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ABSTRACT

Recognizing the potential benefits information technology can bring to education and, ultimately, California's economy, Senate Bill 600 (Rosenthal) created a task force to address and report on the exigent need for technology in all public schools and public libraries. After 18 months of research and regular meetings, the task force compiled this report which: (1) articulates a vision for technology in our public schools, public libraries, and communities; (2) establishes the need for technology; (3) outlines various financing options to bring the information age to these learning institutions; and (4) proposes a grant program to disburse funds. The report consists of four main sections, with the first two sections addressing the technological needs of California schools and libraries and recommending how to best meet those needs. The first section contains a report of the current status of technology in public schools and public libraries. Then, the second section provides an assessment of needs in five areas considered vital to the technological survival of California's education and library systems: (1) access/equipment; (2) staff development/technical support; (3) information/resource management and collaboration; (4) evaluation/assessment; and (5) governance/coordination. The third section explores funding accelerated deployment and adoption of telecommunications and information infrastructure for California schools and libraries and outlines some of the main considerations in choosing among potential funding options. Five major types of funding sources are identified: state and federal programs and funding; California Public Utilities Commission (CPUC) related single event funding; regulatory and legislative rate making; debt financing; and tax financing. The fourth section identifies grant program criteria. Appendices include seven tasks identified by SB 600 task force; estimated costs to establish a school networking infrastructure for California public schools and for public libraries; current state-level funding and future prospects; and current federal-level funding. (Contains 35 references.) (AEF)

CALIFORNIA

SB 600 TASK FORCE

TELECOMMUNICATIONS INFRASTRUCTURE

FOR K-12 SCHOOLS

AND PUBLIC LIBRARIES

DECEMBER 1995

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California Public Utilities Commission
Daniel Fessler, President
505 Van Ness Ave.
San Francisco CA 94102

Dear President Fessler: 2 January 1996

Enclosed is a copy of the SB 600 Task Force on Telecommunications Infrastructure for K-12 schools and public libraries. Copies were sent on 28 December 1995 to the California State Legislature. Additional copies will be sent to the California Public Utilities Commission for duplication and distribution. A disk of the report will be sent to the Commission for addition to the CPUC on-line data base with access through the CPUC home page.

As I reported to the Commission at your 18 December 1995 meeting, the charge to the task force was formidable. The Task Force has reached consensus on a plan to create telecommunications infrastructure for schools and libraries. Implementation of this plan will provide the catalyst to spark California's economic growth particularly in the information technology arena. Any action taken by the Legislature, Governor and/or the CPUC is essential to move California from its abysmal position as last amongst the fifty states in computers in schools. The report calls for unprecedented collaboration. Clearly, the only direction we can take is up from the bottom.

The Task Force profited greatly by work with Commissioner Conlon. His honesty, clarity and perseverance was very supportive to the Task Force. Even though there are competing interests, styles and approaches, the task force members truly committed themselves to the difficult challenges to produce the report. As the chair, I personally learned to practice patience, bring clarity to the issues, listen and let the discussion resolve the issues. I am energized by the collaborative process.

Please let me know if I can be of further service to implement the vision of Life Long Learning for all Californians.

Sincerely,

Kathleen G. Ouye
City Librarian

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The SB 600 Task Force appreciates the assistance of the California Public Utilities Commission, the executive director's office, former CPUC staff member Steve Pangarliotas, and particularly Commissioner P. Gregory Conlon.

The SB 600 Task Force members have provided the following biographies. We honor Charles Binderap, a member of the Task Force who passed away last year. Charlie was a devoted member of the California education community who saw a bright future for all Californians when we realize the vision of CALLL, California Life Long Learning, in an information literate environment.

SB 600 TASK FORCE

CHAIR

Kathleen "KG" Ouye
City Librarian
San Mateo Public Library
1995 Governor's Council on Information Technology
Peninsula Libraries Automation Network

MEMBERS

Charles Binderap (deceased)
Superintendent
Association of California School Administrators
Tulelake Basin Joint Unified School District

Richard Chabran
Chicano Studies Research Library

Ray Clark
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CSU Chancellor's Office

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President of the Education Council of California (IECC), a statewide business led non-profit organization. IECC's mission is to foster the collaboration among industry, education, labor, government and community that is essential to develop

a highly skilled, globally competitive workforce in California. The acquisition of technology "know how" for current and future workers, and in all educational environments, is a high priority for IECC.

