and between the classes supported these issues. The "Five C's" became the focal point of this collaborative effort. A brief description of each and its application follow:

Connectivity—Access is the first step. The students were provided access to the Internet either through the universities or via TENET (The Texas Education Network).

Communication—Daily communication occurred within and between the two classes.

Competency—Procedural, developmental, and instructional information was provided for the students.

Collaboration—Students worked jointly through class discussion and in the compilation of individual portfolios.

Continuity—Information from the portfolios was posted to the ETSU gopher for future use.

The five training issues facilitated the gathering of skills to promote the use of online resources in the classroom. In this way, all teachers can become "distance educators."

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Fast Track to the Internet: A Model for Staff Development

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Key words: Internet training, staff development

Abstract

This paper describes the staff development process being used to prepare approximately 100 educators from 17 scattered site school districts in central Illinois to use the Internet in their classrooms and to train their colleagues. Formative evaluation from the project is also discussed.

Introduction

Fifteen school districts in Peoria County Illinois formed the Peoria County Public Schools Consortium (PCPSC). The PCPSC was awarded a grant by the State of Illinois to help K-12 teachers gain access to the Internet. The challenge of getting over 100 administrators, staff, and teachers in over 30 separate buildings ready to use the Internet was at hand. Staff development would be a key element in the success of the project.

Project Objectives

Faculty across district lines will:

- use telecommunications to collaboratively plan and develop assessment alternatives.
- take advantage of resources available through the Internet when planning instruction.
- plan and implement units of study that integrate the use of resources available through the Internet into student-directed, research-based instructional plans.
- plan and implement instruction where students in multiple locations use telecommunications to cooperatively complete projects.
- publish newly developed instructional units so that other professionals using the Internet can avail themselves of these plans.

Administrators will:

- be linked via telecommunications.
- improve collaborative efforts by using telecommunications to enhance inter- and intra-district communications

Each building will be:

- equipped so that telecommunications links can be established.
- connected to all participating schools.
- able to connect to the Illinois State Board of Education Server as well as the Internet.

Project Implementation

A minimum of two faculty members, one administrator, and one clerical staff member were selected from each building in the consortium. All participants had prior experience with using a computer and agreed to train their colleagues. Having a substantial core group from each building provided the individuals necessary to support the remainder of the staff.

The initial workshop for teachers and administrators focused on an overview of the Internet including jargon and educational applications. Participants received handouts to read and study.

The second workshop focused on the use of Netscape® to navigate the World Wide Web. Participants selected and ordered reference materials from a collection of books about the Internet. The opportunity to choose their own materials enabled the participants to select materials that they were comfortable with and would actually use rather than the instructors selecting one text for all.

The purpose of the third workshop was to form project teams and generate project ideas. This task was broken down into three sessions. The first session served as a brainstorming session to gather potential project ideas from the Internet. The second session was for the formation of teams and further refinement of ideas using the resources of the Internet. The third session was used to present each group's project idea and gather feedback from the entire group.

The final workshop for teachers and administrators was conducted in August and focused on e-mail and constructing home pages. Project timelines were generated and the need for any additional training was identified.

Conclusion

Teachers and administrators are truly excited about using the Internet! Perfect attendance at workshops was the norm. Another plus is the diverse nature of the project teams. The teams cross district boundaries resulting in increased sharing of information. Having teams composed of teachers and administrators has also enhanced the projects being developed as members look at the project from both an administrative and a classroom teacher perspective. It will be an exciting year as the projects unfold!

CURIE: An Internet Gateway and Information Management System for Science and Mathematics Classroom Use

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NSF Grant No. ESI-9355706

Key words: information, Internet, WWW, ftp, gopher, e-mail, CURIE

Abstract

Surfing the Internet for information is an activity which engages many of us. Some of us find this "edutainment", others find it time consuming and frustrating. There is a growing realization that data on the net can be an important element in the pedagogy of the science and mathematics classroom. There is also the realization that teachers need to be able to access the Internet data set in a timely fashion and in a manner which is quickly incorporated into the skills which are essential to today's classroom teacher. The teachers face trade-off #1: the possibilities of finding useful and timely information on a vast resource base compared to the time involved with finding that information.

The net is also a repository where teacher/student - generated reports can be published in a simple, inexpensive and readily accessible fashion. An important consideration is that there is no quality control on the net. The teachers face trade-off #2: the usefulness (and empowerment) of publishing results for the world to see compared to the realization that perhaps no one will bother to read a report which lacks a peer review process.

CURIE is an Internet gateway system for science and mathematics learning which addresses teacher trade-off issues #1 and #2. It is a World Wide Web server with the URL of http://curie.uncg.edu which can be viewed on any computer with three elements: a modem (14.4 kbps or faster is desirable), client software (graphical browser, TCP/IP software, viewers, etc), and an appropriate connection. The latter means that the computer should be directly connected to the net through, say, a university network, should have a SLIP/PPP connection to a university network or commercial provider (Interpath,

VNET, etc.) or should have a shell account on a commercial provider and simulate a SLIP connection with TIA (an Internet adapter which converts a shell account into a pseudo-SLIP account.)

CURIE provides (1) a transparent gateway to Internet services: Gopher, ftp, newsgroups, email, telnet and, most importantly, the World Wide Web, (2) a means of submitting and retrieving peer-reviewed publications on-line and (3) a current, filtered and annotated list of URLs which are judged to be helpful to the classroom teacher. Rather than needing to learn disparate protocols for the various Internet services, the user can point and click to the desired service from within CURIE. Tutorials and on-line help is also available. Publications of field-tested classroom material (labs, experiments, demonstrations, etc.) are in different content home pages, hyperlinked in standard web fashion. This material has been field tested for scientific accuracy, safety and pedagogy, with appropriate ownership clearly visible, and is divided according to the various disciplines: physics, chemistry, biology, physical science, astronomy, science education, and so on. There is also a section of CURIE for 'quick and dirty' publication of non peer-reviewed material, such as student reports.

EdNet: Maintaining an Active Discussion List

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Abstract

Educational reform designed to meet the needs of students though the 21st century presents us, as educators, with a vast array of challenges. Goals for our students must be transformed from "knowing about" to understanding; from collecting all the facts to selecting the relevant ones; from holding information in their heads, to shaping its endless flow. We can begin the process of education reform by ensuring that teachers have access to discussion forums for the exchange of ideas. Three years ago EdNet was begun as a "forum for discussion of Educational Issues on the Internet". Since its creation at the University of Massachusetts School of Education, EdNet has offered teachers concrete ideas and solutions to problems, and built bridges between teachers in the field and the faculty of universities doing educational research.

EdNet was started as an experiment to see if faculty and students could benefit from an unmoderated mailing list. It was made known to the public one year later. Since becoming public, the number of

subscribers has increased steadily, to its present level of an estimated 4,500 readers from all over the world. As EdNet grew, so did management issues. The value of EdNet as a resource for the School of Education had to be weighed against its costs, and a process developed to assess whether EdNet has an essential, dynamic role to play within the School. EdNet had to be maintained under conditions of severe budget constraints and limited technical resources, a low cost management plan had to be put in effect. A graduate student assistantship requiring a 12 month/365 day per year commitment was used to pay an EdNet Manager. A seminar series was developed, which focuses on the general management of listservs. With the help of seminar students, responsibility for EdNet was divided. A subscription manager received errors, contacted those users whose subscription generated error messages, and removed users whose addresses were no longer valid. The training of other students to take over EdNet Manger and Subscription Manger roles was initiated. Archive management and the development of WWW access was also assigned. With backup provisions available for maintenance of EdNet, the decision was made to moderate the list.

Over the past year, EdNet has shown itself to be manageable, and to have tremendous potential in a variety of areas including: communications, public relations, and as a training tool for students. It has served as a platform from which to showcase research activities of the School of Education through the "Expert on Line" program, and it provides a highly visible presence for the UMASS School of Education on the Internet. Future goals include development of online educational journals and access to newsletters from educational institutions in countries which lack adequate Internet resources.

Children as Teachers (ChaT)

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Key words: telecommunications, human rights, international education, distance education, muticultural education

Abstract

Schools in Wake County, North Carolina have participated in telecommunications projects with students in Russia through the Children as Teachers (ChaT) program. Two middle schools and one high school have been using telecommunications to allow students to interact in projects involving second language instruction, human rights, and the development of multimedia presentations.

Students in Wake County, North Carolina are participating in telecommunications projects with students in Moscow, Russia in the program Children as Teachers (ChaT). ChaT is designed to have students use the technology of telecommunications to work together to further each other's knowledge, creating an international co-operative educational learning experience for all participants. Students are interacting in projects that involve second language instruction, human rights awareness, and the use of new technology. The director of the project is Ilja Levin of the Institute of New Technologies in Russia. The Russian Coordinator is Tatiana Egorova of the Moscow Institute of New Technologies. The American Coordinator is Diane Midness of Enloe High School, Raleigh, North Carolina. Students from the Technical Training Center Three and the Youth Center for Human Rights in Russia are working with students at Enloe High School, Carnage Middle School, and Ligon Middle School in Raleigh.

Russian Language students at Enloe High School and Carnage Middle School are corresponding with English language students in Moscow. A Cyrillic/Latin editor written for this project automatically encodes and decodes files allowing students to send text in Russian or English. They use the theme of Human Rights for their letters. The goal of the Human Rights project is to promote mutual understanding of how students from both countries perceive and react to different situations and thoughts. Students do this through transcripts of group discussion and individual letters written by students.

In the fall of 1994 , the Human Rights theme was expanded to include a short term project with foreign policy students at Enloe High School and students from the Youth Center for Human Rights about the coup attempt and resulting elections. An evaluation of the project done by the students demonstrated an expanded knowledge of the political climate in each other's countries. American students appreciated the "first hand" information they received from the Russian students. Russian students were astonished at the genuine interest of American students in their political crisis.

Students at Ligon Middle School and Technical Training Center Three are participating in a project using the computer program, MicroWorlds. This project involves students using technology to learn about each other's culture. Students use the program to draw pictures on themes they have chosen. These pictures can be interactive incorporating video and sound.

ChaT is planning to start math and physics programs for the next school year. These will involve students using computer simulations to learn among themselves the subject matter, progressing from simple problems to more complex ones.

US West/NEA Teacher Networks: Connecting Teachers Through Telecommunications

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Key words: teacher, network, telecommunications, US West, NEA, partnership

Abstract

The U S WEST Foundation initiated this project to establish networks of teachers and administrators skilled in the usage of telecommunications to improve student achievement. The goal is to train and support one percent of the classroom teachers in the 14 states serviced by U S WEST Communications--and for those 4,000+ teachers to pass it on, training some 40,000 others. The project is not only putting the latest technology in the hands of teachers but is also providing access to online services and ongoing staff development support.

U S WEST believes the project must be collaborative and, to this end, has entered into a partnership with the National Education Association to support state efforts to establish and support teacher

networks. To ensure that the networks are broad, collaborative efforts, design and implementation teams are made up of representatives of the teachers' association, state departments of education, and higher education, as well as others in the state with telecommunication experience. This session will describe the two existing networks in Colorado and Utah and share what they are learning about bringing telecommunications directly to classroom teachers.

The Teacher Network Project provides each participant a laptop computer, modem, necessary software, online access, and training to begin to make use of telecommunication resources. The teachers in the networks are expected to provide in-service experiences for staff in their home districts.

Attendees to this presentation will hear how the states involved are connecting teachers through telecommunications. They will hear about the problems the projects and teachers have faced. Classroom teachers involved in the project will describe and demonstrate what they are doing and learning about using telecommunications to improve instruction.

Staff development models being developed and used to train and support the teachers in the networks will be described. The staff development goals in the Colorado and Utah networks include: performing basic telecommunication and e-mail skills, locating and searching electronic resources, and transferring files. Teachers also gain experience in recognizing potential applications of electronic resources in the classroom and developing a plan incorporating telecommunications to improve classroom instruction.

The U S WEST Teacher Network in Colorado is beginning the second year of a program, designed to ultimately train over 400 teachers and administrators in the use of telecommunications. The 153 teachers who participated in the first year of the Colorado Teacher Network provided in-service experience in telecommunications for 1,089 of their colleagues.

The Utah Teacher Network is beginning its first year of operation and networks are currently being planned in Arizona, Oregon, Idaho, South Dakota, and Washington. U S WEST hopes to establish teacher networks in all of the 14 states it provides service within the next three to four years.

What Teachers Are Saying About the U S WEST Teacher Network
In our first year, over 300 students have had some experience with telecommunications as an enhancement to the curriculum...including communication with students around the world...and project research on the Internet.

"Your support of time, talents and equipment has allowed an older teacher to become rejuvenated again."

"I am now able to go into this new program with confidence, and much of it seems like old hat. (Who'd have thought it a few months ago, when I knew next to nothing about computers!)"

"The class was very beneficial. We presented a district-wide in-service about the Internet. We demonstrated graphics file retrieval, e-mail, bulletin boards and retrieval of lesson plans, software and grant information. Thirty teachers and administrators attended and were very enthusiastic."

Exploring the Environment: Online Tools for Successful Earth Science Classrooms

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Key words: telecommunications, teacher training, earth science, technology infusion, hypermedia

Abstract

As part of NASA's High Performance Computing and Communications (HPCC) program, the NASA Classroom of the Future's Program is implementing a cooperative agreement to develop high school environmental Earth science modules accessible over the Internet. The modules will initially augment one semester of existing Earth science courses, and will be beta-tested in classrooms across the country. The project will emphasize online collaboration, NASA's remote sensing databases, and teacher training. Teachers will be provided the skills, knowledge, and methods necessary to use the modules in teaching students about environmental Earth Science, to use technology as a teaching tool, and to become teacher-leaders.

Remote Sensing Databases

NASA and associated agencies hold terabytes of remote sensing data in databases that can be used effectively to support educational activities over the Internet. Unfortunately, few teachers or students know of the resources or have the ability to access them. The purpose of this project is to develop high school environmental Earth Science course modules that capitalize on NASA's wealth of scien-

tific, remote sensing information. Using the online inquiry tools built by this project, students will be able to: develop strategies for information gathering, recognize patterns and relationships, evaluate strengths and weaknesses of data, predict outcomes using extrapolation or interpolation, and design and conduct experiments after the formulation of problem statements.

Scientific researchers making use of satellite and shuttle technology, remote imaging, and image processing, are focusing on global change. Instead of isolated problems, researchers are finding that problems are geographic in nature. Problem areas encompass large areas of land and sea, climates, regional distributions of water, vegetation, soil and rocks, lines of physical communications, and trade, political, ethnic and language boundaries. The ability of remote sensing to look at entire areas facilitates discovery of the interconnectedness, diversity, and scale of global problems, stressing interactions of the Earth's subsystems in explaining Earth dynamics, evolution, and global change.

Remote sensing is ideal for the study of change and the wider relations between many components of the environment. It lends credibility to textbooks. In the past, it was difficult for humans to realize the global impact of their actions. The interconnectedness of Earth systems, however, means that human-induced changes are seized upon and magnified by nature, to be passed through the chain of natural events, to have far-reaching, and sometimes, unexpected effects. Unfortunately, it is too easy to find examples of human impact on the environment. Noted environmental hazards include: the destruction of ozone in the upper atmosphere; the removal of protective grasses from savannah lands and steppes through plowing and overgrazing; and the loss of fertile soil, oxygen generation, and vapor transpiration through deforestation in tropical rain forests.

These examples highlight the interconnectedness of the Earth's subsystems and suggest that had remote sensing been available, some of these problems could have been averted. The environmental Earth Science course modules planned for this effort, however, will have a far wider orientation than manmade environmental disasters. Students will be expected to synthesize and evaluate such matters as: the cause and effect relationships of degradational and tectonic forces with respect to the dynamic Earth and its surface; the relationship of atmospheric heat transfer to meteorological processes; and the relationship between Earth processes and natural disasters. Students should also be able to generate and support insightful and informed recommendations to alleviate environmental problems.

Workshops and Support Materials

The modules that will comprise Exploring the Environment will be disseminated through workshops for experienced, new, and preservice teachers. In addition to workshops, in the second and third year of this project, we will place online necessary information for using NASA's remote sensing databases, references to articles about exemplary teaching, information about other Internet resources, and ideas about implementing evolving science teaching standards and methodology.

During each year of this project, teachers will participate in a week of instruction at Wheeling Jesuit College. The participants will receive intense instruction designed to prepare them to use the Internet and the Exploring the Environment modules in their environmental Earth Science courses and to learn methodology appropriate to new technology and current standards. In addition, and perhaps most importantly, we want teachers to serve as teacher-leaders in the growing integration of instructional technologies such as: NASA's remote sensing databases, inquiry-based science learning, and online collaboration among geographically dispersed classrooms. The Exploring the Environment homepage is located at URL: http://cotf.edu/ETE/etehome.

Cruising the Information Superhighway—Even with Model T Technology

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Key words: telecommunications, Internet, e-mail, projects, key pals

Abstract

Educators are often hesitant to attempt telecommunication activities because they feel they have inadequate equipment to undertake such an adventure. This presentation will demonstrate online activities using antique computer hardware and a meager budget. Presenters will show you what is available, how to get it, how it use it, and student projects accomplished without additional budget allocations.

Don't wait to get your students on the Information Superhighway when you can use the equipment you have. This multimedia presentation will give you the information you need to get on line with limited hardware and a limited budget. The presenters will demonstrate several hardware and software solutions. They will show you how to get started with what you have and how to map for future expansion when you are ready.

This presentation will model innovative telecommunications projects which enhance every educator's curriculum. Telecommunications projects are interdisciplinary, culturally diverse and engage students on several cognitive and ability levels. Students interact with peers both locally and globally to discuss issues of significance to their lives and environment. The presentation will provide examples of successful projects using telecommunications as a vehicle to encourage student participation. Three levels of telecommunication activities will be discussed.

The First Level- Direct Connect:

This can be done with existing phone lines and a computer—even an Apple II or Apple II GS. Some projects using direct connect will be demonstrated.

The Second Level—E-Mail:

Students use e-mail to discuss several exciting subjects with peers around the state, the USA, and the world. Existing phone lines and hardware is adequate for projects.

The Third Level—Internet Relay Chat

During an Internet Relay Chat students are actually able to use their computer keyboard to chat with peers around the world in real time.

Handouts:

Equipment needed and how to use what you have to make the connection.

