

## **Strategies for Statewide K-16 Internet Access Services**

Dr. Philip J. Bossert  
University of Hawaii

Ms. Sharen Arakaki  
Hawaii Department of Education

### **The Perceived Problem/Possibility**

Properly designed interactive learning environments are fundamentally different from pre-planned laboratory experiments and equally distinct from the decontextualized demands of textbook-based memorization and problem sets. Interactive multimedia makes possible non-linear and thus, "non-cookbook" experimentation-based approaches to learning any subject. Interactive network resources can present students with rich streams of data and dynamic representations that are responsive in real time to inquiry and student-manipulation of variables. In an instant, a well-designed electronic learning environment can offer access to powerful tools of reference, reflection, and communication.

While interactive learning offers tempting glimpses at interesting models for promoting scientific literacy, advances in technology can never automatically substitute for the changes that must take place in our schools and classrooms. The realization of these opportunities requires that teachers become learning facilitators who are members of interdisciplinary teams and "co-learners" along with their students, and that the "school day" be restructured into flexible work schedules that allow and promote "project-oriented" — rather than "lesson-oriented" — learning programs. The work of educators in this decade is not only the work of installing and utilizing hardware and software. It is the work of transforming American schools so that patterns of teaching and learning reflect the *spirit of inquiry* that is the basis for all science. So long as teachers remain "instructors" — isolated both physically in their individual classrooms and intellectually in their individual disciplines — and the school day remains a loose collection of fragmented 50-minute periods of "instructional units" there will be little or no change in the learning environments or learning outcomes.

### **The Context: A Shared Vision**

The State of Hawaii is unique in that both lower and higher public education are directed on a statewide basis. The Hawaii Department of Education, under the leadership of a single Board of Education and a single Superintendent, is responsible for all public K-12 instruction throughout the state. The University of Hawaii system, under a single Board of Regents and a single President, provides all public higher education in the state through 10 campuses (including community colleges) and five education centers on six islands.

The University of Hawaii (UH) and the Department of Education (DOE) have moved resolutely during the past decade to implement high speed networks which link all UH and DOE campuses statewide with voice, data and video connections. The UH — with 50,000 students and 7,500 faculty & staff at 15 sites on six islands — utilizes information technology as a key strategy in coping with changing learning environments and increasing faculty & student expectations. The UH views telecommunications as the means by which its campuses and education centers may be woven into a seamless web to efficiently provide equitable high-quality access to higher education throughout the state. The DOE — with 185,000 students and 17,000 faculty & staff at over 300 sites on seven islands — has pursued a commitment to create appropriate access to voice, data and

video information systems for every public school student, teacher and administrator regardless of their location or learning environment by the year 2000.

The role of information and telecommunication systems and services in UH and DOE is to enhance student and staff learning, increase intellectual and administrative productivity, and improve academic and administrative effectiveness. To accomplish this, educational information technologies must:

Ensure *equity of access* to information resources for all persons involved in learning in the State of Hawaii.

Ensure *ubiquitous access* to information and telecommunication systems and services from anyplace at any time. Education must become a 24-hour opportunity accessible from anyplace via a multitude of voice, data and video devices.

Ensure *coordinated and integrated access* to educational information and telecommunication systems and services so that "public information resources" are easily, readily and cost effectively available to everyone, while privacy and personal information are carefully protected.

Just as life-long learning means that education does not stop just because one has graduated from high school or college, so too does it mean that learning does not stop once a person steps outside of the classroom. The vision for educational technology in Hawaii includes access to information resources via telephone, television and linked micro computing devices from the home, the field and places of business.

### **The Strategy: Shared Resources & Joint Ventures**

During the 1980's the UH and the DOE each began building their own data and video networks. The UH focused on building a common state-wide data network to provide its campuses with both academic and administrative data processing; the UH also became a national leader in the area of interactive video based distance learning in order to equalize to some extent learning opportunities at outer island campuses. The DOE focused its efforts on linking its 300+ schools and administrative sites in a common wide area data network for financial and student information systems; the DOE also sought to make sure that all of its campuses had access to a cable television link in order to deliver "scarce resources" to all sites using the local public television channel during the daytime hours.