John Cradler
Legislative Policy Specialist for Educational Technology
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Professor of Management and Organization at the School of Business, University of Southern California; and Chairman of MESA Research, a consulting firm focused on contemporary business issues and opportunities. He is co-author with Stan Davis of *2020 Vision* and several other books on global business and management, including *Managing the Global Corporation* with Jose de la Torre, *Revitalizing American Industry*, and *The Amazing Race*. As a speaker and lecturer, Professor Davidson stimulates audiences on topics that range from the use of specific new technologies to discussing competitive marketing plans and structures in today's and tomorrow's marketplace. He earned an A.B. in economics, an M.B.A. and a Ph.D. in International Management, all from Harvard University.

Sandra Frank
Administrator
Magnet School Programs
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Ms. Frank has been responsible for implementation and evaluation of K-12 magnet schools which include a strong emphasis on technology, career linkages and specialized curriculum.

John Gage
Director
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Dr. Robert G. Harris
Professor of Business and Public Policy in the Haas School of Business and Director of the Telecommunications Policy Research Program at the University of California, Berkeley. He is also a Principal in the Law & Economics Consulting Group. He earned BA and MA degrees in Social Science from Michigan State University and MA and Ph.D. degrees in Economics from U.C. Berkeley. At Berkeley, he teaches courses in Managerial Economics, Business 7 Public Policy, Antitrust and Economic Regulations and Telecommunications Policy &

Strategy. In his teaching, Professor Harris stresses the practical application of economic and public policy principles, recognizing the human and institutional limits which are often ignored in economic theory.

Dr. Harris has published more than 50 articles analyzing the effects of economic regulation and antitrust policy on industry performance and the implication of changing economics, market conditions and technology for transportation and telecommunications policies. While on leave from the University in 1980-81, he was a Deputy Director of the Interstate Commerce Commission, where he was centrally involved in the implementation of the motor carrier and railroad regulatory reform acts. He has consulted to the U.S. Department of Transportation, the U.S. General Accounting Office, the U.S. Office of Technology Assessment, the U.S. Department of Justice, the California Attorney General and the California Department of Consumer Affairs. He has recently advised the Economic Planning Agency of Japan on major structural reforms of Japanese Regulatory policies in telecommunications, transportation and electric power.

Dr. Harris has testified before the U.S. Senate, the House of Representatives and the Joint Economic Committee of Congress on transportation, antitrust and telecommunications policy. He has testified on numerous occasions before the Federal Communications Commission, the Interstate Commerce Commission, the Canadian Radio-Television and Telecommunications Commission, the Secretariat of Communications and Transportation of Mexico, and the state regulatory commissions of California, Colorado, the District of Columbia, Illinois, Indiana, Iowa, Kansas, Michigan, Nevada, Ohio, Oregon, Pennsylvania, Tennessee, Utah, Virginia, Wisconsin, and Washington.

Deborah Kaplan
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Mr. Lanthier is responsible for integrating public policy, technology and infrastructure plans. Pat is the National Chairman of the New Services and Technologies Issues (NSTI) Subcommittee of the United States Telephone

Association, and an advisor to the National Academy of Sciences' Computer Science and Telecommunications Board (CSTB), the Congressional Office of Technology Assessment (OTA), the California Economic Strategy Panel, Project California, and Bay Area Multimedia Partnership.

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Mr. Lenehan has been actively engaged in utility matters for over 35 years. He has had numerous management and administrative positions in Pacific Telephone and AT&T over the past 28 years and is currently with the AT&T Government Affairs organization in San Francisco. In this capacity he is responsible for environmental, education and telecommunications infrastructure issues being addressed by regulatory and legislative bodies in the Western United States.

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Thomas J. Long
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Sandi McCubbin
Cellular Carriers Association of California

Ursula Meyer
Representing Public Libraries
Held various public library positions in Washington State and California over a forty-year period. Also served as the consultant staff of the New York State Library and for the last twenty years before retirement, held the position of Director of Library Services for Stockton-San Joaquin Public Library. Active in American Library Association and California Library Association, served as President in 1978.