From Online Mentee to Mentor

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Key words: mentor, mentorship, online courses, science, math, inservice, professional development

Abstract

This presentation describes the dynamics of training mentors via an online course to deliver online instruction. The course instructor and one teacher who took the course will reflect on the strengths and weaknesses of online instruction. The teacher will continue the presentation by further reflection on what it means to switch hats from taking an online course to becoming the mentor of such a course. Questions related to online instruction will be raised and discussed.

Project Summary

The "Reach for the Sky" project, funded by the Annenburg/CPB Math and Science project and the US West Foundation, has created a nationally scaleable online mentor training model as applicable to those with minimal online access, using offline readers, as for those with full Internet access. This session discusses how teachers learn about Internet online and how they can learn to become successful mentors themselves.

The Reach for the Sky project is a bold demonstration project with the following goals:

- Providing teachers access to telecomputing equipment, sustainable connectivity, training, and technical support.

- Linking teachers to the Internet science/math resources and databases.
- Networking teachers with local, national, and global communities of peers and experts.
- Assisting teachers to create and conduct telelcurricular activities and to mentor other teachers in the development and implementation of similar activities.
- Showcasing teacher innovations in the use of Internet and telecomputing which provides role models of educational renewal.
- Facilitating public discussions on the relevance of community math, science, and technology literacy and implications for educational renewal.

The ultimate goal is to produce mentors with the skills and confidence to continue their own self-directed learning and mentoring activities using Internet resources and tools. While it is expected that each mentor will have unique knowledge, interests and activities, the hope is that each mentor will continue modeling purposeful peer interaction with a clear idea of the genuine benefits to teachers of telecollaboration.

The mentors will model how prewritten, well-organized lessons can be very effective in training mentees without creating a serious time burden for the mentors. This model allows for scaleability, permitting a single teacher to mentor many mentees, easily. Mentors and mentees will learn how to create their own "how-to" exercises for their own use and for training others. An archive of mentorship resources will be co-created by all concerned.

The following questions are addressed:

1. How does the instructor/mentor communicate with students enrolled in the course?
The instructor has the option of public postings to all mentees via five newsgroups: news, chat, general, technical help, and the Internet course, or private electronic mail to any individual.

2. How can mentees be motivated to keep up with the lessons and assignments?
Mentees are asked to make a commitment to be online twice a week at the beginning of the course. Intermittent feedback as to the overall degree of online activity is shared with the group as a whole, without giving individual specifics which will risk embarrassing some mentees.

3. How does one deal with the stragglers and those who are ahead of the group?
Online courses lend themselves to individualized instruction, hence, those eager to learn quickly outpace those who are too busy, or suffer from procrastination. Those ahead of the group are asked to assist those lagging. Stragglers are given encouragement, often in the form of personal phone calls.

4. How does the instructor/mentor foster the development of an online community?
The instructor needs to be a facilitator of group learning, sharing, and interaction. The instructor needs to model the processes of gathering and sharing information, of asking questions of the group, admitting fallibility, and steering discussions in productive directions.

5. What strategies are effective and which are not?
Unfailing patience, encouragement, and well-organized, self-directed instructional resources...with a voice hotline to instant technical support, are effective strategies.

6. What is the glue that holds a community together?
The glue that holds the community together is the genuine need to learn how others are integrating Internet use and resources in their curriculum, the benefit of hearing about hot resource tips without spending hours searching, and the potential for shared multiclassroom telecurricular activities.

A Place To Start A Place To Grow: The Mali Interdisciplinary Project Plan

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Key words: interdisciplinary, social studies, english, art, African, project

Abstract

During the Mali Interdisciplinary Project (MIP) students will use the World Wide Web, as well as other traditional resources (such as books and magazines) to find out information about Mali, a country in West Africa. Also, students and teachers will find out information about participating sites by using the World Wide Web and other resources. In addition, site participants will communicate with other participating sites throughout the project by using an e-mail reflector. Finally, students will submit research findings for WWW publication via electronic mail and provide constructive criticism of other's research findings.

MIP Goals: students will enjoy reading, writing, and working together. Also, students will increase their social skills, their understanding of African culture, and critically consume information.

MIP objectives: students will describe the Mali culture in written or oral format or both; students will locate Mali on a map, provide directions on how to get to Mali, and draw and color a picture of Mali, students will answer and add to the MIP navigator questions presented; students will work cooperatively and ask other students questions about the MIP Navigator via. an electronic mail reflector. Finally, students will submit their MIP Navigator with references or bibliographies or both and constructively criticize other students' MIP navigator submissions.

The Mali Interdisciplinary project (MIP) was designed for teachers with various degrees of telecommunications experience. The Mali Interdisciplinary Project (MIP) is carried out with an MIP Navigator, which provides directions and questions.

For educators who know the basics of how to get around the Internet, the MIP can be a means to apply your knowledge of the tools in the educational context; for teachers who have already used

various Internet projects with their students, the Mali Interdisciplinary Project is another project which could be used with your class(es). MIP is an open-ended and adaptable project.

Teachers Learning to Use the Internet: Challenges and Successes

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Key words: professional development, Internet, telecommunications, teacher education

Abstract

Those who organize and teach professional development sessions about the Internet for teachers face some unique challenges. In this presentation, we describe these challenges and discuss strategies we have successfully used to meet them.

In our enthusiasm to help students explore the Internet, the problems and difficulties teachers have in learning to use it are often overlooked. All three of us have focused much effort on trying to help teachers learn to use the Internet as a tool to enrich their teaching. While we do not pretend to have definitive answers to all of the challenges teachers face, we do have some suggestions to offer those who organize or teach Internet professional development sessions for teachers.

Level of Internet Access

One basic dilemma many of us face when organizing computer workshops is whether to teach teachers using state-of-the art technology, or to teach them using the hardware and software they will most likely find in their schools. This is not a trivial question when discussing Internet training. Graphical client direct access is considerably more attractive and easier to learn, but less available to teachers, than dialing up to a remote character-based client. A recent survey of U.S. public schools (Heaviside,

Farris, Malitz, & Carpenter, 1995) reported that of the 49 percent that have access to either the Internet or another wide area network, "the overwhelming majority of schools...use modems (97 percent)" (p. 5). Only 21 percent of the schools with Internet access (35 percent of the total) reported having use of graphical user interfaces via direct, SLIP, or PPP connections. Although this will probably change dramatically in the next five to 10 years, the great majority of Internetworked teachers now, by implication, have only VT100 access.

We need to reach a compromise on this issue. We should attend to the immediate needs of the majority of teachers by helping them to learn the use of VT100 tools as effectively as possible. Consequently, electronic mail and computer conferencing should hold important places within our training agenda. In addition, teachers still need to know how to make and use interactive (Telnet) and non-interactive (FTP) connections in VT100 mode, if they want to be able to use much of the information presently available anonymously. At the same time, we must expose teachers to the convenience and ease of client-server Internet access to prepare them for the not-too-distant future when this mode of access will be commonplace in schools.

Models to Aid Understanding

When teachers or others are first introduced to the Internet, they are frequently overwhelmed by the sheer quantity of resources available and the difficulty of finding what they want. One of our challenges as trainers is to help teachers construct their own understanding of this world of resources. A simple, yet effective model that we have used to achieve this is to describe Internet resources as a virtual library or a "library without walls" and compare it to its physical analog.

We depict the library as having five rooms. The first is the card catalog containing the collection of Internet tools available for finding resources, such as Veronica, Archie, and Lycos. Next is the reference room, which contains the set of tools commonly found on the Internet such as Webster's Dictionary, the CIA World Factbook, and Bartlet's Familiar Quotations. When we discuss the third, the reading room, we talk about sites such as The Electronic Newsstand's collection of commercial magazines and Time Magazine Universe. In the media room, the fourth room we visit, we introduce the vast array of pictures, maps, software, audio, and video files that are available for downloading on the Internet. And in the fifth room, the stacks, we describe the collection of subject-oriented materials located, for example, through Michigan State University's subject trees, and full length electronic texts such as those found at Project Gutenberg.

A more complete description of this model can be found in Owen, Owston, & Dickie (1995). These authors have also made available on the Internet, a set of links, organized by library room, to take you to some of their favorite resources they use for teaching. The links can be found at the address http://www.edu.yorku.ca/LearningHighway.

Curriculum Integration

We are concerned that many teacher Internet workshops tend to focus on technical aspects and the "razzle dazzle," with little time devoted to discussion on how teachers can make meaningful use of the Internet in their classrooms. Thus, when they return to their classrooms, teachers may see the Internet as an activity unrelated to the "serious" curriculum and simply turn students loose to "surf the 'net'."

We have developed a framework that provides a useful structure and approach to Internet-based learning experiences in the classroom. The framework's premise is that learning experiences on the Internet can provide students with the ability to be taken seriously for what they have to say, and that

a sense of purpose and the desire to understand the experiences of others are the keys to learning on the Internet.

The framework has four broad areas of focus

1. Focus on Interaction
This includes using the Internet for activities that involve interaction or collaboration with others. For example; penpals, or person-to-person exchanges; class to class exchanges: "Ask-an-expert" or online guests; or understanding the computer as a catalyst for learning

2. Focus on Information
This includes using the Internet for activities such as research (information searches, collection and organization) and Publishing, or sharing research with others

3. Focus on Task
This includes using the Internet to focus on particular learning activities. For example; writing, simulations, and social issues

4. Focus on Technology
This includes Internet-based activities that are designed to promote learning about technology and its uses and understanding the computer as a tool

In summary, we urge those providing Internet professional development to teachers to consider the unique learning needs of teachers and to plan their sessions with these in mind.

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The Process of Turning a Large Ship

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Key words: telecommunication, change process, restructuring, integration

Abstract

This is a description of the process of rapidly moving a large school district onto the Internet. The district is NOT wealthy, but cares deeply about the learning process. Learn how the need was built and the support was generated. Look at the ongoing training process and join in on the next steps.

History

The San Juan Unified School District is a large, suburban, K-12 district in central California. In 1987, the district began to develop instructional local area networks at each school site. The primary emphasis was to support student learning using computer-assisted instruction correlated to the adopted curriculum. This effort was so successful that the district currently has over 4,000 instructional computers and 78 instructional local area networks providing support to 95% of the students in the district.

As the students and staff became more comfortable using the computers as intelligent tutors, it became apparent that it was time to introduce productivity tools.

In 1991, the Board of Education adopted a computer competency requirement for graduation. As of June 1995, all graduating seniors must pass a "hands-on" minimum competency test in word processing, database, and spreadsheet. The required skills are being taught not only at the high school level, but to students at middle and elementary schools. Numerous K-8 students have passed the test, and their transcripts note that they have completed this twelfth grade graduation requirement.

Teachers in the district are going through a voluntary update of their own technology skills as they take district-provided courses in the use of word processing, database, spread sheet, and telecommunication.

The Internet Project

As the telecommunications became a usable learning tool in the K-12 environment, several schools emerged as pilot sites. These elementary and secondary schools used and demonstrated to the rest of the district that Fredmail, National Geographic Kids Net, AT&T Network, Scholastic Network, Pacific Bell's Knowledge Network Gateway and our own in-house bulletin board service could effectively support educational goals.

As each of these pilot projects progressed, parents, school board members, administrators and teachers of other schools, and local television and newspapers were invited to share in the students' response to this exciting new support to the curriculum. Teacher training and an Internet Summer Institute was provided to support "pioneers" from all sites.

This was a multi-year process which raised many questions across the district. These pilots were doing, or asking to do, things that the district had not anticipated.

The district has used a WAN to support attendance and the financial side of education. As the Internet project was evolving, the majority of administrators were already connected by e-mail. E-mail was not at "mastery level" for many, but there was already talk that e-mail was enhancing communication within the district.

The district responded by bring a committee together and over a six-month period, developing a plan and process for implementation. Wiring specifications included a fiber optic backbone and (10baseT) connections to each computer using level 5 supertwist wire for ease of upgrade. To save on labor, the district mandated that when a school-wide rewiring job was scheduled for telephone, security, computer, TV cable, fire alarm or computer, all of wiring for each of these functions would be completed at the same time.

As it became apparent that the Internet was going to be usable in the K-12 environment, it also became apparent that funding was going to be a significant question.

A series of three hour "Hands-On The Internet" training sessions were scheduled for curriculum specialists and principals where they were shown how to find grants and curriculum support for their personal areas of interest. Even the superintendent and assistants were treated to hands-on Web surfing. A second teacher "trainer of trainers" Internet class was started. The training process was aimed at encouraging the staff of the district to talk about the uses of the Internet in the schools.

As business and industry were discovering the marketing possibilities of the Internet, the SJUSD became the first district in our area to become serious about the educational uses of the Internet. As a result, the well cultivated media was now "at our door" asking for the answer to the Internet question of the day.

The board enthusiastically approved the use of funds to support the Internet Project. Each school was offered 20 network cards, a 48 port hub, a router, wiring, and a T1 line. The schools had to supply the computers and upgrade RAM. All of the schools "bought in".

End of Phase One

A lab at every school site was connected to the Internet in the Summer of 1995. The teaching staff began the next phase of intensive training and development of the uses of the information highway as a tool to support student learning.

Critical Attribute

This paragraph is not what is expected in a document of this type. To make changes, one must take risks and step outside of the standard bounds. The above process STRETCHED the bounds in many ways. This is a stretch of the document standards.

The district is always looking for collaborators in the learning process. If your school is looking for other sites to work with, please don't hesitate to e-mail us. We have teachers and schools with a very wide range of interests. We even have sites that understand and enjoy Beta Testing. We will be happy to put you in touch with an appropriate site.

The Electronic Internship Program

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Key words: mentorship, internship, educational innovation, mediated work experience

Abstract

The Electronic Internship Program provides on-line work experience for students involved in the BC's New Directions In Distance Learning project. Students in small rural schools experience high-tech careers through an on-line internship program, made possible through the use of interactive television, video production, a provincial FirstClass network and the Internet.

The Electronic Internship Program

In British Columbia, the Open Learning Agency, the Regional Correspondence Schools, and the Technology and Distance Education Branch of the Ministry of Education are bringing high technology work experience to students involved in the New Directions In Distance Learning (NDDL) project. Sponsored by Human Resources Development Canada, the Electronic Internship program adds value to the existing NDDL project, providing new models for on-line mentorship, teacher-professional development, and community connections.

In British Columbia, all graduation level students are required to complete 30 hours of work experience for their graduation credit. In the New Directions In Distance Learning project, students in small rural secondary schools, at home, or in adult learning centers can take a two-year Career and Personal Planning course, developed specifically for distance education. This four-module course is designed to cover all aspects of the new B.C. Career and Personal Planning curriculum, including the work experience component.

The Career and Personal Planning course includes a special video production, written and produced by B.C.'s own *Get Connected* Schools TV team, designed to provide real life links to the curriculum. This video series includes dramatization, information, career spotlight sequences, and upbeat interviews with industry personnel. It is designed to be incorporated into the curriculum, and gives students a "video catalogue" of career possibilities.

The Electronic Internship Program, an alternative model for Career and Personal Planning work experience credit, gives 100 NDDL students the opportunity to gain some or all of that credit using interactive television, video production, a provincial FirstClass network, and the Internet. The Open Learning Agency Schools Program staff provides training, support, and a new way of connecting with

communities and schools for on-line mentors at a variety of industry locations. Mentors from senior management, sales, service, development and support positions within these industries work with students in research, career exploration, and job related tasks. On-line counselors from the Regional Correspondence Schools assist students throughout the Career and Personal Planning course and the Electronic Internship Program. Students, industry mentors, and on-line counselors work collegially as a "community of learners" through the use of communication technology and the development of new models of work.

The Electronic Internship Program provides distance education students with a wide variety of career possibilities, work environments, and learning activities. Some of these activities include:

- Work experience: telecommuting from the distance learning site to the work experience location
- Job shadowing: using the on-line world to learn more about career possibilities, through interviews, interactive television, video broadcasts
- Community service: self-directed projects for volunteer work on-line, such as peer mentoring
- Entrepreneurship: self-directed projects for commercial Entrepreneurship

California Technology Information Project (CalTIP)

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Key words: curriculum, funding, legislation, Internet, calendars, information, gopher

Abstract

CalTIP provides up-to-date information about the many educational technology-based resources available in California, in a centralized resource easily accessible by students, teachers, administrators and policy-makers.

CalTIP includes information about:

- Quality technology-based materials including software, multimedia programs, videotapes and videodiscs, and distance learning program resources.
- Model projects and programs such as the Model Technology Schools projects, selected Star Schools projects and model uses of technology at other district and school sites.
- Printed materials such as technology use planning guides, software and video catalogues, newsletters, research articles, and policy reports.
- Staff development and professional organization resources and calendars.
- Curriculum and assessment and program evaluation resources.
- Educational Technology Publishers.
- Telecommunications resources.
- Funding resources.
- Policy Reports and Legislative Updates.

Because schools vary in their access to technology, CalTIP utilizes a variety of methods for distributing information. CalTIP may be accessed as follows:

Internet E-mail, Gopher, WWW

A gopher allows users to browse database menus and retrieve files on computers on the Internet. Through the Internet, CalTIP is able to provide current information concerning the access and use of educational technology. CalTIP also offers information dissemination via online documents to schools, districts, counties and regions throughout California.

Gopher: edtech.fwl.org
WWW: http://www.fwl.org/edtech/caltip.html

Fax on Demand, 1-800-360-9856

This service provides a variety of documents and summaries of gopher documents, delivered to your fax machine. To receive a catalogue of current fax documents, select 0 upon connecting to the Fax-on-demand service.

800 Help-line, 1-800-240-2744

The 800 number provides direct access to basic services of CalTIP. The number connects the user to an information specialist who can advise about resources or where resource information may be obtained.

Professional Development

Training in the use of CalTIP services is also available, in collaboration with the Telemation Project, California Technology Project, and the Santa Clara County Office of Education. CalTIP provides professional development to assist educators in accessing and using the CalTIP resources. Workshops and Institutes include demonstrations and hands-on use of telecommunications, emphasizing its uses for students and teachers in the classroom. We offer suggestions on classroom integration of technol-

ogy in alignment with the state frameworks. Contact Judy Powers or Gene Agee for details, (408) 453-6763 or jpowers@cello.gina.calstate.edu or gagee@cello.gina.calstate.edu.

CalTIP is a project of Far West Laboratory and the Santa Clara County Office of Education, funded by the California Department of Education under the provisions of SB1510—the Morgan-Farr-Quackenbush Educational Technology Act of 1992.