In 1990, the UH and the DOE began to cooperate in their technology efforts. The DOE began to see the wisdom of using interactive video based distance learning technologies (DLT) — as opposed to broadcast based public television — to deliver certain programs, and recognized the UH expertise in this area. The UH provided use of its facilities and trained DOE personnel with the result that the DOE was able to build and staff its own DLT studios in a very short period of time. Today, DOE and UH share networks, staff and studios to optimize the use of DLT resources on a statewide, 24-hour basis.

The DOE returned the favor when it negotiated statewide educational software licenses for its schools and included both the UH and the Hawaii Association of Independent Schools in the agreement, achieving as much as 90% across the board reductions in software prices.

When the DOE was funded in 1992 to test the feasibility of bringing Internet services to its schools in the National and International Services for K-12 Distance Education (NINSDE) project, it again recognized the lead of the UH in this area and developed the project as a joint venture.

## **The Hawaii Education Networking Consortium**

In 1993 this “informal” cooperative effort was somewhat formalized when the Hawaii State Legislature suggested formation of a consortium composed of the UH, the DOE, and the East-West Center (EWC). The partners were asked to create an entity to develop and share information and telecommunication resources for education and research purposes. The Hawaii Education Networking Consortium (HENC) brings together all campuses of the three consortium members (two are State agencies and the third is a research institute funded primarily by the Federal Government). Together, the three have a combined user base of over 375,000 students, faculty, and staff. The consortium also regularly cooperates with the Hawaii Association of Independent Schools (HAIS) and the State of Hawaii’s Information & Communication Services Division (ICSD) which provides it access to and, in some cases, control of, a diverse array of network resources which form the technological basis of the HENC Infrastructure:

**Cable Television Companies.** Due to its mountainous terrain, Hawaii is the most heavily cabled jurisdiction in America. Service is provided by seven companies on six islands. The largest of these is Oceanic Cablevision, a Time Warner subsidiary, which serves most of Oahu (where 90% of the State's population resides). Oceanic is building a network that connects schools via Ethernet over a hybrid fiber-coaxial cable system in a metropolitan network (Ethernet-over-CATV). The remaining cable companies are required to comply with State mandates for institutional networking similar to the Oceanic system.

**I-Net:** Cable TV is franchised on every island by the State Department of Commerce and Consumer Affairs (DCCA). As part of the franchise agreements, all cable companies are required to assist the State with construction of Institutional Networks (I-Net). I-Net includes synchronous fiber optical connections (SONET) between State buildings (schools, government, the judiciary, UH campuses) over which video and data are transmitted. The system includes capacity on the coaxial cable networks for Ethernet-over-CATV. The SONET System will be extended to all schools and UH Campuses on Oahu by 1996-97.

**HAWAIIAN (Hawaii Wide Area Integrated Information Access Network):** is the State's interisland digital microwave system. It supports high-speed voice, data and video communications and effectively ties the respective communication systems together.

**HITS (The Hawaii Interactive Television System):** provides four channels of full-motion analog interisland interactive television, with both two-way video and 1-way video/2-way audio capabilities. HITS is based on an interisland microwave backbone that parallels HAWAIIAN and Instructional Television Fixed Services (ITFS) transmission systems on each island.

**Hawaii FYI:** This state funded videotext gateway is available via modem toll-free throughout Hawaii. Hawaii FYI provides access to a variety of governmental information resources and private information service providers.

**PEG Channels:** Hawaii's cable TV franchises are required to provide channel capacity for public, educational and government programming. The UH and DOE collaboratively schedule most of the prime time hours on three available educational channels.

**PACCOM:** UH developed and still manages many of the high speed Internet connections in the region, with connections to Japan, Korea, New Zealand, Australia, Hong Kong, Guam, Hawaii, and the U.S. mainland.