Janice Obuchowski
President
Freedom Technologies, Inc.

William Padia
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Research, Evaluation, and Technology Division
Department of Education

Bill Ragsdale
Mr. Ragsdale 20+ years science and computers at Pleasanton Unified School District. Teacher/Consultant National Education Association Center for Education Technology in Washington D.C. Mentor teacher for 9 years.

Glen Semow
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State Regulatory Affairs
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Michael Shames
Executive Director
Utility Consumers Action Network 4

EXECUTIVE SUMMARY

Recognizing the potential benefits information technology can bring to education and, ultimately, California's economy, Senate Bill 600 (Rosenthal) created a taskforce to address the exigent need for technology in all public schools and public libraries.

> *"The key to the communications infrastructure is to insure that the underpinnings of the information age are available as widely as possible, as accessible to as many as possible, and operate as efficiently as possible. Cooperation between the telecommunications industry, the California business and education communities, and state government can bring the benefits of the information age to all Californians."*
>
> – *Senator Herschel Rosenthal*
> *Regarding Informational Technology in the California School System*

The task force, chaired by the California Public Utilities Commission's designee, Kathleen Ouye, San Mateo City Librarian, includes representatives from the telecommunications industry, ratepayer advocacy groups, and educational interests. After eighteen months of research and regular meetings, the taskforce has compiled the following report which: *1) articulates a vision for technology in our public schools, public libraries, and communities; 2) establishes the need for technology; 3) outlines various financing options to bring the information age to these learning institutions; and 4) proposes a grant program to disburse funds.*

ADDRESSING CALIFORNIA'S LEARNING CRISIS

> *"We must ensure that government takes full advantage to educate our kids and continually train our workforce, grow our economy, make government more accessible and cost effective and enhance the quality of life for all Californians."*
>
> – *Governor Wilson, Governor's Information Technology Council*

The urgency of this statement is underscored by the fact that, last year, California fell to 50th in the ratio of students to computers, with less than 2% of educators accessing or using telecommunications (Quality Educational Data, 1994). Further, California ranks among the bottom in state funding for technology.

What are the implications of this deficiency? Simply put, California is falling behind. As information-intensive services supplant manufacturing and defense production, the need for workers proficient in technical and professional skills has increased dramatically. How can California achieve and maintain a competitive advantage in this emerging global information economy? The answer is through pro actively integrating the use of technology in our public schools and public libraries. Integrating technology into the life-long learning environment will establish the critica link in nurturing information-literate citizens; it will revive the California economy.

A VISION FOR THE FUTURE

> *"We will soon have a visionary blueprint for California's future in the information age."*
>
> -- *Governor Wilson, Governor's Information Technology Council*

It is the year 2000, California has implemented plans and policies to transform education, enabling Californians to fully participate and compete in a rapidly changing world -- a world dominated and liberated by networked information technology. A new education paradigm, called California Life-Long Learning (CALLL), unites and inspires various groups to collaborate, connect, and move California out of its old educational doldrums. California, often the trend setter, is now seen as a global leader in creating, developing, and deploying networked learning technology for all ages.

CALLL links schools, libraries, senior centers, homes, businesses, and government as part of an expanding California Information Infrastructure (CII), National Information Infrastructure (NII), and Global Information Infrastructure (GII). CALLL connects each to all -- from Kindernet through SeniorNet. High speed networks enable instantaneous response from around the world via interactive video digital data, text, and voice. The Internet is both a pervasive learning tool and a virtual development lab for teachers, librarians, and students. Students produce multimedia reports on CD-ROM, with direct digital input from students, teachers, and librarians around the globe. California's cultural diversity is recognized as a strength in such an interconnected and interdependent world.

CALLL is more than technology. It really is about people -- people of any ag learning from other people and using the best means to do just that. In addition to networked information technology (networks, computers, software), staff and professional development are key aspects of this new paradigm. A new literacy standard is in place -- Information Literacy -- and both learners and facilitators

(teachers, librarians) are certified via this standard. In the year 2000, all facilitators are certified, and some students already work in the digital studio/virtual office/distributed work environment of the third millennium.