Addressing Education's Most Pressing Issues Through Distance Learning

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Key words: distance learning, staff development, satellite, student achievement

Abstract

The United Star Distance Learning Consortium (USDLC) involves five state departments of education (Florida, Illinois, New Mexico, North Carolina, and Texas), one university (Western Illinois University), one business partner (TI-IN/Westcott Communications), and an Education Service Center (Region 20, San Antonio, TX). The Consortium was awarded a two-year Star Schools grant provided by the U.S. Department of Education for approximately $3.7 million dollars. We are making available to downlink sites across the nation programs addressing: safe schools, managing multicultural learning environments, math and science training for teachers, effective use of technology in the classroom, occupation identification planning, and building capacity within migrant families. This programming is designed for students, parents, school faculty, and officers, and the community at large. Printed support materials are available upon receipt of registration.

USDLC goals include producing quality programming delivered nationwide to support student achievement, demonstrating the efficacy of distance learning technologies in addressing education's most pressing issues, providing leadership to the distance learning community in the use of emerging technologies, and increasing access to distance learning programs and services. These goals are supported by a strong and meaningful business/education partnership between TI-IN/Westcott and Education Service Center. Region 20.

Programming is being broadcast on C-Band analog and TI-IN's Ku-Band digital signal. A variety of production techniques and styles have been used by program-producing partners. Programming

includes hands-on activities and demonstrations for math and science teachers; clips of successful migrant students in our Estrellas Brillantes program; teleconferences that provide information for parents in Programma Estrellas; interviews from across the nation on approaches used to reduce violence in the schools; and models for establishing career choices and options for students.

We estimate a total number of participants for 1995-96 to be 64,796 across the nation. Currently we have registrants from 22 states. Many of our programs are being rebroadcast via cable and microwave. Locations of rebroadcasts include Virginia, Wisconsin, Texas, Illinois, New York, Arizona, and Ohio. We encourage wide participation and we value differing perspectives in the debates surrounding the issues addressed in our programming.

Rural Teachers Meet the Internet

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Key words: math/science reform, teacher training, Internet access, telecommunications, rural

Abstract

Reach for the Sky is a telecommunications project which has given rural teachers access to the Internet. The paper explores the broad questions, "Does access to the Internet deliver the anticipated renewal of teaching and learning? If so, under what conditions? and to what degree?"

Introduction

The Internet and The Information Super Highway have become familiar buzz words. In some circles, access to the resources of the Internet has become synonymous with educational reform. The purpose of this paper is to explore the broad questions, "Does such access deliver the anticipated renewal of teaching and learning? If so, under what conditions? and to what degree?"

In 1993, the Annenberg/CPB Math and Science Project funded five groups with the general aim of using telecommunications and the Internet to foster the renewal of math and science education in rural schools. It is one of the few initiatives to explicitly link reform in math and science education with the use of telecommunications. The extent to which one of these projects, Reach for the Sky, has succeeded in reaching this goal during the first year and a half of operation will be explored in this paper.

The Project

The goals of Reach for the Sky are:

- Providing teachers access to telecomputing equipment, sustainable connectivity, training, and technical support.
- Linking teachers to the Internet science/mathematics resources and data bases.
- Networking teachers with local, national, and global communities of peers and experts.
- Assisting teachers to create and conduct telecurricular units and to mentor other teachers in the development and implementation of similar units.
- Showcasing teacher innovations in the use of the Internet and telecomputing which provide role models of educational renewal.

During the first year of the project, 22 teachers of grades 3-12 with special interest in math and science, are receiving training in the use of the Internet and in the creation and use of telecurricular units. In the second year, these teachers will act as mentors for an additional 80 teachers who will receive all training online. After that it is expected that an unlimited number of teachers will be able to emulate the project model using the disseminated project materials with the assistance of online mentors.

The Questions

The questions below will be posed and discussed, both in this paper and the presentation:

1. What happens when teachers who have never been on the Internet before are first given access? What are the frustrations and the triumphs? Are there one or more identifiable barriers to be overcome? Does the type of access make any difference?

2. What kind of math/science resources were found on the Internet? How easy was it to find and acquire these resources? Was the time spent perceived to be worthwhile? Which of the resources was perceived as being most useful?

3. Can the resources found on the Internet, or access to the Internet in general, result in better classroom practice? In which ways does access to the Internet change ways in which teachers teach and learners learn?

Methodology

The data presented in this section were collected using questionnaires, interviews, comments made online, a focus group discussion and classroom observations. During February 1995, a questionnaire

devised by the external evaluator, Dr. Kim Yap of NWREL, was answered by 19 of the 22 Reach for the Sky teachers. In the same month, 13 of the teachers met in Helena, Montana, the State capitol, to participate in a technology fair at the Capitol building, and to meet as a project. During this time, all teachers met with the internal evaluator for a 15 minute interview. Teachers not attending the Helena meeting were subsequently interviewed by phone. Towards the end of February, the internal evaluator accompanied an external evaluator from NWREL on an onsite visit at two of the Reach for the Sky schools, Garfield School in Lewistown and the Winifred School, some forty miles north of Lewistown. During the visits, four classrooms were observed and an in depth interview was held with each of the four teachers. On the afternoon of 2/22/95, the external examiner facilitated a focus group discussion which included teachers (both part of the project and outside of it), administrators, students, parents, and community members.

Results

1. ***What happens when teachers who have never been on the Internet before are first given access? What are the frustrations and the triumphs? Are there one or more identifiable barriers to be overcome? Does the type of access make any difference?***

Teachers in the Reach for the Sky Project spoke with feeling about both the frustrations and the triumphs of their experience with the Internet. One teacher put it, "The Internet is 45% frustration, 45% not being connected, and 10% exhilaration. "Some of the triumphs will be examined first, followed by the frustrations.

One overwhelming theme, which was repeated again and again, was the exhilarating experience of having access to unlimited information and resources. Some likened it to a large library to which they now had instant recourse, but the access is available without having to leave one's home. The access provided, for some, new avenues of learning and possibilities which previously had not even been imagined. The scope and variety of what is available proved to be a recurring sub-theme during the interviews. Some said that they enjoyed 'surfing the Internet' just for the fun of seeing what would turn up next. For others, just knowing it was there made a psychological difference.

A second major theme to emerge from the responses of teachers was the overcoming of isolation and the feeling of being part of a global community. A phrase which reoccurred with some regularity was the enjoyment of "meeting new people". Specific contacts with peers, such as other middle school teachers, and with experts were mentioned. The latter category included seeking information from experts on diverse topics such as subways, the Loch Ness monster, adult education programs, desert plants, and hantavirus pellets. Also mentioned as part of this theme was the opportunity to partake in some global telecommunications projects such as Live from the Antarctica, MayaQuest, Geogame and Where is Roger.

A third theme, which was diffused throughout most of the responses was one of excitement and renewal. The opportunities and possibilities were seen to be both exciting and overwhelming, but for all that much appreciated. The theme of "new approaches, new ideas, new resources" was a frequently recurring one.

On the other hand, the opportunities provided by access to the Internet were not without some frustration. As before, various themes emerged, shaped in part by the availability of resources at the school and the kind of access provided.

Time emerged as the number one source of frustration. Some mentioned the time that it took to master some of the skills needed to access the Internet. Almost all commented on how they wished

there were more hours in a day to acquire resources and to use them. An important sub-theme to emerge at this point was the existing curriculum. Teachers are already trying to cope with a full curriculum. Invariably, time spent on some kind of telecurricular activity, even one linked to the existing curriculum, is going to take time from what was done before. Priorities will need to be decided. In the meantime, the pioneering teachers are trying to add new activities and skills to what is already in place. Often times, the resources obtained cannot be effectively used in the classroom without developing some kind of curriculum package to support their use. Again, this takes time. As fun as it is, the Internet can be a great waster of time. Some teachers spoke of hours spent trying to track down some resource because its location involved a lot of guess work. Others subscribed to a listserv, only to be overwhelmed by the volume of mail which suddenly arrived in their mail boxes. Time management and discipline became important skills to be learned. Teachers had to make time available on a weekly basis, usually at set times, and learn to neither skimp on or exceed what was allocated. Some spoke of the adjustments they had to make in their lifestyles and family commitments.

Second, frustrations with the Internet itself emerged as a substantive theme. Basically, the Internet is not user-friendly and this was pointed out on a number of occasions. More specifically, the Internet is not reliable. If access is to be part of a lesson, there is no guarantee that a connection will be made. Frequently, access to a specific site is denied because it is heavily used. Other times, when access is gained, a particular resource is not available, or cannot be accessed. As one teacher put it, "There is so much to weed out." Teachers spoke of having to wade through messages on the listservs to glean out the small fraction of what was useful. Another source of frustration was experienced when 'experts' were approached and failed to answer or there was some other form of lack of response. Frustrations in this area were compounded by the lack of time. Some allocated a precious hour to find a particular resource and then came up empty handed. Either source of frustration by itself might have been acceptable, but together they became a major aggravation.

Third, Reach for the Sky has provided access to the Internet using a modem and long distance phone lines. This access mode does have its limitations. Some would have liked a graphic interface, with point and click capabilities. However, during the first year of the project, this was not feasible. This type of access also raised the question of cost. Those using long distance phone lines to access the Internet found that the cost of being online could be rather prohibitive. Many were shocked at their August and September phone bills! The offline reader, which is the main telecommunication mode advocated by the Project does keep phone costs low, but on the other hand does not permit browsing of the Internet. Many teachers found themselves on the outside looking in when it came to direct resource acquisition. They had begun to glimpse what was out there for them to explore, but online costs limited what they could actually experience and download.

The fourth source of frustration is also cost related. As teachers began to realize the potential of the Internet and to experience learning modes hitherto unknown to them, they began to visualize new ways in which their students might begin to learn. However, in some cases these dreams floundered because of the reality of the classroom situation. In the worst cases, the classrooms were devoid of computers. Others did have a computer, but no modem or phone line. The gap between potential and actual learning in the classroom has become a source of frustration for a number of teachers. Some have been successful in getting their colleagues and administration to glimpse their vision and to start providing support in the form of hardware. Others have become more isolated from their colleagues, and are thinking of moving to technologically greener pastures.

2. ***What kind of math/science resources were found on the Internet? How easy was it to find and acquire these resources? Was the time spent perceived to be worthwhile? Which of the resources was perceived as being most useful?***

Reach for the Sky teachers tended to fall into one of two groups. The one group consisted of teachers who had spent a lot of time searching the Internet for resources, and were by and large pleased with what they had found. The other group did not spend much time on searching for or accessing resources, but rather used the Internet to participate in telecurricular activities and thus spent time on collecting, sharing and analyzing data. The two groups tended to be somewhat exclusive of each other, suggesting that time constraints forced teachers to set priorities.

Teachers who did invest time in searching the Internet for resources were pleased with what they had found, and felt that the investment was worthwhile. A list of resources cited is categorized and listed below. Numbers in parenthesis indicate how often a particular resource was cited.

Programs

- Live From Antarctica—Math/Science/Social Studies
- Interdisciplinary unit involving experts in the field and studying Antarctica.
- Where is Roger?—Tracking Roger through the Eastern Hemisphere, we spent the last semester tracking him through Australia and have contacted other schools around the world who were also on the list. (2)
- Geogame—A geography activity for Middle School kids. (2)
- MayaQuest—Students being able to interact with experts online in Central America seeking answers as to why the Maya civilizations have disappeared. We are going to compare this ancient civilization to other ancient civilizations we've already studied in Europe. (2)
- The Geometry Forum through which we get a Problem of the Week and a Project of the Month for the class or individuals to work on. The results are written and then returned to the forum. (2)

Graphics

- Space related (8)
- General or unspecified (6)

Lesson plans/Units

- Math (5)
- Science (3)
- General or unspecified (2)

Information

- Weather
- Edupage News
- Data for projects

- Math (2)
- General or unspecified (2)
- EdNet
- NIH
- NWREL

Software

- Volcanoes

Listservs or general help

- Ideas for the classroom (8)
- Middle schools (2)
- Math projects
- Science/environmental projects (2)
- Kidlink
- General knowledge (3)

Other

- Civil war letters
- Shakespeare
- Drama plays for elementary students
- Santa
- Firenet

The search tools employed by selected Reach for the Sky teachers were analyzed over a three month period. The results are shown in the table below. The figures in the cells represent total number of minutes spent using a particular search tool.

	January 1995	February 1995	March 1995
Home Page	100	85	305
Telnet	70	40	25
Gopher	120	280	70
Archie & Veronica	0	45	45
Lynx	80	360	855
FTP	40	260	230
Webcrawler	480	255	195

The Web is clearly the place teachers spent the most time browsing or seeking resources. However there is an interesting pattern. At the beginning of the period, the webcrawler was used to seek out unknown sources. By March, use of the webcrawler had decreased significantly, to be replaced by Lynx, which was used to go to specific sites on the Web.

FTP was the third most used search tool overall. All teachers had automatic access to the Big Sky Telegraph home page, which proved to be the fourth most used tool. The increase in the use of the home page suggests the same change in pattern noted earlier—the seeking out of resources from specific sites.

3. ***Can the resources found on the Internet, or access to the Internet in general, result in better classroom practice? In which ways does access to the Internet change ways in which teachers teach and learners learn?***

Ultimately, the worth of experimental projects like Reach for the Sky will be judged in terms of differences they make to the teaching and learning processes. Renewal in math and science education eventually needs to play out in the classroom if the project is to have any impact. Data gathered to date is based on self reported changes, gathered both by means of a questionnaire and an interview. Furthermore, four classrooms have been observed. Based on this data, Reach for the Sky teachers fall into two groups. The first and larger group reported some significant, in their estimation, changes to their teaching practice. The second group said that they recognized the potential for teaching differently, they were proceeding with caution and were still learning themselves. This second group envisioned making some kind of change to their teaching in the near future. Both changes to the way in which teachers teach and students learn were reported in the interviews. The changes to teaching styles and methods will be dealt with first.

A major difference in the way lessons are taught appears to be the use of resources which were not available previously. Resources that were mentioned included images and textual information. While the former tended to be used as visual aids, and viewed by the students passively, the latter tended to

be incorporated by the students in a more active manner in reports and discussions. The availability of these resources, in some instances, had a major impact on the content taught. For example, the availability of images from space led to a greater emphasis on this topic. Those teachers who were involved in telecollaborative activities during the Fall of 1994 reported on the data from other schools as an important resource. Finally programs such as Live from the Antarctica, Where is Roger?, and Geogame, where used, appeared to have made a major impact on classroom teaching.

A second major theme to emerge was that of personal growth, and more specifically the ability to overcome isolation and to incorporate more diversity in lessons taught. As one teacher put it, "I am more of a global person and very aware of what's going on in the rest of the world. I try to communicate that to my students so they realize what may be affecting their new found friends on different continents. We always try to find commonalities on all parts of the globe. I am much more aware as a person."

Personal growth was a theme touched on by a number of those interviewed. Specifically, teachers were able to consult scientists and other teachers for ideas and advice. Perhaps more importantly, they were able to bring the outside world into their own classrooms. Some teachers allowed their students to follow the activities of scientists from all over the world working in the Antarctica, and to pose questions to them. Others had the opportunity to follow Roger across Australia. Science, geography, math, social studies, and writing could all be incorporated into accounts of Roger's travels. One teacher capitalized on the fact that Roger declined to climb a rock sacred to the aboriginal people of Australia to initiate a discussion on sensitivity to cultural beliefs of others. Yet another way in which isolation was overcome was the provision of opportunities of students to communicate directly with other students in other parts of the country or world. In one school, each student was linked with a student teacher in a university methods course. This cross-age linkage proved to be exciting and beneficial to both groups. The university students discovered how much they had to learn about explaining math concepts using text only. Friendships were established that extended beyond the end of the course itself.

Third, some teachers reported that a major change was taking place in the way in which they taught. Lesson were becoming more student centered and less teacher directed. "I have been able to personalize my teaching more to the individual student through the items that I have gained access to through the Internet. The students have been getting more hands on resources during this time."

Students were being given more freedom to pursue topics of their own interest, which were often sparked by some resource found on the Internet. "It has made me a much better teacher! I have more resources out there on the Internet. I have gained a better understanding of my students needs. They are directing their education more than they ever did in my class before. I feel that I have much better connections with other teachers from around the world. My students have gained more of a world view of things, understanding other cultures and breaking down stereotypes."

Another example is that in math classes, students were challenged to find ways of expressing the data that they had collected instead of the teacher telling them what to do. Some teachers reported that they were seeing their role more as that of a facilitator, and that their style of teaching was becoming more investigative and inquiry oriented. "Much more innovative and relevant to student needs for the future. More student centered and focused on investigative type activities."

Teachers also reported on differences in ways in which students were learning. In some cases these changes were well underway, while in others they were envisaged rather than implemented. One overall way of looking at the change in learning was summed up in the words of one teacher who

quoted the old proverb, "Give me a fish and I eat for a day. Teach me to fish and I eat for a lifetime." While learning in the past has tended to concentrate on assimilating a body of knowledge (usually set out in a textbook), the Internet encourages students to become seekers of knowledge and teachers the facilitators of learning in this new mode.

Looking now at some of the specific points made by teachers. One overwhelming response was that the use of computers and Internet access was proving to be highly motivational. For example, the ability to download an image from a source many miles away fascinated students. Many were excited both by the computer itself, and by some of the other indirect changes that were occurring as a result of the technology available. "The biggest change is new ideas in the classroom. The students are more interested even though they are learning the same concepts they would have learned from the book. It has a whole new flavor with different approaches that the students enjoy and think of as 'new'."

A second major theme to emerge was that students were becoming independent explorers and were taking more responsibility for their own learning. Teachers claimed that the problem solving skills of their students were improving. Specifically, the use of real data gathered by the students themselves, sometimes in collaboration with other schools, has made a big difference in attitude towards math and in how learning occurs. As students became more responsible for the analysis of their data, they sought to make meaning of what they had found, rather than to follow a set algorithm to come up with the right answer. "Because we are collaborating with other schools, the students have a REAL audience and REAL reasons for accuracy." This theme was summed up by a teacher who said, "They will be doing more true science, not just the canned stuff."

Students were able to take charge of their own learning, to some extent, by the access to resources that were not previously available. In some cases these resources were found and explored online. In other cases, they were available on CDs provided through the Microsoft partnership. Students were able to do independent research on topics of interest to them because of access to information previously unavailable to small, rural schools.

Third, greater collaboration between students was reported by some teachers. Many of the telecollaborative projects, as well as those found on place like the Geometry forum, required students to work in groups to come up with a solution to a problem. This solution would then be posted and viewed by students in other schools.