**PEACESAT:** UH developed and operates the PEACESAT network which provides voice and low speed data transmission to over 30 sites in the Pacific Basin.

## **The Hawaii Education & Research Network**

The three-year, \$2.1 million Hawaii Education & Research Network (HERN) project is a research program of the Hawaii Educational Networking Consortium (HENC) which seeks to answer both technical and education reform questions surrounding the design, implementation, management and support of an integrated, statewide Internet services system for Hawaii's K-12 and higher education campuses. The project is a joint venture of the Hawaii State Department of Education and the University of Hawaii — in cooperation with the federally funded East-West Center and the Hawaii Assn. of Independent Schools — and was funded in 1994 by the National Science Foundation as one of the national demonstration projects of its National Infrastructure for Education initiative.

### **HERN Project Objectives**

During the 1992/93 NINSDE Internet pilot project, the joint UH/DOE team members encountered a number of “barriers” which raised significant issues concerning the use of statewide networks for educational purposes in general and in particular in K-12 institutions. These “barriers” fell into three categories:

**Technological** — Although almost all of the DOE and UH campuses were being linked to the Internet via wide area networks, most faculty and staff did not have time during their busy days to access these networks for research and instructional preparation activities. The need for access from home raised access issues (Who provides the “dial up” access?) and support issues (Who staffs a 24-hour help line for 375,000 customers?). Between 1993 and 1995, the number of Internet accounts in the UH and DOE jumped from just under 5,000 to over 30,000.

**Pedagogical** — Most teachers are “isolated” either in their classrooms or in their disciplines or both. Moving from “lesson plans” to “project plans” requires inter-disciplinary and multi-disciplinary thinking and collaborative on-line efforts. Most teachers, both K-12 and higher education, simply do not think or act this way comfortably if at all. The time and effort required to redesign teaching and learning strategies quickly killed the enthusiasm of many for this type of enterprise.

**Psychological** — Once “on the net” with a project, many if not most students quickly pass the teachers in both knowledge and facility of its (the Internet's) use and content. Many teachers are simply not prepared for or comfortable with this power shift.

In light of the above findings, a joint DOE/UH team prepared and submitted a proposal to the National Science Foundation in the spring of 1994 with a research agenda designed to investigate some of these issues. HERN has the following project objectives.

**Management and Institutional Structures:** Over the course of the project, the research seeks to determine appropriate organizational mechanisms to facilitate the implementation and support of a shared educational networking infrastructure for education institutions in the State of Hawaii. This includes exploration of the necessary management and operational agreements and procedures. It also seeks to determine which aspects of educational networking can be centralized, which can be provided by higher and lower education independently, which can be decentralized to individual campuses and schools, and what the appropriate mix is of “institutionally” owned and operated resources vs. “private sector” (i.e., telephone and cable companies) owned and operated resources.

**Connectivity:** The research seeks to determine the most appropriate mechanisms for making access to the Internet and its information resources available to faculty and students at school and at home on a statewide basis. This includes exploration of “appropriate” access filters for different constituencies and a variety of Internet “Interfaces” for use by different levels and types of users. As part of this research the project also is investigating the use of Ethernet-over-CATV as an alternate means of providing non-dial-up access to the Internet for both the campuses and the residences of students and faculty.

**Training and Support:** The research is also investigating the most appropriate manner to provide support to a large number of users on an on-going basis. A revision of the State’s *Telecom & Technology for Teacher’s (T3)* program, and *Internet Bootcamp*, and a statewide self-help listserv are current projects in this area of investigation.

**Educational Reform:** The most important area of the project’s research is focused upon the investigation of reforms in teaching and learning strategies which occur as a result of the availability and use of networks in schools. The emphasis is on experiments with reformed education approaches and structures including: Mechanisms for schools to restructure the school day to provide significant blocks of time where students and teachers can engage in collaborative projects on site, between schools and with other locations throughout the world; and the design and testing of models for collaborative curriculum development and delivery in a networked environment.