Students in some of the schools had direct access to e-mail, while others had to send messages through the teacher. In either case, students were able to reach out to the world beyond themselves and their own community. To many of them, contact with other schools in Montana was as novel as being able to communicate with Estonian students.

Hence it would appear that students are becoming independent learners to some extent. However, a caution was sounded by one teacher. He reported that students are more inclined to explore and 'surf' than to specifically mine the resource for information to do with an identified research question.

The MSU Technology Exploration Center: Design Principles for a Collaborative Learning Environment

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Key words: technology, collaborative learning, discourse, e-mail, world wide web

Abstract

The MSU College of Education is creating a Technology Exploration Center designed to enable children, teacher education students, faculty and inservice teachers to explore uses of technology together in a playful, supportive environment. Our Tel•Ed 95 presentation will focus attention on the design issues conducive to creating collaborative learning environments for professional development and teacher training through a demonstration of the Technology Exploration Center's presence on the World Wide Web and a videotape tour of the TEC.

Design Principles

We believe that the challenge of learning to use technology differs in important ways from other domains of knowledge, especially with its dependence on access to tools that are changing rapidly and broadening in scope and capacity. The design principles which address these differences must include attention to the motivational, affective and social dimensions as well as the cognitive and pragmatic. Among the design principles embodied in this Center are cross-age and cross-role collaboration, linkage to faculty and student offices and classrooms, ongoing partnerships with hardware and software companies, legislators, and school districts, use of technology to support learning about technology (including expert systems, two-way interactive video conferencing, and C.U.-See Me type linkages with cooperating schools), and using the Internet to make knowledge gathered in the Center accessible from anywhere.

Beginning in the fall semester of 1995, this Center will become an integral part of our teacher preparation program. The Technology Exploration Center differs by design from the typical computer classroom or laboratory as it is designed to foreground applications of technology to subject matter areas. Specific stations are devoted to specific subject matters, including science, mathematics, and social studies among others. We intend these designated stations to become the focal points for social networks and discourse communities taking place in the center as well as on line through linkages with school districts, museums, public and cable television, libraries and other resources. By using telecommunications such as electronic mail, network access to databases, video conferencing with distant sites, and bulletin boards to enhance the practice of teaching, we hope to create discourse communities in the building, the state and beyond.

Enriching High School Biology Curriculum: A Lunar Simulation Project

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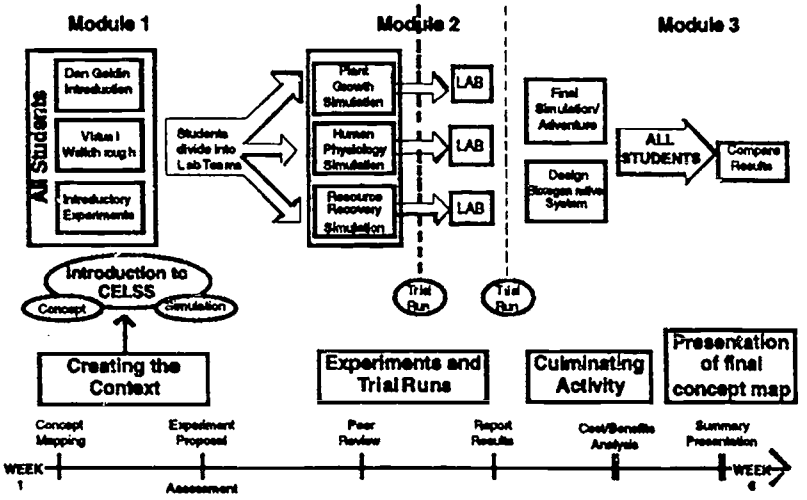
Abstract

This research and development project will design, develop, and assess a nine-week biology curriculum project called BioBLAST which will address the national science education reform goals and promote increased student understanding of high order biological literacy standards. BioBLAST will augment the existing high school biology curriculum with activities that have students using multimedia resources and network technologies within the context of studying basic biological processes that sustain life on earth and potentially in space. In this project students will be designing a regenerative life support system for a lunar base. Students will have access to simulations, reference materials, and data from NASA life sciences research to conduct their own investigations in the classroom and to design their own life support system.

The purpose of this project is to provide a model, grounded in a constructivist view of teaching and learning, of how strategic application of current educational technologies can extend, enhance, and improve high school biology curriculum. Scientists and educators involved in the national educational reform movement have strongly recommended that curriculum developers and science teachers completely redefine biological sciences curriculum to address key concepts through student-centered, problem-solving activities. The NASA Controlled Environment Life Support System (CELSS) research suggests ways to help young people better understand themselves and key life science concepts through an integrated study of humans as a viable species which lives and adapts to complex worlds through interactions with natural, technological, and social systems. Figure 1 provides an overview of the structure of activities included in the BioBLAST project curriculum.

Figure 1



A diagram of the sequence of curriculum activities included in the BioBLAST project.

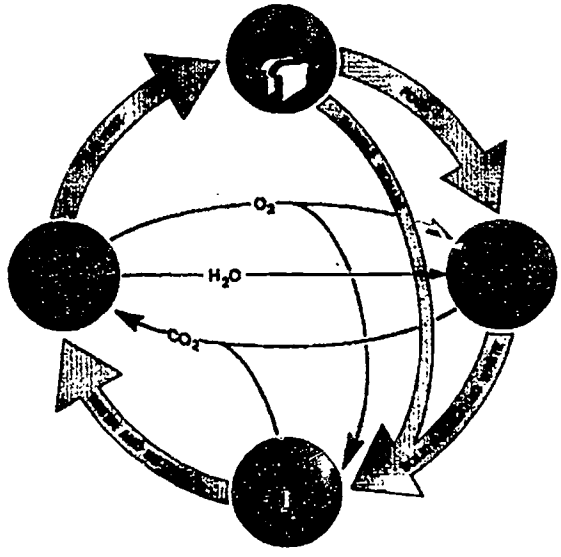
The BioBLAST project scenario begins by having students participate in a NASA research mission conducted on a lunar base. Students must apply their conceptual knowledge and laboratory research skills to sustain themselves and their crew members by designing a life support system that can function on the moon. In the course of this mission students will study plant physiology, human physiology and nutrition, and resource recovery requirements in order to design a bioregenerative system that can sustain human life for an extended period of time.

The diagram shown in Figure 2 illustrates the key biological concepts addressed in this multimedia project. In the course of this project students will design and test their ideas regarding what should be included in a closed, regenerative, and sustained habitat to support human life on a harsh extraterrestrial location such as the moon. The problem-solving activities included in the BioBLAST project augment the existing high school biology curriculum in ways that will:

- Engage students in doing science and learning about the methods and processes of scientific research through student-centered, investigative, and hands-on research experiences.

- Explore the integrated use of multimedia resources and network technologies within the context of a defined set of educational goals to increase understanding of how new applications of educational technologies alter and enrich the teaching/learning environment.
- Explore the use of multimedia mentoring with students, teachers, and NASA scientists providing input for the creation of "artificial agent" mentors.
- Explore the use of electronically filtered interaction with NASA CELSS scientists and engineers.
- Develop a set of issue-centered problems and resources that will engage research teams in student-driven projects, thereby allowing educators the opportunity to become "senior research mentors" rather than didactic sources of information.
- Develop assessment tools suitable to the content goals and which include use of technologies and collaborative tasks addressed within this project.

Figure 2



This diagram represents the inter-related concepts students will come to understand through this project.

Students participating in BioBLAST will participate in a long-term, self-sustaining lunar mission. Within the context of this survival "game" scenario, various multimedia components, with some amount of "intelligence" to respond to student inquiries, will be available to the student researchers to provide mentoring and guidance. In addition to using the multimedia software, students will keep journals of their work and engage in off-computer activities including conducting experiments, and participating in team and cross-classroom presentations/critiques of procedures, results, and conclusions. By participating in this project students will be given opportunities to obtain multidimensional understanding of biological concepts which will be useful throughout their lives.

Using Computer-Mediated Communication Networks to Teach Problem Solving and Theoretical Concepts

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Key words: network discussions, student participation, biology, telecommunications

Abstract

This research study describes the social characteristics of student-to-student and teacher-student interactions that occurred within a computer-mediated communication environment situated within a plant science lab. This presentation will discuss how computer-based discussions were used to facilitate and record student applications of abstract concepts to particular research problems. The activity described in this study shows how computer-based discussions can be used to structure, guide, and observe student participation, interaction, and regulation, in a computer-mediated environment.

Aims

Computer-based learning and communication modules offer a unique capacity to support group collaborative work that is not time or place dependent, can support variable response rates, and can manage multi-leveled topical themes simultaneously. This study provides a detailed description of the social characteristics of student-to-teacher and peer interactions as they occurred in electronic discussions and in face-to-face interchanges. The goal of this study was to show how computer-based discussions can be used to structure, guide, and observe student-teacher and peer interactions.

This study was grounded in the constructivist theoretical perspective which suggests that cognitive growth involves internalizations and transformations of social interactions among students and their teacher. The classroom social relations observed and interpreted in this study were mediated by cultural tools which in this case included eight networked computers. The electronic discourse created among and between students and their teacher was viewed as an external device through which student learning was materialized and could be interpreted.

Introduction to the Setting

The Physical Setting: The computers, monitors, videodisk players, and video display monitors were mounted on a wooden beam above the lab table. The keyboards and mouse devices were used on the lab table surface in the Plant Science Lab.

The Instructional Setting: (1) Each lab started with a computer-based introduction to the concepts to be covered in the lab exercises for that day which gave students a visual introduction to plant characteristics and processes which would be examined in live plant specimens. (2) Most of the class period was allocated to hands-on work with live plants. These "wet lab" exercises were designed to simulate current plant science research. (3) The final thirty minutes of class was set aside for a computer-based discussion designed to relate the topics covered in the lab to a research investigation discussed in current news or to a socio/political issue related to plant processes or species covered in lab.

The Computer Interface: The Daedalus Integrated Writing Environment (Trademark) network software was used for the in-class, synchronous discussion. A sample screen showing the Daedalus Interchange program in Figure 1, provided a linear text representation of real-time, in-class group discussion. As shown in Figure 1, all participant comments are tagged with the sender's name and can readily be distinguished in the linear, scrollable list of messages.

Methodology

A critical activity referred to as the "capstone event" was devised to capture multiple perspectives of students interactions and attitudes. This event was designed to occur when students were comfortable with the technology and when the instructor had gained some confidence in creating appropriate assignments for students that would relate well to the overall objectives for each lab. The capstone event was constructed to provide a triangulation of raw data sources for in-depth analysis of student interactions from within the electronic community created by the computer network. Three different coding systems were used to analyze the computer-based discussions:

- Coding messages by content, rhetorical strategies, and according to social characteristics (Bales, 1950/1976).
- Using quantitative measures of participation and interaction (Butler, 1993).
- Message Flow Analysis: Initiation, Response, Evaluation Sequence (Flanders, 1970; Levin, Kim, & Riel, 1990)

Each method for coding the transcripts provided different ways of interpreting the student on-line interactions.

The capstone date consisted of

- individual student rating scores & comments (before the group discussion),
- electronic transcript of the on-line discussion after the individual rating,
- individual student rating scores & comments (after the group discussion),
- student responses to a written questionnaire about the use of the electronic interchange as a method for a class discussion, and

- Observations of student face-to-face interactions during these activities.

Results

The results are described in terms of two key research questions.

Question 1

What are the characteristics of student participation and interaction in the computer-mediated environment? Increased participation—especially by students who never or rarely participate in the face-to-face environment. This was documented through observation of student interactions in the face-to-face setting. Students exhibit variable styles of adapting to the sense of anonymity and privacy characteristic of the CMC interface. This is documented through comparisons of the face-to-face and on-line participation of particular students. Student interactions demonstrate a shift in status from that observed in the traditional, face-to-face setting. This was noted in student responses on the written questionnaires and by comparing levels of participation and initiation. Multiple threads of discussion occur simultaneously which is positively accepted by some students and causes confusion for others. This was also noted in student responses on the written questionnaires and by comparing levels of participation and initiation.

Question 2

What kind of impact does the use of computer-mediated communication (CMC) in the classroom setting have on student learning? Students reported an increased understanding of computers and how they can be used. Students were observed to use the computers with fewer interventions during the lab. Student participation in the CMC discussions showed more student initiation and evaluation comments rather than just responses to teacher questions. Students reported a benefit of using CMC was that they had increased access to asking their instructor questions in this environment. Students shared more ideas and benefited by being able to share early ideas and by reading those expressed by their peers.

Conclusions

We can observe how the classroom experience is fundamentally changing for both students and teachers by applying participant observation methods to evaluate initial adoptions of computer-based communication technologies into real course settings. The unique opportunities to support group collaborative work via electronic network resources is not time or place dependent, can support variable response rates, and can manage multi-leveled topical themes simultaneously.

The characteristics of increased anonymity and privacy associated with CMC have been shown to have a great impact on the social structure of the groups (Dubrovsky, Kiesler, & Sethna, 1991; Hartman et al., 1991; Myers, 1987). In the case of the Plant Science Lab, the Daedalus on-line discussions encouraged and made it easier for all students to participate and share their ideas.

Social conventions for participation and interaction in the computer-based interactive writing activities were influenced by: (1) media characteristics (which was documented in student comments and is consistent with prior research); (2) instructor behavior exhibited in the CMC discussions (this characteristic is interpreted from comparisons across two different classes which both used similar CMC activities, but which had different instructors); (3) nature of the topic (which was documented through comparisons across different interchanges); and (4) comments by peers (which was documented in the analysis of peer review rating scores, comments about the rating activity in mail messages, and changes in participation observable in the message flow diagrams).

As pointed out in prior research, knowledge of subject matter, level of recall, and interest in a given subject matter are strongly related (Alexander, Kulikowich, & Schulze, 1994). Our qualitative assessment of the use of Daedalus in the Plant Science Lab suggests some further investigation of this relationship. We found that those students who felt that this course encouraged their interest in a future career in biology were also the same students who felt that the use of the Daedalus Interchanges should become an on-going part of this course. This supports the cognitive theories that suggest that mental effort required to understand and assimilate abstract concepts normally requires that an individual have some interest in that subject area, and that this higher level of learning will be passed over when a student lacks a genuine interest in the content material.

The Plant Science Lab used Daedalus as a way to engage students in some higher order thinking and problem solving activities. Our observations of students in this class showed that those with a personal interest in the subject, enjoyed these activities more than those who were less interested in the subject. A question raised by this finding is whether the electronic discussions stimulated interest in the subject matter in those students who might not have otherwise realized they could enjoy biology. Further study is needed to explore these and other questions.

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Teacher Education and the International Use of Internet

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Key words: telecommunications, teacher education, international, Chatback, European Schools Project

Abstract

The growth of interest in the use of Internet for education has led to high expectations for users of e-e-mail. Almost instant communication has meant that our new generation of computer literate students (with their teachers hanging onto their coat-tails) are making electronic voyages of discovery that were inconceivable just five years ago.

How can we use this new enthusiasm in the classroom? What do you say after you've said "hello"? The Chatback Foundation of England has been using this medium for eight years now, and in partnership with ConnSENSE (Connecticut Special Education Network for Software Evaluation) in the USA, these organizations have refined some of the skills that new teachers will find useful when venturing onto the Internet. We're attempting to train future teachers to go beyond the usual computer literacy and know how to use Internet in their classrooms for maximum benefit.

During the summer of 1995 graduate students in a course on Internet developed several new projects to be incorporated into the Chatback format. Key features of successful work done in the USA and the schools of the European Schools Project (ESP) and Chatback in the UK are detailed including descriptions of a number of Chatback and ESP projects. Two of the new projects developed in the Internet course (Way Kool Software Reviews and Eco Surfers) and the Memories of 1944/45 Project are presented in greater detail.

Way Kool Software Reviews

This project teams up juniors in the University of Connecticut's teacher training program enrolled in an educational technology module with youngsters, parents, and teachers in the U.S. and beyond. Children of any age, parents, and teachers are encouraged to submit reviews of software they are using at home or in school. Special evaluation forms will be available. The UConn students manage the collection and dissemination of the software reviews through a listserv and the World Wide Web.

Eco Surfers

This project consists of a series of recycling projects involving elementary and secondary students world wide and University of Connecticut prospective teachers. It is run on a listserv in which students are encouraged to report on successful and innovative recycling projects. In addition, there is an electronic recycling newsletter, and a poster contest on recycling. Various social questions concerning the ethics and economics of recycling are posed to members of the listserv.

Memories of 1944/45

Since it's now 50 years since World War II, Chatback wanted young people to learn about that conflict from those who experienced it. In Tom's words, "We are a living history book. We have passed

beyond the hatreds that we suffered at the time. We tell our stories now in the hope that you will learn from it, and will realize that conflicts on this scale do not solve problems."

Chatback has assembled a group of 10 people who were around during the war years. These 10 people compose The Panel of Elders. They consist of (a) the Land Girl, (b) the Berlin Schoolboy, (c) the London Schoolboy, (d) the Viennese Schoolgirl, (e) the Survivor—A woman who was taken to the Auschwitz concentration camp, (f) the Nurse, (g) the American Soldier, and (h) the Croatian Soldier. Once the Memories of 1944 project was announced, students from all over the world began asking the Elders questions about the war years through a listserv.

A history book or a movie or a videotape might be able to provide this information. However, Memories of 1944/45 is so current, so alive, so personal. There's nothing like it!

Journey Beyond the Walls: Integrating Internet into the Elementary Classroom

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Abstract

Nederland Elementary , a rural school located in the mountains of Colorado, is engaged in exploring the possibilities of using Internet in a K-6 setting. Support in this venture has come through creating strong partnerships with Boulder Valley School District, Annenberg/CPB and US West. Our project is appropriately called Creating Connections.

The important lesson we have learned and will share in this presentation covers three major areas: 1) Access, 2) Training, and 3) Curriculum development

Access
The school district provided Nederland Elementary with high speed lines enabling us to give instruction of Internet tools in a lab setting and use of Internet within the curriculum in a classroom setting. This luxury level of connectivity together with high-end computers and graphic-based software has made Internet accessible to young children. I will share how this set-up works and why it is important in an elementary environment.

Training and Support
A very successful training program developed by the Boulder Valley Internet Project provided the framework to begin to bring staff and students online. This program combined with on-going support

established the foundation to begin curriculum investigations. An overview of the program will be outlined.

Curriculum Development

The issue of curriculum is massive and a large hurdle due to its open and abstract nature. In order to truly integrate Internet into curriculum, it became apparent that we needed to look at the structure of the classroom itself. By studying the elements of successful efforts of reform we found many possible solutions to difficult situations. Key elements include collaboration, community, teaching for understanding and making education meaningful for the student. Working with these essentials, we are restructuring the normal delivery of curriculum and developing three curriculum models that can be applied to any subject. Examples of curriculum using each of the models will be highlights.

In support of curriculum, a database named SAMI (Science and Math Initiative) was created. Located on the World Wide Web, SAMI is a solid place for educators to gin their Internet travels. Realizing time is sparse and Internet resources abundant, SAMI is designed to allow the K-12 community time efficient explorations. A short demonstration of SAMI and directions on how to access SAMI will be provided.

Enhancing Curriculum and Instruction Through Star School Programs

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Key words: star schools, distance learning, technology, instruction, staff development

Abstract

This curriculum and telecommunications workshop will share curricular resources available through the Star Schools program. Star Schools projects transmit elementary and secondary level curriculum modules by satellite and through other telecommunications systems. Ways in which Star Schools programs can contribute to instructional program quality and educational reform will be shared.

Description

Star Schools Distance Education Projects produce and transmit elementary and secondary level curriculum modules by satellite and through other telecommunications systems. Studio teachers provide instruction via satellite, computer, or other electronic means. On-site teachers then work collaboratively with studio teachers to support and extend student learning. Resource materials and teacher training are also available. Star Schools projects are funded by the United States Department of Education.

Participants will learn more about programming and other curricular resources that are available through Star Schools projects. Strategies for utilizing Star Schools programs and resources as part of a curricular program will be discussed. Technology and distance learning can greatly enhance curriculum and instruction, and ways in which Star Schools programming and teaching strategies can contribute to instructional program quality and educational reform will also be shared. Collaborative approaches which are incorporated into Star Schools programs will be presented. Star Schools programs encourage collaboration between the classroom teacher and studio teacher, among students at the same site, among students in different locations, and among groups of teachers. Teacher training and parent education are also important components of Star Schools projects.

All currently funded Star Schools programs will be shared during the presentation. These include seven general Distance Learning Education Projects, one Statewide Network project, and three Dissemination projects. The current Distance Education Projects are Connections 2000, TEAMS Distance Learning, Los Angeles County Office of Education, Los Angeles California; Four Corners Distance Learning Network, College of Eastern Utah, Blanding, Utah; Healthlinks, Massachusetts Corporation for Educational Telecommunications (MCET), Cambridge, Massachusetts; Star Schools: The Next Generation, Oklahoma State University, Stillwater, Oklahoma/Northern Arizona University, Flagstaff, Arizona; Pacific Star Schools Partnership, Educational Service District 101, Spokane, Washington; Star Link, Ana G. Menendez University System, San Juan, Puerto Rico; United Star Distance Learning Consortium, Education Service Region 20, San Antonio, Texas. The Statewide Network which is currently funded is the Kentucky Telelinking Network, Commonwealth of Kentucky, Frankfort, Kentucky.

A Galaxy of Resources: Getting Started With Star Schools

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Key words: star schools, distance learning, technology, instruction, staff development

Abstract

This workshop shares distance learning resources available through the Star Schools program. Star Schools projects produce and transmit elementary and secondary level curriculum modules via satellite and computer. Programming clips and online resources will be shared, along with strategies for getting started and successfully implementing distance learning programs.

Description

Star Schools Distance Education Projects produce and transmit elementary and secondary level curriculum modules by satellite and through other telecommunications systems. Studio teachers provide instruction via satellite, computer, or other electronic means. On-site teachers then work collaboratively with studio teachers to support and extend student learning. Resource materials and teacher training are also available. Star Schools projects are funded by the United States Department of Education.

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Repurposing Internet Resources Using Toolbook Authoring Software

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Key words: Internet, toolbook, repurposing, tutorial

Abstract

This presentation provides examples of how colleges with limited Internet access can use Toolbook, a feature rich, object oriented authoring system, to re-purpose Internet resources. Repurposed Toolbooks include a simulated African art exhibit, workbooks on race and affirmative action, a hypertext study on black intellectuals and tutorials on "What Color is Black" and "Drug Abuse."

Repurposed Internet Resources

The Internet offers a rich source of data that can be used in the teaching and learning process; however, for schools and colleges with limited or no access to the Internet one needs to devise alternative methods for utilizing online resources. One method I have developed is the creation of Toolbook tutorials based on online resources. Toolbook requires little or no programming skills. Similar to the Macintosh's Hypercard, Toolbook allows me to create an interactive, hypermedia tutorial using the easy to understand metaphor of a book.

I have developed several Toolbooks which I will demonstrate. These include:

- An African Art Exhibit which has graphics and text from the University of Virginia's online art gallery;
- Workbooks on Race and Affirmative Action based on materials downloaded from *Newsweek*'s online magazine;
- Tutorials based on a *Newsweek* feature article "What Color is Black?" and an online encyclopedia article on "Drug Abuse"; and
- A hypertext study of Black Intellectuals based on a paper done by a Florida Memorial history professor and "The New Intellectuals" feature article in the March 1995 issue of *Atlantic Monthly*.

Each of the above Toolbook applications allowed me to present material which otherwise would not be available to students and faculty at Florida Memorial, a historically black liberal arts college located in Miami, Florida. The college does not have a direct link to the Internet; therefore, I have purchased a SLIP Internet account from a local provider. This allows me to use the World Wide Web to search for stimulating academic resources and re purpose them using Toolbook. Faculty working with Hypercard or Linkway could produce similar tutorials. I will demonstrate the tutorial template I created to aid faculty who want to repurpose their own materials.

Equal Access

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Key words: network, Internet, access

Abstract

During the 1994-95 school year, Tennessee awarded innovative technology grants to school districts on a competitive basis. The Bledsoe County School System was awarded funding for the proposal Equal Access to ensure that students from a small, rural school system which was served by a private telephone cooperative could have the same opportunities for learning via the electronic highway as large metropolitan areas. (Small rural communities served by private telephone cooperatives do not have direct calling access to metropolitan areas; therefore, any use of Internet by the educational community requires a long distance rate).

This project established a wide area network serving the entire school district. Classrooms were linked, schools were linked to each other, and all were networked to the superintendent's office and teacher training site. IP addresses were issued to a main server at the superintendent's office allowing Internet access from that server.

The National Plan for Educational Technology: What's Next?

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Key words: technology, planning, national, federal

Abstract

The National Long-Range Plan for Educational Technology was released by the U.S. Department of Education this fall after a year of gathering input from the education community. This session will present an overview of the plan and ask for feedback and discussion from the audience.

The Department of Education's Online Library

Under the Improving America's Schools Act, the U.S. Department of Education was charged with drafting a national long-range plan for educational technology for the Secretary to present to the President and to Congress this fall.

The Office of Educational Technology spent over a year gathering input from teachers, students, parents, teacher educators, staff developers, administrators, school boards, and the business sector in workshops, panels, focus groups, public hearings, and online forums.

The educational community told us what we needed to know: the vision for technology and learning, the barriers to integrating educational technology, the issues this country should address, and some solutions that have worked in some places.

We've assimilated this knowledge, which is really the best thinking of everyone who cares about technology's impact on learning and drafted a plan. The questions now are: Did we get it right? and Where do we (as a nation) go from here?

This session will present an overview of the plan and ask for feedback and discussion from the audience.

SAMI—A World Wide Web Resource for All Educators

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Key words: math, science, standards, education, resources, funding, Internet

Abstract

The Creating Connections project, sponsored by the Boulder Valley School District, seeks to meet two needs of the rural education population. The first is to connect rural teachers using telecommunications by providing Internet training at twenty regional training centers nationwide and follow up support for two years of support. The second goal is to provide rural teachers with an easy-to-use Internet accessible database of information both on math and science reform initiatives and Internet accessible math and science data as well as supporting other educational areas. The Project is supported by the Annenberg/CPB Math and Science Project, the US West Foundation, the National Science Foundation, the Boulder Valley School District and the University of Colorado at Boulder.

One of the most substantial means of support which the project offers to rural teachers is the Science And Math Initiatives (SAMI) database . Many rural teachers pay long distance charges or high 1-800 charges to access the Internet and "surfing the net" is not feasible at these hourly fees. SAMI is designed to centralize pointers to the most useful math, science and other educational resources so that teachers don't have to spend money and time searching the network. SAMI also contains other information specifically pertinent to rural areas and resources for grant funding. It has been designed as a one stop shopping center for educators.

In order to support math and science reform in rural classrooms, the Creating Connections staff and participants are establishing a resource on SAMI called "SAMISM" or "SAMI-Solve-Me" problems. This section of SAMI has been created to provide math and science challenges for students and teachers at all levels and to support teachers in their implementation of national standards in the classroom. The challenges will be linked to the national math and science standards and will demonstrate performance assessment and the use of rubrics.

Solutions are invited from teachers and their students. Several solutions to each challenge will be published on SAMI and the names of the student, teacher and the school will be included with the solution. Teachers and students are also encouraged to submit SAMISM challenge questions.

SAMI can be reached by using a world wide web browser to access http://www.c3.lanl.gov/-jspeck/SAMI-home.html or users can Telnet to bcn.boulder.co.us and login as "ban". SAMI can be found under the Education Center and Boulder Valley School District. John Speckien is the "curator" of SAMI. He is supported by the technical expertise and resources of the Los Alamos National Laboratory which houses the database on one of their machines.

The Arts and Humanities: Training, Tools, and Resources for Teachers

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Key words: arts, assessment, curriculum, diversity, humanities, interdisciplinary, standards

Abstract

The arts are core subject areas as defined in recent education reform policies and initiatives. Technology is playing a key role in the development of tools and resources for bringing the arts into educational programs and practices at all levels. The Kennedy Center, with support from the National Endowment for the Arts and the U.S. Department of Education, established a national arts and education network, ArtsEdge, to help guide the integration of arts, education, and technology that is meaningful and useful for teachers and artist-educators.

The research and prototype development completed for the ArtsEdge network resulted in the following conclusions: Teachers are looking for primary source materials and information drawn from the arts and humanities that can be used directly by students and/or in conjunction with curriculum development. Teachers need assistance in locating such resources as well as guidance for integrating arts and humanities with other resources to achieve educational goals and objectives (whether for discipline-specific or interdisciplinary objectives). Technology provides a mechanism for helping teachers to gain the knowledge, understanding, and tools necessary for planning, implementing and assessing arts-based activities that link with new national standards for the arts (and related arts curriculum frameworks at state and local levels).

ArtsEdge

ArtsEdge is a WWW site that can be reached at <http://artsedge.kennedy-center.org>. It hosts opportunities for teachers and other interested individuals to share information and ideas through online discussion groups as well as to contribute to the development of arts education information and resource databases. A Curriculum Connections area provides teachers with instructional models, resources, and professional development opportunities to assist them with arts-based curriculum design and implementation. The network also serves as a global clearinghouse to help young people and adults who seek educational information and resources in the visual and performing arts.

The California Arts Project

The California Arts Project (TCAP) is one of nine state-funded subject area projects based on a teachers-teaching-teachers model. TCAP has designed Arts Education Online (AEOL) as a statewide electronic network to provide teachers with opportunities to participate in online arts education focus groups (e.g. aesthetics, assessment, diversity, curriculum planning) as well as access to arts-based information and resources that are easily accessible and/or directly related to statewide educational goals and objectives.

Kennedy Center IMAGINATION CELEBRATION at Fort Worth

The Kennedy Center IMAGINATION CELEBRATION (KCIC) represents a six-year collaboration between the unified school district and cultural institutions in Fort Worth to ensure that students and their families participate in arts education programs on a year round basis. A local arts education BBS is provided the means for documenting, disseminating, and marketing the important arts and cultural opportunities that are available to the diverse population comprising Fort Worth.

There are other field sites, institutions, organizations, and individuals who are currently contributing to the development of the ArtsEdge network as well as other technology-based strategies (e.g. teleconferencing) for teaching teachers how to integrate the arts in education. Teachers are encouraged to access the network or contact ArtsEdge staff to learn more about opportunities and incentives to participate in this evolving online arts education community and clearinghouse.

Conceptual Frameworks for the Implementation and Use of Information Servers

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Key words: information servers, Internet, collaborative learning, K-12

Abstract

Recent developments in information servers and collaborative learning have demonstrated the educational potential of the Internet. Information servers provide forums for students and teachers to be producers and mediators of knowledge within authentic learning contexts. We will describe exemplary servers and a framework for research and use in K-12 settings.

During the past four years, client-server technologies have fostered an exponential growth in the number of information servers on the Internet. At the same time, new models of collaborative learning and distributed problem solving have changed the way in which teachers use network technology in K-12 curricula. Together, these two developments have demonstrated the educational potential of the Internet. However, research is needed to qualify the nature of server-mediated collaboration and to evaluate the implications for teaching and learning. Information servers provide a means for students and teachers to be producers and mediators of knowledge within authentic learning contexts. The projects described in this session help build a framework for continued research on educational information servers.

Web66: A server for empowering K-12 students on the Internet
Stephen Collins and Christine Collins

Hillside Elementary School, in collaboration with the University of Minnesota College of Education, had sixth-grade students create one of the first K-12 Web servers. Our goal has been to integrate the use of the Internet, and specifically Web resources, into the K-6 curriculum by having students use computers for research, communication, and collaboration. We expanded this project to include Web66, a server which links schools throughout the world for collaborative work and helps teachers and students find curricular resources and tools. We will describe our experiences integrating the Internet into the curriculum.

The Illinois Learning Mosaic and other multi-district information servers
Sandy Levin and Scott Lathrop

The Illinois Learning Mosaic is a prototype server that organizes information about educational programs and resources across Illinois. Other servers support a variety of projects conducted by NCSA's Education and Outreach Group. We will describe various efforts underway to create and organize educational resources available to K12 classrooms, and their impact on K12 teachers and students.

Implementing distributed authorship as a model for an Internet server
Pia Bombardier and Matthew Stuve
The UIUC Learning Resource Server (LRS) contains information related to the instructional, research, and service missions of the College of Education. This server is composed of resources provided by numerous staff, faculty, and students within the College from local K-12 schools using a model of distributed authorship. The LRS represents the realization of a suite of desktop server technologies that are feasible and scaleable in a K-12 setting.

Lenses on the Local Information Infrastructure
Beverly Hunter
Currently, information and other resources on the Internet are organized from an information provider's point of view. The framework for this presentation is individual and group users' lenses on the local information infrastructure, with an emphasis on teachers. Three examples of such lenses include curriculum frameworks, project plans, and assessment tasks. We will consider tools, processes, and organizing structures for constructing, archiving, and modifying such lenses.

Knowledge spaces, hypertext, and network learning environments
Michael Jacobson, James Levin, Youngcook Jun and Yasuhiro Uno
New information servers make a whole spectrum of knowledge available, ranging from personal to globally shared. We have developed hypertextual and intelligent network software tools to facilitate productive learning interactions over network learning environments. We will describe those tools and discuss a conceptual framework for addressing the role they can play in promoting substantive learning in distributed network environments.

Using a Distributed Authoring Model with a Desktop Internet Server

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Key words: information servers, distributed authorship, Internet, knowledge spaces

Abstract

In the past year, Gopher and World Wide Web servers have become very easy to set up and manage on desktop computers. We have developed a model for implementing server-mediated collaboration and will demonstrate the features of the UIUC Learning Resource Server and how distributed authorship is facilitated.

However, the multi-user access that Unix-based servers offer have not been systematically replicated on desktop systems. We have developed a model for facilitating server-mediated collaboration using desktop computers.

This Distributed Authoring Information Server (DAISy) model is based on the notion that all members in a learning community can participate in the construction of knowledge resources. To do this, each member, or a collaboration of members, can publish their works on a mutually accessible server without having to run a separate server. In this way, the server is centralized in how it is maintained, but it is decentralized in how information is shared. The DAISy model relies on client-server technologies to work. The server is the "publishing" agent, and the client software is the "authoring" agent. The negotiation of who or what gets published depends on the structure of the learning community (or communities).

The Learning Resource Server (LRS) is a realization of this distributed authorship model. The LRS is a repository of information pertaining to teaching and learning. That information can come in many forms, such as text, images, sounds, databases, and links to other relevant servers. Those resources can be published by members of the learning community itself. In this way, the LRS represents a "shared knowledge space", where geographically distributed communities of learners and teachers can exchange instructional resources. The LRS can also be thought of as a "window" on a community of teachers and learners. Their projects and activities can be shared with their peers around the world.

In our model, authorship is distributed by granting write-access privileges to specific portions of the server(s) to the authors. The authors use LAN-based file-sharing technologies to publish their resources on the remote server at their own discretion.

Education and Business Internet Partnership (Kids Talking to Kids)

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Key words: business/school partnership, Internet access, teacher training, security guidelines

Abstract

In the fall of 1993, Battelle Pacific Northwest Laboratory provided the Kennewick School District with a free local access phone number and gateway onto the Internet for the duration of two years. In return, our District was to provide a framework for support and training.

A Building Internet Liaison program was created as part of our district support. A security awareness workshop was developed, Internet instruction classes, and a procedure for sharing projects with Battelle were all implemented.

The guidelines for the partnership evolved from the Secretary of Energy Notice, SEN-23-90. This encourages DOE (Department of Energy) offices and contractors to provide technical assistance and support to improve precollege science and mathematics education through employee participation for schools involved in formal partnerships with DOE facilities and offices.

Battelle operates the Pacific Northwest Laboratory (PNL) under contract to the US Department of Energy (DOE). PNL provides access to the Internet using spare backup equipment. They have provided initial training for the Internet Liaisons and guidance for computer security training. The purpose of our partnership was to provide a password to all staff members who wanted access to the Internet.

Although students were not issued passwords many teachers provided opportunities for students to participate in a wide variety of projects. The long range goal of our partnership was for participants to become proficient with the integration of telecommunications, specifically on-line searching, electronic mail and conferencing.

All twenty-one buildings in our district have a minimum of one phone line dedicated for modem use. Some schools have more and tow schools are using a wireless modem. Currently, over 450 staff members have participated in the security awareness training and have received a password.

The quality and value of on-line information has been demonstrated and the opportunities exist. The challenge is to help teachers and students search for information in an efficient way, to evaluate what they find, and use it to extend their knowledge. Our partnership with Battelle has helped us meet this challenge.