### **The HERN Institutes**

During a series of “HERN Institutes” teams composed of K-12 teachers and higher education faculty are brought together to develop Internet-based collaboration skills and resources for use in the schools and colleges. These multi-disciplinary, inter-institutional teams are full-time teachers and instructors located on UH, DOE and HAIS campuses where they can share this expertise in the form of training and assistance to their colleagues while drawing support themselves from other HERN team members on the HERN statewide “self-help” network. In parallel, the HERN project staff is identifying and experimenting with infrastructure management strategies, organizational structures, training systems, support systems and end-user interface requirements needed to provide equitable access for the rapidly growing, statewide, on-line educational community.

The groups selected for the HERN Institutes — on the basis of responses to an RFP — consist of project teams from Hawaii public and private K-12 institutions and both individual faculty members and campus-based teams from the University of Hawaii’s community colleges and four-year campuses. In order to participate, the institutions agree to create a project team composed of three to six teachers, representing at least (but not necessarily only) the core disciplines of math, science, social science and languages from one or more schools, as well as to suggest a multi-year interdisciplinary project. These projects will be developed during the HERN Institute’s summer *Internet Bootcamp* and implemented during the following academic-year. The project team proposals address educational goals, progress, teaching techniques, learning styles, curricula, discipline and education alternatives with a mission to try something novel or unique and to evaluate the outcomes, especially centered around how well and what students are learning.

All team projects involve collaboration among multiple institutions, for example, teachers at a high school working with colleagues from another high school or a community college; high school teachers working with colleagues from “feeder” elementary and intermediate schools in their complex. Projects use mixed media involving the use of related technological tools to support an innovative, interdisciplinary approach to learning. The overall goal of these activities is the use of networked technologies to facilitate and support educational reform. In particular, the project intends to establish models for collaborative curriculum development and delivery across multiple levels of education.

## **Concluding Remarks**

The DOE and the UH are cooperating to solve not only the significant technical issues surrounding “appropriate” and “effective” access to Internet-based learning resources, but also the more important issues associated with the reform and restructuring of the design and delivery of learning in educational communities. The “single district”, “single university” structure of the State of Hawaii’s educational system provides a unique testbed for investigating the scalability of both technological and pedagogical strategies for integrating (voice, data, and video), delivering, and supporting networked learning resources on a broad scale.

One year into its research, the HERN project has come up with a few answers to some of its initial research questions, but in the process also has uncovered additional issues and problems — as well as a few new possibilities. At this point, it seems to us that the real question facing educational planners is not: “What is the role of technology in the classroom?” but rather: “What is the role of the classroom in the age of information technology?”

### **Coordinating Presenter:**

Dr. Philip J. Bossert  
Project Director  
Hawaii Education & Research Network  
University of Hawaii  
2532 Correa Road, Bldg. 37  
Honolulu, HI 96822  
TEL: (808) 956-2777  
FAX: (808) 956-5025  
E-Mail: bossert@hawaii.edu

Dr. Bossert was formerly the President of Hawaii Loa College (1978-86), a Strategic Information Systems Manager for GTE Hawaiian Tel (1986-90), and the Asst. Supt. for Information Technology Services for the Hawaii State Dept. of Education (1990-94). He is currently the President of Strategic Information Solutions, Inc. and serves as the HERN Project Director.

### **Co-Presenter:**

Ms. Sharen Arakaki  
Co-Principal Investigator  
Hawaii Education & Research Network  
Hawaii Dept. of Education  
c/o 2532 Correa Road, Bldg. 37  
Honolulu, HI 96822  
TEL: (808) 956-2854  
FAX: (808) 956-5025  
E-Mail: sharen@kalama.doe.hawaii.edu

Ms. Arakaki was formerly a science teacher, special education teacher, and technology resource teacher in the California and Hawaii school systems, and is currently an Education Technology Specialist with the Advanced Technology Research Group of the Hawaii State Dept. of Education.