During this session information on establishing a school/business partnership, the Internet Liaison concept, training materials, and various projects at all three levels will be shared, as well as what will happen after the duration of our partnership.

Responsibilities of Building Internet Liaison

- To participate in the training that Battelle and the District will provide.
- To read all the material they are provided about the Internet.
- To log on the Internet and explore possibilities.
- To plan activities and lessons for students for 1993-94 and 1994-95 school years.
- To integrate use of the Internet into their curriculum.
- To provide training and instruction for using the Internet to other interested teachers in their building (94).
- To be the contact person, trainer, and trouble shooter for other teachers as they work on the Internet.
- To write a report (hopefully with students) about what they are doing, how they are using it and what educational value or successes have been obtained by integrating the use of the Internet into their curriculum.
- To follow and promote "Online Etiquette" Rules.

Clovis Crawfish—Alive, Not Fried

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Key words: telecommunications, reading, writing, collaborative learning

Abstract

Elementary students used telecommunications to correspond with local storybook hero Clovis Crawfish. A team of educators composed responses. The exchanges were done in a modified "conference" format. The project promoted the virtues of reading and increased student's writing skills through providing them with a meaningful task with a real audience.

Project Overview

Students at local elementary schools used telecommunications to correspond with storybook characters. A favorite character was Clovis Crawfish, the main character in a series of books which focused on the local Louisiana heritage. First graders and fifth graders working together composed messages to Clovis. A collaborative team including the school librarian and a local teacher from the Cajun Country of Louisiana collaborated to respond to the messages. The responses were structured to include the true flavor of Clovis—including phrases, voice, and style which the crustacean might use. In addition, children were encouraged to read other Clovis books to learn more about their area of interest or for enjoyment. The exchange was a done in a modified "conference" format. All of the exchanges were printed and displayed in classrooms in the school so that students could read them. This helped students to get ideas for their own messages and to feel like they were part of the dialogue.

Project Objectives

The project was developed to increase student's reading and writing skills through providing them with a purposeful and meaningful task. They had a real audience for their work, rather than performing simply for a grade. The project also promoted the virtues of reading and provided students with a purpose for reading that was fun and exciting. Although the students knew that Clovis was not real, they liked to imagine that he was and that they were actually talking with him. It also included collaboration within the school. Students in the fourth and fifth grade teamed with the younger students to help them compose and read messages and manage the telecommunications exchange. This particularly gave the fifth grade helpers a sense of self worth and responsibility that resulted in a general improvement in academic performance and feeling of belonging and responsibility at the school.

Outcomes

The use of telecommunications to reach Clovis and the other characters in the Suess in Cyberspace Project created an excitement at the school about learning and exploration. It provided the children with a active roles in their learning and the opportunity to take responsibility for their learning. It provided the character portrayers with a unique way to interact with students and enhance learning and to see the excitement that they were part of, despite the fact that the true identities of the characters was secret. Telecommunications was used to enhance learning and teaching and to provide new outlets for teachers and students to become involved together in ways not often possible through traditional teaching strategies. The school is now firmly committed to the use of telecommunications and now actively searches for more collaborative opportunities for students and classes to make learning meaningful and challenging and exciting all at the same time.

fundamental aspects, no meaningful data will be generated about whether the increased technological support actually enhances student performance, productivity, or appreciation of the course. It is in the area of special projects that we anticipate the changes in the course. Here students will participate in sharing with other students, other schools, authors, and archival institutions through the use of the campus wide information network. We also anticipate opportunities for individual research projects, increased community building among class members, and an increase in the current events component of the class.

FTP Multimedia Internet Resources: Finding What You're Looking For

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Key words: Internet, FTP, multimedia, policy

Abstract

As education begins to facilitate multiple learning styles, teachers and students will begin to utilize various forms of non-textual information. This session will help teachers learn how to access and use these materials in multimedia production using FTP. We will explore the many kinds of files available through FTP protocol, including sound, graphics, quicktime movies, and software.

Finding Resources

Participants will learn how to find resources on the Internet and how to conduct an archie search using key words and extension types. File extensions will be explained and a list of extensions and their file type will be included in the handouts. Participants will learn how to find descriptions of FTP files in order to identify a file before downloading it. Handouts will list many multimedia FTP locations by discipline. An example search will be conducted resulting in a list of resources. A multimedia presentation of example files will be displayed on the LCD panel. How to look for files using standard FTP procedures will also be explored. What is a "sfnec.zip" anyway?

Participants will learn how to find "use policies" for particular FTP sites. General guidelines will be discussed. How to view "use polices" for materials obtained through FTP protocol will be demonstrated. Examples of "use policies" and how to find them will also be provided in the handouts. A discussion of appropriate and inappropriate use of materials will be conducted.

Sending Multimedia Files

Participants will learn how to uuencode multimedia to facilitate sending over e-mail hardware, and software limitations and practicality of this procedure will be discussed. Hardware and software limitation will be examined. Locations for uuencoding shareware will be included in the handouts. Transferring and managing files for conscientious use will be demonstrated using image editing shareware.

Utilizing and Converting Multimedia Files

Participants will learn how to translate FTP files using shareware software. Translation of file types will allow greater use of FTP files in many programs. Sites for downloading shareware utilities will be listed in the handouts for all of the shareware shown. These programs will allow conversion of picture files to formats that can be imported into many commonly used software packages. Examples of how to incorporate these multimedia resources into commonly used programs will be shown. Conversion of file formats to more consistently used cross-platform formats will be discussed, i.e., pic., tif., gif., jpg. Conversion programs for sharing sound and graphics files between hardware platforms will also be discussed. Examples will be shown. File extension types will be discussed in terms of how to check for compatible extensions and convert files if necessary for compatibility.

Conclusion

This session will be aimed at the intermediate and advanced Internet user who does not have a SLIP Internet connection. Examples of both Macintosh and PC shareware programs will be included in the discussion and demonstration. Practicality in terms of student and instructor use will be stressed.

Sciencing by Student Web Wizards

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Key words: science simulations, hypermedia, student WWW documents, integrated curriculum

Abstract

The Sciencing by Student Web Wizards Project exemplifies the kind of learning of K-8 students at the Baker Demonstration School (BDS), National-Louis University (NLU). In order to facilitate this project, the BDS technology coordinator, science teacher, and a service administrator worked together to help students create World Wide Web documents representing school work.

The presentation includes a description of the steps taken to develop the WWW documents, uses these documents as an integrated part of the BDS curriculum, and defines guidelines for students to follow when creating hyper text mark-up language (HTML) documents with instructional content.

Project Description

In the Sciencing by Student Web Wizards Project students at Baker Demonstration School (BDS) of National-Louis University design hypermedia simulations focusing on a concept in mechanics or chemistry. The faculty and students of the Middle School at BDS collaborate to establish a constructivist learning environment. The essential elements of this environment include peer collaboration, cross-grade student interactions, faculty-faculty collaboration, student-faculty collaboration, and extensive exploration of ideas and processes.

"The html document was a crucial aspect of the curriculum, not only in terms of the 4th and 5th grade presentation but also as a representation of my 8th grade chemistry unit. In the same way the table directed the 4th and 5th graders in their learning, the html document indirectly forced us to examine our own experiment and knowledge and provide it by creating this document. It is a good example of the Baker philosophy of teaching where learning is self-taught! It is an even better example of how science can and should be taught."—Bridget Igoe, eighth grade.

This project involves the eighth grade students at BDS, the science teacher, the technology coordinator, and selected students in fourth and fifth grades. As seventh graders, the students learned hypermedia authoring as part of a unit in science entitled "The Hypermedia Zoo." Each student

designed and constructed a hypermedia (HyperCard) presentation based on the observational study of a particular mammal at the Lincoln Park Zoo in Chicago, IL. As part of the technology curriculum these students also designed stacks using HyperStudio for a Latin project and began using the Internet with various e-mail projects. They explored the Internet using Mosaic and built home pages using HTML.

"Before we started the html projects, I thought it would be much more similar to the Hypermedia Zoo project that we did in the 7th grade. I was so remarkably wrong in my expectations. Although the same concepts are used, the way of going about it is not. It seems as if there is an entirely different type of language used for the html than for HyperCard. I know that HyperCard is a very exceptional program and that we barely even began to explore the possibilities of what the program is capable of, but when I was sitting at the computer working on the html, I felt as if there was so much more now that I could do!"—Devin Ryan, eighth grade

As an essential element of their studies this year, the eighth grade students are using Mosaic to design a simulation of a science investigation. The purpose of the simulation is threefold. First, the simulation will be used to assess how effectively the student authors understand the information. Second, on an in-house level, the simulation will introduce a fourth or fifth grader to the study. The simulation is a preview for an actual investigation the individual fourth or fifth grade student will perform under the guidance of the eighth grader. Third, documents are posted on the World Wide Web for students in other schools to view. Students and teachers in the other schools may use the Mosaic simulations in their own schools and perform the investigations. The students will exchange feedback via the Internet.

Students write several reflective summaries during the project describing what they are learning. A more structured summary written at the end of the unit includes: a summary of what the student has learned, an evaluation of what the lower grade student experienced, a self evaluation of the specific simulation, and an evaluation of the teaching methodology to provide feedback to the science and technology teachers to shape the implementation of this project with next year's eighth grade class. These two forms of discourse serve as a basis for examining themes that emerge as the students construct their knowledge.

"I think that by transforming the information that we discovered from the chromatography investigation into a medium other than a written chart or report forced us to think about what we had learned. We processed it in a different way which enabled us to put it into a document not only with the appropriate text items but made it more intriguing with pictures and movies showing the actual investigation. The html document presented a more interesting hands-on source for the learner who is able to navigate around the document on their own without reading through pages and pages of prose."—Becky Straus, eighth grade.

In the presentation of the Sensational Student Science Simulations Project we will share student simulations, their comments on the learning process, and the technology used to produce the simulations.

The Impact of Nebraska's Statewide Internet Implementation

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Key words: telecommunications, research, evaluation, integration

Abstract

The Internet, the international network of computer networks, is an exciting addition to K-12 schools. World-wide communication, information gathering, and information sharing are possible using this one source. Nebraska and its educational community are in the process of connecting to this resource, with the passing of LB 452 in 1993. Fifteen Educational Service Unit servers, located across the state, provide access to the Internet for almost all public K-12 schools. Schools are being connected by modem dial in, as well as by direct connections. Also, educators are being trained across the state to effectively use the Internet to improve the education of their students. Currently, an evaluation team from the University of Nebraska at Omaha, in cooperation with the ESUs, is investigating the impact of the state-wide effort to connect schools and teachers to the Internet. This summary is related to the first 18 months of a comprehensive five-year evaluation process, which focuses on examining the general impact on teachers, students, and schools of these statewide connectivity and training efforts. Each of the data sources were examined for related implications, with cross-referencing between sources conducted when appropriate. The following are some of the implications referenced and explained in the formal 18 month report document.

Evaluation Implications

Implications from the Pre-training survey: A fairly wide range of survey responses from the pre-training instrument has been accumulated (3776 surveys), representing all Nebraska ESUs, in order to provide an evolving "baseline" on Nebraska teachers who enter the ESU training process.

1. Many teachers report knowing very little about telecommunications before entering the Internet related training.

2. A variety of teachers are becoming involved in the Internet training, with the second year of training accessing a higher percentage of teachers in the early grades.

3. Initial training sessions are beginning to access a higher percentage of teachers who are less computer literate in general.

4. Examples of innovative classroom uses of the Internet need to be widely distributed to the teaching population.

Implications From the Post Survey Data: A post training survey instrument was sent by electronic mail to all pre-training survey respondents, with 517 responses returned. A follow-up paper copy of the survey was then sent, via U.S. Mail, to 400 randomly selected non-respondents, with 142 surveys completed and returned.

1. Teachers use the Internet often, and most teachers report accessing the Internet at school, although few Internet-connected computers are readily available to them.

2. Nebraska educators' initial use of electronic mail supports that they are using the Internet in very appropriate ways.

3. Educators tend to use specialized computer personnel as their primary source of help.

4. Relatively few Nebraska students are currently using the vast and varied resources of the Internet.

5. Principal support seems important to Internet use.

6. Responding educators plan to use the Internet and acknowledge its value to them for communication and information gathering.

7. Nebraska educators also see value in having their students use Internet and its information gathering capabilities.

8. A majority of Nebraska teachers, who have had Internet training, are comfortable with computers, and a high percentage feel that computers are very important to the future of their profession.

Implications from the Server Data: Based upon an analysis of server data information, the following implications are identified and described in the 18-month evaluation report.

1. The statewide pace of training is substantial.

2. Statewide connectivity is progressing well, but the reliance on modem based technology at many schools is a significant barrier to progress.

3. School districts must work to become more self-reliant on follow-up Internet support.

Implications from Innovative Uses of Teachers and Projects: Several initial implications are apparent from the classroom observation and teacher interview data related to the evaluation at the 18 month reporting period. These implications will no doubt evolve as additional data is accumulated and analyzed for later reporting periods.

1. Student use appears to be a critical component to "innovative" curricular use.

2. Student "research" using the Internet appears to be at a considerably higher level than in more traditional activities.

3. Most innovative curricular uses were multi-disciplinary in nature.

4. Innovative uses by teachers typically overcame significant technical and instructional barriers.

5. Innovative classroom uses often accessed "non-traditional" classroom resources.

6. Teacher and school based grant opportunities, such as Nebraska Lottery funds, are an important catalyst to innovation.

General Implications: Three general implications are also apparent from the evaluation process at the 18-month reporting period, and are identified and described within the formal report document.

1. Significant progress is being made for the implementation of LB 452.

2. Community interest is starting to parallel educational interest.

3. Nebraska continues to play a national leadership role.

In summary, it was apparent from these evaluation implications that Nebraska has an excellent start to the implementation of LB 452, and its integration of the Internet into the K-12 schools in Nebraska. The continued high level of cooperation between many state institutions would seem critical to continued progress in the state. Based upon a review of the relevant literature, and other status reports from other states, it is also clear that Nebraska is well ahead of a considerable majority of states in bringing the power of the Internet into the K-12 classroom.

Talking Telecommunications: Access to Internet and TENET Using Assistive Technology

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Key words: telecommunications, visual impairment, assistive technology, speech access

Abstract

The "information highway" has become a key component to success in business and in educational settings. The timeliness of the information and variety of resources available on networks encourages teachers and students to use Internet and Texas Education NETwork (TENET) for information and research. Without vision, however, the task can seem an unmanageable and time-consuming task. Assistive technology in the form of screen enlargement options, screen reading programs, speech synthesizers, Braille keyboards and displays, and programs without graphics can work together to allow people with visual impairments a route to the information.

Using Telecommunications

Use of information networks, such as the Internet, has grown to over 40 million people. For people in both rural and urban communities, access to recent and varied information resources has become a key component in business and educational areas. For most people, information can be located and accessed by "trial and error" methods and with assistance from other users, manuals and on screen instructions. Many of the services available require making choices based on visual information with symbols, specific key combinations, or a mouse. The instructions to move around on the network, whether in a different color of text, a symbol, or a graphic, is unavailable to people without vision. Assistive technology is available for people without visual ability to use telecommunications independently. The options that enable users to obtain information or issue commands vary with the needs and abilities of the users. Assistive technology has been developed to put in information, to review information and to read the information that is obtained.

To run the programs, key commands can be used from traditional computer keyboards rather than relying on use of the mouse or arrow keys. A variety of electronic Braille speech and note-taking devices are available which act as alternate keyboards. For people unable to use a keyboard, there are a few specific programs which rely on voice commands.

Visual information can be displayed on color monitors in various sizes or color combinations depending on the user's visual needs and preferences. For people who cannot read print, Braille display devices may be used. The people who choose not to read print or Braille find they have access to the information on the monitor using speech synthesizers and screen reading programs.
A speech synthesizer is different from a sound card.

An informal survey of computer users with visual impairments found the most common method of access to telecommunications was accomplished using a traditional keyboard, a telecommunications package which was text-based, a speech synthesizer and a screen reading program on a MS DOS system. For people who rely on auditory information such as those with visual impairments, blindness, and reading challenges, access appeared to be accomplished more easily with the use with the traditional keyboard.

Selecting a speech synthesizer can be a complex process. A variety of synthesizers which are compatible with the screen readers are available for MS DOS platforms. The factors which determine what synthesizer to use depend on the platform as well as the skills of the user. While initial connections can be difficult (incompatibility of products, presentation of information in graphic interfaces and

complex bulletin board design) techniques to sidestep or overcome these obstacles have been found. A discussion and comparison of the most widely used speech accessories and products will be presented.

Manuals are available from most manufacturers for the assistive technology in accessible formats: on disk, on tape, in Braille, or in large print. Factors that can help in installation and usage will be discussed.

Precautions that will help the persons needing access overcome some of the roadblocks on the information highway include:

- never, never share passwords with students or strangers.
- change passwords often.
- read manuals for system requirements of each addition to the computer.
- note and use the product support of the assistive devices.
- at the present time, speech programs usually work more easily with word processing and telecommunication programs which have only text, no graphics.
- headphones or speakers with volume controls protect passwords from being overheard.

Integrating Multiple Technologies: From Online Research to Video Teleconferencing

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Key words: video conferencing, library media, global education, collaborative projects, partnerships

Abstract

Educational Technology takes many forms and accomplishes many objectives. Teachers can now integrate the use of multiple technologies within a given project or unit of study. Our session will demonstrate how such integration takes place in a high school social studies classroom. We shall also demonstrate how a partnership between a classroom teacher and a library media center is a critical component in planning and using educational technologies especially in the area of research. The specific context will be social studies, but the strategies will be clearly transferable to other subjects and to interdisciplinary learning.

Projects

Several projects will be used as examples of multiple technology use. ICONS (International Communication and Negotiation Simulation), CPIN (Connecticut Project International Negotiations) and Win/Bloom VTC (Windsor and Bloomfield Video Teleconferencing. ICONS and CPIN are telecommunications simulations where students take on the role of a specific country and debate such topics as human rights, nuclear proliferation, trade, and the environment.

Win/Bloom VTC is a pilot project sponsored through a grant from the Southern New England Telephone Company. Using Intel's Proshare, the two schools will develop projects based on social, economic, and environmental issues. These activities will be considered through the use of video teleconferencing which will enable the students to collaborate on a project and to edit and share documents simultaneously on the computer screen. The project will culminate in presentations in both schools as well as to state legislators.

Methods

In order to develop positions to be communicated via electronic mail and real-time conferencing , students need to build their own knowledge base. Collaboration with the library media specialist in order to plan student research is critical. Students use a range of resources from CD-ROM to online databases. Access to primary sources through the Internet, current articles from America Online, extensive newspaper coverage using Dialog, and use of clipping folders from X-Change are all part of the multiple strategies to prepare students for these projects.

Outcomes

Using these projects as a model, we will demonstrate the almost seamless integration of different technologies for research, presentation, and exchange. These types of activities help students to develop the expertise which is necessary to understand the complexity of issues, as well as the technological skill which will be critical for life in the twenty-first century.

English Over Satellite: 'Making It In America'

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Key words: satellite education, English as a second language

Abstract

Students in the Seattle School District had an opportunity to learn English as a second language (ESL) available through a district technology levy. The course, entitled "Making It In America" was developed in part through assistance from a federal Star Schools grant to Educational Service District 101 in Spokane, Washington. At the time of this study, 120 students were enrolled in the course throughout the state of Washington. Gains in English speaking, reading, listening and writing ability were measured and evaluated with assistance from the Northwest Regional Education Laboratory. Results and implications are discussed.

Background

Immigrant students in the Seattle School District had the opportunity to learn English as a second language (ESL) through an advanced telecommunications program. A recent technology levy enabled "Making It In America" (Vietnamese-to-English, and Spanish-to-English) to be delivered via cable from Seattle's Instructional Broadcast Facility to students throughout Seattle since the fall of 1992.

Program Delivery

Making It In America-Spanish to English was offered four days a week to students throughout Washington state. The Vietnamese version was also available four days via cable to students in the Seattle area. Students outside Seattle who were taking the Spanish version of the course were provided the telephone assistance of a native speaking teacher aide.

During spring semester, 91 students in 16 sites throughout Washington state took the ESL Spanish-to-English course. Forty of those students attended 6 schools throughout Seattle; 39 students throughout Seattle were enrolled in Vietnamese-to-English televised instruction.

Of interest to the investigators in this study was the value-added factors that contribute to televised programming as being more or less effective than direct classroom instruction. In order to determine the benefits to students, a number of assessment strategies were selected. Descriptions of those strategies are given below.

Program Evaluation

After a preliminary pilot evaluation of the study, students were asked to read and respond to a variety of questions using multiple choice selections. Expressively, they had to analyze and respond in writing to pictorial situations using English. Content validity for the written portion of the test was determined by an interdisciplinary committee, consisting of the three program administrators and the two on-air teachers. It was determined that the content of the test closely aligned with the course curriculum.

The written assessment procedures were explained ahead of time to the classroom coordinators at the schools to prevent confusion and to elicit their support in distributing and returning tests. In the case of other Washington students, the teacher assistant the satellite studio facility compiled the written tests under the supervision of the investigator. All written tests returned from sampie school sites were

then scored by one of the evaluators. Rubrics for scoring were agreed upon prior to test administration.

Oral Assessment

Student populations whose written tests were analyzed for the purpose of this study were also interviewed orally prior to and at the conclusion of instruction. Again, questions posed were selected from a cross section of the topics covered in the course. Questions were designed to assess auditory comprehension and verbal expression of concepts covered in class.

Anecdotal Assessment

Throughout the semester, on-air teachers kept a log of comments volunteered by both students and classroom aides. Perceptions of students and building level personnel are important to televised instruction for a number of reasons. Students may recommend courses to their friends, instructional aides' effective use of the medium can be more easily assessed, and important factors not assessed through more formal procedures may come to light.

Data Analysis

An informal analysis of the mean scores of both experimental (television) and control groups for the ESL Spanish-to-English and Vietnamese-to-English gave an indication of relative success of the use of televised instruction to teach a non-native language. Data collected from televised and non-televised classes were reviewed with a senior researcher at the Northwest Regional Laboratory in Portland, Oregon. A subsequent statistical analysis indicated whether significant differences exist between control group ESL students and televised ESL students final achievement scores. A second analysis examined gain results from pre to post test of both groups.

Anecdotal information provided feedback from the success of classroom coordinators to facilitate the broadcasts, as well as the students' reaction to learning at a distance. While factors such as the effectiveness of control group teachers and how bias may affect the outcomes of these analysis, overall value-added results were expected to emerge.

Results

A. Group mean results for pre- to post-test differences in oral scores (shown in Table 1):

TABLE 1:

ESL Spanish		ESL Vietnamese	
Televised	Control	Televised	Control
0.97	-0.29	0.85	-0.08

B. Group mean results for pre to post test differences in written scores (shown in Table 2):

TABLE 2:

ESL Spanish		ESL Vietnamese	
Televised	Control	Televised	Control
24.72	18	6.2	9.4

Data Analysis

Oral and written pre- and post-test means were tested for significant differences for all groups of students in study. In tests of statistical significance, a probability of value of .05 or .01 is generally hypothesized. The more stringent value of .01 indicates that there is only a one in 100 chance that the results obtained could be obtained by chance alone. The value of .05 indicates a 5 in 100 chance that the obtained by chance alone. The value of .05 indicates a 5 in 100 chance that the results were obtained by chance alone. These values are used widely in educational research in supporting an initial hypothesis. The following results were obtained.

Within Group Comparison

STEP- Spokane (Spanish, televised): For both oral and written tests, there was a statistically significant difference in the gain ($p<.01$) between pre and post test scores.

Seattle (Spanish, televised): For both oral and written tests, there was a statistically significant difference in gains ($p <.01$) between pre- and post-test scores.

Seattle (Vietnamese, televised): For both oral and written tests, there was a statistically significant difference in the gains ($p <.01$) between pre- and post-test scores.

Seattle (Spanish, control): For written tests only, there was a moderately significant difference in the gains ($p <.05$) between pre- and post-test scores.

Between Group Comparison

Seattle (Vietnamese, control): For written tests only, there was a moderately significant difference in the gains ($p<.05$) between pre- and post-test scores.

Seattle (Spanish): For oral tests, there was statistically significant differences between televised and non-televised group gains ($p <.01$). There were no significant differences for written score gains between control and televised groups.

Seattle (Vietnamese): For oral tests, there were statistically significant differences between televised and non-televised group gains ($p < .01$). There were no significant differences for written score gains between control and televised groups.

Anecdotal Feedback

In the case of both courses, school and community feedback was overwhelmingly positive. The modular curriculum of the class is especially strong, composed of units that help students bridge the gap between their native cultures and their new one. Comments included:

- "They loved the folk story of the autumn festival. It made them feel at home and good about themselves. The kids felt lost in their regular classes. Here they feel safe making mistakes. The class has also helped one special education student very much."
- "Students' attendance is higher because of this class. One student from El Salvador who almost never came to school is there almost every day now!"
- Newcomers to the Seattle's Vietnamese community commented, "This program is a lifesaver." They have recognized her in the community and ask her to relate her personal experiences in coming to the United States.

- A classroom coordinator in a Seattle school related to the on-air teacher that a noticeable improvement in a student's attitude and behavior had taken place since starting the class. His risk for becoming a gang member had decreased since interacting with the television instructor.

- Washington's Hispanic community has made similar comments about "Making It In America-Spanish to English". One participant from Redmond, WA. stated, "Your class is excellent. I can learn at home and take care of my granddaughter. I've learned so many new words I didn't know before and I am now using them when I go out."

- The on-air instructor for this course did travel to some Washington downlink sites. A site coordinator commented, "This class not only helps them with their English, but with overall performance in school. It encourages attendance, self esteem, and completing daily homework. One student gets on a bus and travels an extra 20 miles to this school so he can participate."

- Teachers from both courses report being recognized when they go out in the Seattle community, and that community members are encouraged that a positive perception of their language and culture is being supported these English language instruction classes. Students were affected in a positive manner both academically and socially through interaction in the televised classes.

Discussion

Oral score pre- to post-test differences for students participating in the televised ESL-Spanish course was 0.97 as opposed to a -.29 for the control group. A similar difference was noted in the Vietnamese group televised vs. control group scores (0.85 vs. -.08). A contributing factor to these results may be that of tester bias. Perhaps the ESL instructor and their aide came to develop some familiarity with students in the televised class, whereas, they only met students in the control groups twice during the courses conducted during fall semester, a reliable process for assessing the effectiveness of the ESL courses was determined. Evaluation of Seattle students focused on both Spanish-speaking and Vietnamese speaking students. Evaluation of other students throughout Washington state included those who were enrolled in Spanish to English ESL.

Sample Population

Of students enrolled in the Seattle ESL course, a sample of subjects was randomly selected using a computerized selection program. The following sample sizes were used for data collection:

Spanish to English	
Seattle televised:	20 students
Seattle non-televised (control group):	10 students
Spokane televised:	18 students
Vietnamese to English	
Seattle televised:	17 students
Seattle non-televised (control group):	14 students

Written Evaluation

The written portion of the course evaluation included evaluation of students' receptive and expressive use of printed English prior to and at the conclusion of instruction. The fact that students in the televised instruction group were able to interact with their teachers both on-air and after class over the telephone undoubtedly contributed to the teachers' familiarity with both the students speaking ability as well as with the details of their individual lives. However, the differences in oral score improve-

ment between the experimental and control groups of both languages strongly suggest a positive motivation on the part of students to improve both listening and speaking skills. This suggestion is explained by one of the instructors who suggests that students who have to call in live, on-air are more likely to prepare themselves and seek out opportunities to interact verbally in English.

Overall, the oral scores for both control groups dropped from pre to post testing. This decrease was caused by three or four scores in each group that decreased over the semester. One of the teachers from the ESL control classroom was interviewed at the conclusion of the semester in order to better understand this phenomenon. One speculation was that peer group pressure of immigrant students might be negatively impacting English acquisition. She did not confirm this speculation and was surprised that some students oral scores had declined.

Results from the written exams, which tend to be a more objective measure of student performance, were inconsistent. While the Spanish experimental (televised) group did have stronger pre to post test gains than did the control group, the Vietnamese groups showed a reverse tendency. For this group the control showed higher pre to post gains than did the televised group. A number of variables, including teacher effect may have contributed to these results.

An additional factor includes the fact that the Spanish televised pretest mean was more than nine points below their Vietnamese counterparts. This implies that because the Vietnamese students (both the control group and the experimental group) came into the semester with much stronger written English skills, the potential for significant improvement during the semester appeared unlikely.

Regardless of entry-level English skills, however, information shared with the course instructors from classroom aides strongly suggest a very positive impact of the on-air classes in the lives of the students. The warmth and personality of the instructors and the strong, integrated curriculum contribute to the favorable feedback volunteered from the schools and communities. A prevailing perception communicated was one that the courses validated the native culture while teaching usable, real-life skills in the new one.

Conclusions

Results from this evaluation indicate that televised instruction of English as a Second Language can have a positive impact on student performance in English, especially when entry level English skills are low. This finding has potential impact for developers of distance delivered programs as they design and provide programs for students in K-12 grades. The value added impact of the Seattle project lies in its ability to reach out to large numbers of geographically dispersed students who are limited in their English proficiency.

From Textbook to Notebook: A Design Proposal for Teaching United States History in the 21st Century

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Key words: Internet, World Wide Web, history, Listserve

Abstract

While the issue of what should be taught in the "social studies" continues to be hotly debated there is universal agreement that the manner and philosophy of instruction is undergoing a significant and meaning reinvestigation. An increasingly diverse, technologically literate, consumer oriented student constituency awaits. How will educators respond to the challenge of identifying individual student abilities while still preparing for college entrance examinations? How will we encourage serious and deliberate thought and still appeal to the varied ways in which students learn? How will we teach the "process" as co-existent with content?

Background

The North Shore Country Day School (NSCDS)is an independent school which is located 12 miles north of Chicago. The school has 370 students from Junior Kindergarten through the Twelfth Grade. We are in the second year of implementing the Technology Committee's plan for the 21st Century Fund. Two unplanned catalysts, a grant to provide an entry level campus-wide Internet connection and increased faculty enthusiasm for integrating technology into their curricula, have created higher expectations and demands.

For NSCDS to be on the cutting edge by 1995, we must counter balance our technological advances with an organized and coherent curriculum plan. Finding common ground between "the framework they need," and the swelling technological umbrella represents a tremendously exciting challenge. This is the nature of the AP US History pilot project, to create such an alignment between the content/ subject matter of a course and the process/skill aspects. It is our belief that a true and congruent relationship can only occur by using interdisciplinary instruction, broadening the global perspective of the students, and adopting problem solving exercises and corresponding authentic assessment as pedagogical lynch pins.

The nature of the NSCDS schedule discourages, in some respects, the very nature of progressive education....experiential learning. We believe that this pilot project offers a wonderful opportunity to test the viability of experiential learning via the Internet, peer group projects with other schools, and student-teacher-student online communication out of school. We believe that this model will dramatically change the way we as an Upper School see "class time" and will serve as a means of evaluation before wholesale changes are made in the schedule. We also believe the pilot project offers a measuring stick for current student technological ability and potential, hardware and software needs, and level of dialogue between the Technology department and other curriculum areas.

The Project

A PowerBook computer will be given to each of the fourteen AP US History students. Along with the PowerBook, each student will receive a network transceiver for in-school use and a 28.8 kb modem with PPP connectivity at home. Each PowerBook will have the software needed for Internet access, including ClarisWorks 4.0 for HTML entry and Eudora for e-mail access. Other utilities will also be available to each student. Training is a key issue and we are beginning this the week before school begins. Each student will attend a three-day Internet Boot Camp which will cover topics such as the Introduction to the Internet, Searching Techniques and Strategies, and How to Send Email, and An Introduction to HTML Creation. Additional training will be integrated into normal class times. Vincent Vrotny is currently in charge of these initiatives.

From the network perspective, we have been upgrading our Internet connection so that all of the curricula of the school can also utilize this tool, creation of the services including installation of a World Wide Web server and e-mail listserv for this project, and establishing the remote connectivity for the users within this project.

Student Assessment

While technology and its role in the curriculum is certainly one of the items that will be studied during the Pilot Project, it does not represent the entire focus of the AP US History curriculum. The course has traditionally focused not only on preparation for the AP exam in May but also cultural, intellectual, and social history. The supplemental reading books/materials, including summer reading, will bear this out. The basic concentration of assignments has always fallen into three areas: AP style tests, analytical papers, and special projects. We will continue to have AP type tests approximately every three weeks and spend a significant amount of time on writing, constructing one essay every three weeks. The constancy in these two aspects of the curriculum is absolutely vital to evaluating the success of the project since no control group of students is present at North Shore to compare to these thirteen in the Pilot Project. Without continuity in the content of the course, or in two of its most fundamental aspects, no meaningful data will be generated about whether the increased technological support actually enhances student performance, productivity, or appreciation of the course. It is in the area of special projects that we anticipate the changes in the course. Here students will participate in sharing with other students, other schools, authors, and archival institutions through the use of the campus wide information network. We also anticipate opportunities for individual research projects, increased community building among class members, and an increase in the current events component of the class.

A High School's Journey to the World Wide Web

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Abstract

This poster session will outline how Benjamin Franklin High School got its high speed connection to the Internet. It will include posters that discuss: the cost of connecting to the Internet, the type of the connection we have, the rational used to pick the high speed connection, the use of free versus commercial software, and how our students use the Internet.

Benjamin Franklin High School is the laboratory school for High School District 230. We are located in the southwestern suburbs of Chicago. We are currently in our 2nd year of operation. As the science teacher and the person in charge of installing the computer lab, I was given $50,000 to install the lab. This allowed me to spend about $25,000 for computers, $10,000 for software, and $15,000 on the Internet connection. The $15,000 for the Internet connection for the first year was broken down into $9,000 for equipment, $3,000 for yearly dues to NetIllinois, and $3,000 for the phone line charges.

We have a 56Kb/sec. connection which allows all 25 students in our lab to connect simultaneously with limited delay. Even if all the students are surfing with Netscape and looking at pictures, the amount of time they have to wait is acceptable.

All of the software we use to connect to the Internet is freeware or shareware that was downloaded from the net. The obvious advantage is that it is cheap. The disadvantage is that there is very little support. It took one and a half years to get our connection working. The unfortunate alternative is to spend about $10,000 more on an Internet server that comes preconfigured with all the software.

The students at Franklin High School use our Internet connection for doing research, and for communication with other students. Our Social Studies classes have used The Voice of America Gopher Server to investigate current events. They have also used the CIA World Fact Book for reports on countries. Our French classes used the WWW to find information for a Mardi Gras celebration they put on. Some students found recipes on the Web that they used to make food for the party. The Biology students have used WWW to do research for a project on the 5 Kingdoms. They also did an online lab using the virtual frog dissection that is on the web. The Geometry students have done research on the Pythagorean Theorem.

Trainers in Transition: A Model Train-the-Trainers Program

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Key Words: training, train-the-trainers, electronic community, WWW

Abstract

A grass-roots organization in Virginia has developed a train-the-trainers program for the state telecomputing system, Virginia's PEN. PEN is transitioning from a text-based menu-driven system to

a Web-based system, which introduces complicating factors when creating a training program. This presentation outlines the influences and conditions that made such a program necessary, the process through which the program was built, and the heart of the product (the training program).

The Need

When the Virginia Society for Technology in Education (VSTE) helped to initiate Virginia's Public Education Network (PEN) in 1989, the Society made a tacit commitment to support the network. Most of the key people involved with the volunteer work on the network are VSTE members and there is a strong working relationship with the Virginia Department of Education (VDOE) which administers the system. As the network has become more and more popular with the educators it was designed to serve, a strong need for quality, consistent training throughout the state became apparent. VSTE, in cooperation with the VDOE, established a grass-roots task force to design and implement a train the trainers program for the state.

In March 1995, the Design Task Force met to plan the perimeters of the program. As we strove to define the components that such a training program would encompass, we struggled with issues that are facing many other networks currently in place. PEN is a Unix-based menu-driven system but is rapidly making the move towards a Web structure. Several forces are driving this rapid change: the flexibility of the Web structure, the value of pictures and sounds in education, and the drive to have Virginia schools directly connected to the Internet and thereby paying their own connectivity costs (rather than the state-funded system as it is currently in place).

To design a training program for a centralized system that was to become a decentralized system of open Internet access became our task. At the same time, a new motivation for the program came into play as we saw the potential dissolution of the "electronic community" that had been created by the existence of PEN. We wanted to use our training program to reinforce that feeling of community that had become so useful to the professional lives of our teachers.

The Process

Volunteers for the Design Task Force were culled from the general membership of VSTE and included several VDOE staff members. We did not specify any criteria for task force membership, but were lucky to get people who had varying degrees of experience with telecomputing and with training. Aside from these volunteers, VSTE Executive Director Dr. Daniel Arkin was assigned leadership for the process to ensure its satisfactory conclusion. Several face-to-face meetings were held over the course of four months, with much collaboration among task force members occurring online.

After dividing into smaller sub-groups in order to attend to the individual parts of the training program, we realized that many of the topic areas overlapped extensively. We determined that our final materials would be placed online in a Web page with hypertext links between the various topics. We also determined that some materials were likely to be only be available in hard copy format.

A report was submitted to the VSTE Board of Directors, approved and some seed money budgeted. An Implementation Task Force, containing mainly members of the Design Task Force, was created and a pilot training program was held in one school division to test the early draft of the materials.

The Product

The Train-the-Trainers program covers the broadest range of telecomputing topics that can be covered in 30 hours. The program's defined objectives are:

1. To promote the use of telecomputing and Virginia's PEN resources for educators in K-12 classrooms throughout Virginia..

2. To provide a consistent and uniform base of knowledge training of trainers in all geographical regions of the state.

3. To provide training which emphasizes professional development, content areas and instructional applications for the classroom.

4. To maintain the concept of a Virginia Community by emphasizing Virginia's PEN as a resource especially of Virginia-specific materials and as a safe educational environment.

5. To prepare educators to responsibly utilize emergent technologies and the applications of those technologies.

To meet our objectives, we developed five "areas of certification". Each trainer will need to pass an assessment of their knowledge and skills in each of these areas:

I. General Knowledge

II. Telecomputing Tools

III. Resources on PEN

IV. Classroom Applications

V. How to set up Workshops (& adult learning)

Each area has background knowledge and information to ensure that all trainers have the same level of knowledge. Also in each area, several training modules have been created for the trainers to use in their own training sessions. The modules address the various levels of telecomputing experience and need that are found within the educators of Virginia.

The majority of the program materials are available to trainers at our Web page. This allows us to update the materials on a timely basis, and also allows for our trainers to have some impact on what is available to them. Although still in the planning stages, a listserv or newsgroup will allow our trainers to keep in touch with each other and become their own support group. Practical assessments are made throughout and at the end of the training, focusing on skills, knowledge, and the ability to make presentations to adults.

Shrinking the World While Expanding Horizons: Telecommunications in the Virgin Islands

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Key words: telecommunications, Internet, partnership, history, public, private

Abstract

The presentation will give a road map to educators how telecommunications has been implemented into the schools of the U.S. Virgin Islands. Focus will be on:

- history of educational use of telecommunications in the Virgin Islands;
- special telecommunications projects in schools, both private and public;
- setting up and use of a Global SchoolNet node;
- putting together partnerships with public, private, and business concerns to make telecommunications possible in the schools;
- developing Internet connections to the schools for use in everyday learning.

Blasting Off to Cyberspace with the New NASA Spacelink

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Key words: NASA, Internet, database, interactive, technology, math, science

Abstract

Would you like to show your students images of exploding stars, "surf" the Internet for tomorrow's lesson, or "chat" via computer with an astronaut or research scientist? With NASA Spacelink, NASA's Electronic Teacher Resource Center for educators, you can! Don't miss an online demonstration of Spacelink and other NASA databases which can be accessed via the Internet. NASA representatives will demonstrate the system and answer questions about how you and your students can communicate with NASA.

NASA Spacelink Electronic Teacher Resource Center
NASA Spacelink provides educators a central location for the most current and complete aerospace and scientific research program information available electronically. This informational database, the "Spacelink Electronic Library," may be accessed through direct dial modem as well as every commonly used Internet route, including Telnet, FTP, Gopher and World Wide Web.

Materials in the Spacelink Electronic Library are arranged in a logical order designed to be easily understood by teachers. The system also offers a search feature to help educators quickly locate appropriate educational materials. Spacelink information is designed to supplement math, science and technology lessons in grades K-12 and at the university level. Topics include status reports on a variety of NASA programs, astronaut biographies, historical information on America's aerospace program, a variety of graphic images, educational software, career information, aeronautics data, and NASA's plans for the future.

The Spacelink Teacher Resource Center (STRC) provides teachers who have received a Spacelink educator's account an opportunity to go beyond the Spacelink Electronic Library. Educators can take a virtual field trip to all of NASA's Centers as well as other exciting locations on the Internet. Through E-mail, Usenet newsgroups, and other STRC features, Spacelink educators may interact with other teachers and students throughout the world to expand their knowledge in countless areas. They may call upon NASA experts to assist with math, science and technology lessons; they may participate in live, online discussions with top scientists, astronauts, and other special guests; they may set up conferences with each other to discuss methods of using telecommunications to improve education; the possibilities are endless. Because the communication link to the STRC is text based, even teachers with low-end hardware can take advantage of all the services the STRC has to offer.

Fosters Learning Community

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Key words: Learning Communities, community-based learning, authentic tasks, authentic audiences, interdisciplinary, Internet, Television, African American, mentoring

Abstract

The Discovery Learning Community: Focus On THE PROMISED LAND is an experimental gathering of resources, relationships, and collaborative activities that is easily accessed by World Wide Web, Gopher, FTP and e-mail technologies. The pilot project has been developed to help teachers, learners, and their educational partners innovate educational uses of the Discovery Channel programming in ways that are indicated by current research into the relationship between engaged learning and telecommunications technology.

The resources, relationships and collaborative activities have been brought together to encourage teachers, learners, and their educational partners to produce original, authentic scholarship regarding this century's "Promised Land" migrations and implications of these movements of people and ideas for contemporary America.

The project is primarily geared for use by junior high school levels and above, although elementary school students and teachers have found "attachments" to the project. Undergraduate, graduate, doctoral candidates and a wide range of experts from institutions of higher learning and research and

cultural centers are serving as local and "tele-mentors", LISTSERV moderators, and occasional contributors. Thousands of interested people of all ages with no attachment to formal learning are "visiting" the Internet- and America Online-based sites and engaging in listserv discussions and private correspondence with teachers and students.

The Promised Land learning community pilot has provided the framework for additional thematic learning communities, or Learning Worlds to be part of Discovery Communications' educational services. Learning Worlds can be accessed by the World Wide Web at http://www.Discovery.com

Rationale for the Project

The pilot project was developed to explore and better understand the concrete dynamics and responsibilities that define educational leadership in the interactive information age.

Project Description

The learning community model is intended as a "support environment" or project incubator that helps teachers and learners innovate, design, and pursue interdisciplinary projects. Projects sprout and develop with the help of a community of people who have deep, personal connections to the Promised Land and related themes.

The project was developed for Discovery Communications, Inc. It is the co-design of Hunter Williams, Senior Manager, Discovery Educational Communications and Andrée and Will Duggan of the Duggan Associates, a Maryland-based telecommunications consulting firm. Gopher and Web design consultation and implementation was provided by the AskERIC project at the ERIC Clearinghouse on Information & Technology, Syracuse University and the InfoMall program of the Northeast Parallel Architecture Center, also located at Syracuse University.

The project supports the repeat broadcasts of the series on Assignment Discovery, a daily programming service on The Discovery Channel which allows teachers, media specialists, and librarians to tape commercial free versions of the Discovery Programming cleared for educational use.

The learning community has four major components that make it adaptable from project to project:

- A moderated LISTSERV discussion allows community members to use e-mail to post interests, queries, references and opinions and to share common interests in program themes and/or pedagogy.

- Pre-engaged, pre-screened "tele-mentors" are accomplished artists, business people, community leaders and scholars who are ready, willing and able to work with students and teachers in their neighborhood or in cyberspace.

- Contributions from and participation by the leaders of major research and cultural institutions. The project allows these individuals to establish new, meaningful context for their holdings as they explore use of interactive communications to advance their educational missions.

- A hyperlinked World Wide Web and Gopher Internet resource which organizes:

- information about the documentary , called "The Production";

- educational activity guides housed in an a "Teachers' and Learners' Center";

- community resources (books, articles, films, exhibitions, collections, Internet resources) in an area called "Community Connections";
- special projects (such as NPTN/Academy One's e-mail/fax based panel discussion on Leadership, and I*EARN's New Places Project); and
- an accruing showcase of student-created scholarship in a variety of formats (text, audio, video, multimedia, performance) in an area called "The Showcase".

Sample Projects

Cass Technical High School, Detroit Michigan. Almost 1,000 students across 30 classes participated with teachers, family and community mentors in a multidisciplinary cooking project connected to African American history. Projects included diverse activities such as interviewing grandparents about their favorite recipes and how these tied to their experiences during the Great Migration and the chemical breakdown and reactions of the recipes ingredients. Teachers are planning on an expanded project next year.

Mississippi School For Math and Science, Columbus, MS. made the Promised Land the focus of their annual Humanities Day program. History, math and Language Arts classes worked on common projects to explore the impact of the migration on their community and reverse migration back to Mississippi from the industrial north. Projects were conducted in anticipation of May 4th, Humanities Day, which featured a lecture by author Nicholas Lemann.

Springbrook and Blair High Schools, Montgomery County, Maryland developed a "new blues" project in which original compositions were scored, written and performed by the Blair High School Chorus. Ysaye Barnwell of the group "Sweet Honey and the Rock" corresponded with teacher Shirley Letcher and other teachers and learners to explore the blues as both a historical artifact and cultural genre.

References

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Behind the Web

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Key words: World Wide Web, e-mail, university teaching, gopher, newsgroups

Abstract

For students to have an understanding of the Internet, they need more than exposure to the World Wide Web. This session will examine a series of assignments and activities that help students gain

understand the inner workings of the Internet and the ways in which information can be stored and transmitted.

The World Wide Web/Mosaic/Netscape has swept the world of telecommunications and the Internet with a speed and pervasiveness largely unexpected. In the process, people who never even considered using the Internet find themselves "surfing" the Web for hours.

In my introductory computer classes I have long advocated an understanding of the technology that students are using—an understanding that goes beyond key presses and obscure commands. While the Web is more intuitive than many other Internet tools, it is still not magic nor is it perfect. While Web surfers who are searching for information need little understanding of the tool they are using, students learning about technology can benefit by learning more about how the Internet works.

Over the past several years, I have developed a series of lessons and activities designed to teach students about Internet tools and techniques. This series steps students through "traditional" Internet tools and helps them understand how the Web works and why people are so excited about it.

Typical topics included in these lessons include:

- Working with a local listserv for class communication;
- Interacting using e-mail;
- Printing e-mail and listserv messages;
- Working with an Address book;
- Managing e-mail using online folders and files;
- Accessing Gopher, often both via e-mail accounts and through TurboGopher;
- Exporting e-mail—often to a local server—using FTP or Fetch;
- Exploring newsgroups;
- FTP from a remote site using FTP commands or Fetch;
- Using Binhex to send formatted files via e-mail;
- Importing files into e-mail;
- Accessing the World Wide Web using both lynx and Netscape.

Each of these assignments is open ended, allowing students to explore in whatever way they wish. The important part of the assignment is exploring the new technique.

While this series of lessons is constantly evolving as there are changes in the Internet and our local system, the concept of teaching more than just surface commands continues to be of value. When students have completed each of these activities, they have a much clearer concept of how the Web works, and a much better appreciation of the power of the tool they are using.

The Technological Itch: Starting from Scratch

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Key words: technology, integration, education, professional, development

Abstract

As educators, we know we must prepare our students for the 21st century. The 21st century most certainly includes technology. We know technology is out there, and some of us are eager to embrace it; and others are just itching to avoid it. If teachers are to be prepared for the 21st century, their professional development must include ways to effectively use and integrate technology. But how is this accomplished? How do we scratch that itch?

A training model is demonstrated by which teachers are eased into the world of technology. Session participants will be exposed to focusing goals, the scope and sequence of training, and developing action plans for their own schools. We will explore marketing plans through the use of technology commercials on closed-circuit television, Technology Teams, and more! This session will be a real world look (complete with aches, pains, and itches) at the growing use of technology in education.

A Model School

Kenwood Elementary in Miami, Florida is a school which knows that technology is here to stay. With that in mind, a Technology Team was developed to oversee and design a training module for the school that would meet Kenwood's specific and unique needs. Under the guidance of the school's Technology Coordinator, Kenwood is on its way!

First Itch—Determining the roles and responsibilities of the Technology Team—Focusing Goals for the School (survey the staff, needs assessment)

A Technology Team of five teachers was selected according to interest and skill level. This team meets with the Technology Coordinator (a full-time position at the school) to focus goals, preview software, meet with consultants and vendors. Each Tech Team member is responsible for a grade level

for initial training and troubleshooting. The entire staff at Kenwood completed a Technology Survey in order to assess technological skill level and needs.

Second Itch—Scope and Sequence of Training—Realistic Timelines

With the Tech Team in place and surveys in hand, goals are set forth and a training model must be outlined. Realistic goals and timeline is essential, and must be reinforced. What are the school's needs? What do we want the teachers to know and be able to do by the end of this school year, semester, etc.?

Third Itch—Develop an Action Plan

Pull out your calendar and get to work! Again, be realistic! Training sessions every Wednesday for the entire staff is not realistic. Grade level training sessions during common planning time, may be easier to fit into the school's schedule. Offering voluntary training sessions may also be realistic for your school. Scratch one itch at a time! Do not try to make everyone an expert after one training session.

Fourth Itch—Market your plan

Offer incentives for training. Closed-circuit television (CCTV) is used for morning announcements. Make this time more entertaining! TECH-Tuesday was developed at Kenwood for this specific reason. Every Tuesday, staff and students are introduced to computer terms, keyboard shortcuts, and more. What better way to market technology than through the use of CCTV! You have a captive audience, no one can walk out on you!

Fifth Itch—Train, follow-up and support continuously

Training sessions are in progress, most teachers are comfortable with turning a computer on, using CD-ROM technology, and the laserdisc player. Now what? Teaching strategies to integrate technology into the classroom is vital. Having a Technology Coordinator as part of the staff, is essential in order to provide follow-up and demonstration lessons. Support must always be available, whether it be for troubleshooting problems, providing classroom connections, or brainstorming.

At last, relief!

For the mutual benefit of all, Kenwood Elementary School is providing a model for other schools. We do not propose to have all the answers. Technology must become an essential component of our school's curriculum. Often times a computer is placed in the classroom and instantly the school is labeled on the forefront of technology. Technology is the answer: it motivates, intrigues, excels, entertains! How do we use it? How does it evolve and become effortless in its use?

The technological learning curve is steep upon inception. The uphill climb is filled with frustration, injury, and yes, even pain. But once on top, looking down the other side; one finds valleys, small hills and a longer journey. The basics are learned, but how are they applied? Much is common sense, the rest must be taught. It is like that incessant itching. You scratch and you scratch, and just as the itching subsides; you sit ready because soon enough the itching will begin all over again.

Promoting Professional Development Through Online and Off-line Resources

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Key words: special education, telecommunications, professional development, video

Abstract

This presentation describes the model developed by the National Center to Improve Practice (NCIP) to promote professional development around the use of technology to benefit students with disabilities. In addition to running a telecommunications network, NCIP uses an integrated set of print and video resources that link to network conversations and an online library.

A Model of Professional Development

The National Center to Improve Practice (NCIP) is a five-year project (1992-1997) funded by the U.S. Department of Education, Office of Special Education Programs. Housed at Education Development Center, Inc. (EDC), NCIP has been a collaboration between EDC and WGBH Educational Foundation (Boston's public television station) for the first three years of the project. NCIP's overall mission is to expand and improve the ways in which technology is used with students who have sensory, physical, cognitive, and emotional disabilities in grades pre-K-12.

Toward that end, NCIP has developed a set of materials and resources for professional development that integrates print and video formats with a telecommunications network. Each volume of *NCIP Profiles* contains a binder of printed materials and is accompanied by a videotape. The purpose of both is to illustrate how teachers effectively use a broad range of technology applications to benefit students with disabilities. These volumes also highlight the implementation issues surrounding the integration of technology into the curriculum. Thus far the topics covered include:

- using multimedia with students who have learning disabilities*
- using tools to support writing for students who are visually impaired*

- technology to support inclusion of students with severe disabilities in preschool
- tools to support organizing of information
- ways to integrate video and word processing to support the writing of students who are hearing impaired*
- use of word prediction software for students with learning, speech and physical disabilities*
- implementation issues around the use of laptops
- ways telecommunications can support students with a range of disabilities

NCIP administers NCIPnet, a telecommunications network which houses lively discussion forums about all aspects of technology in special education (e.g., inclusion, legislation, keyboarding, multimedia, ADD, etc.). NCIPnet also offers an online resource library, containing descriptions of exemplary classroom practice, research syntheses, bibliographies, vignettes, and resource lists. Forums and resources on NCIPnet are linked to topics in the print and video profiles, providing the depth of information that enables participants to delve more thoroughly into a topic. In addition, NCIP offers hosted events, inviting key experts in the field online for two to three weeks. During this time they are available to discuss salient issues with the NCIPnet community.

In order to effectively disseminate its materials and resources, NCIP is building a community of key individuals in school districts, regional educational collaborative and technical assistance centers, parent advocacy groups, and schools of education. Within their individual settings, these individuals serve as change agents with regard to technology and students with disabilities. Although their actual job titles may vary (e.g., technology coordinator, special education team leader, trainer, professor), as part of their roles and responsibilities, they disseminate information, conduct workshops, and provide technical assistance. NCIP distributes its off-line materials, resources, and online network accounts to these change agents. They, in turn, familiarize themselves with the materials and disseminate them strategically to their colleagues and constituencies in a variety of ways—e.g., informally, through structured workshops, and/or passing on copies of print or downloaded materials in the course of providing technical assistance.

As this community's meeting place, NCIPnet currently links over 400 practitioners, administrators, parents, and consumers of special education around the country. With the support of network "facilitators," participants converse about effective practice, share information and resources, and help each other solve problems. NCIP staff support this community of change agents in their use of NCIP's materials and resources through written guidelines accompanying the profiles and ongoing conversations on NCIPnet.

NCIP is currently in its fourth year. During the first three years, the project developed the materials and conducted a rigorous evaluation. Based on the findings from the evaluation, in Years 4 and 5 NCIP will market the materials, offering subscriptions to school districts, schools of education, technical assistance and advocacy centers, and other organizations and agencies that serve students with disabilities and their families.

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