Unprecedented collaboration, coordination, and action have fueled this California transformation. The Governor, the Legislature, the Superintendent of Public Instruction. the State Librarian, the State Library Association, the Department of Education, the California Public Utilities Commission, the California Teachers' Association, key information technology businesses, parents and students joined together to implement policies based on a shared vision established in 1995 - The California Life-Long Learning vision.

PURSUIT OF THE VISION

> *"The powerful convergence of technologies presents an unprecedented opportunity for action."*
> — *Governor Wilson, Governor's Information Technology Council*

To begin pursuit of the vision today, the task force conducted a needs assessment. This needs assessment emphasizes a fundamental and expansive objective: to utilize information technology now, with concurrent training and management support, in order to transform the future of public education, life-long learning, and community interactions in California.

Currently, there are few examples of California public schools with access to the information infrastructure. Due to limited funding, these isolated "information islands" are not connected to one another, nor are they managed by highly trained individuals. While many public libraries have access to the information infrastructure, this access is inadequate, with few workstations for public use. For example, only 21% of the state's over 1,000 public libraries have Internet access, often limited to a single publicly accessible work station. Consequently, the far-reaching benefits of the information age are not being realized by the state's populace.

Critical components of a technological plan that will successfully provide information infrastructure access to all Californians through our public schools and public libraries include:

- *Access and Equipment: so all Californians can access high speed*

networks capable of video, data, and voice.

- *Staff Development/Technical Support: to ensure successful use of network technology.*
- *Information/Resource Management and Collaboration: so technology is a key component of state educational reform efforts; every federal and state education program should include funds designated for technology.*
- *Evaluation and Assessment: so all technology efforts in California are evaluated based upon cost-effectiveness and cost/benefit analyses.*
- *Governance and Coordination: to ensure coordinated planning by various stakeholders.*

ESTIMATING COST SCENARIOS

Having identified these critical components, the task force developed two cost scenarios for connecting California's public schools, public libraries, and communities to the emerging network infrastructure. One involves basic technological deployment, the other minimal technological deployment. Both scenarios consider the costs of wiring, hardware, software, training, and connectivity Where they differ is in the number of sites that will have access to the information infrastructure.

Basic technology deployment in California's public schools and public libraries is an expensive proposition -- approximately $2.3 to $2.9 billion. Minimal deployment is estimated at $1 billion. However, the benefits of an educated, technology- and information- proficient populace far outweigh the costs. And costs may be recovered in the short-run: a Wharton Econometric Forecasting Associates study determined that North Carolina, a smaller state with a correspondingly smaller information economy than California, could add $2.7 billion to its state gross product and create at least 44,000 new jobs by 2003, simply by providing statewide access t the information superhighway.

FINANCING INFRASTRUCTURE: A PORTFOLIO APPROACH

Without sufficient funding, California public schools and public libraries, and California's economy, will not receive the benefits of access to the information infrastructure. To ensure sufficient funding, the task force has identified several major funding sources. The report explores these major funding source areas, examines specific options within each area, presents pros and cons of each option, and weighs each option against the financing requirements of a comprehensive

infrastructure program. Proposed funding sources include:

- *Existing State and Federal programs and funding*
- *CPUC-related single event funding*
- *Regulatory and legislative rate making*
- *Debt financing*
- *Tax financing*
- *Public/Private partnerships*
- *FCC auction funding*

Rather than recommending a single funding option, the task force suggests that employing several of these options in combination may be the most successful manner to achieve appropriate funding. This *portfolio approach* would not over-burden any single source, yet would provide the initial and ongoing funds necessary to support the information infrastructure.

GRANT PROGRAM CRITERIA

The grant program for public schools and public libraries to receive funding must be simple, fast, and equitable. It must ensure funding for those learning institutions with the greatest need and a commitment to using the network. To apply for funds, public schools and public libraries shall, at a minimum:

- Conduct a local needs assessment
- Describe how technology will be integrated into current curricula
- Describe how the community will benefit from new technology
- Allocate sufficient time for staff development programs
- Provide cost justification

Public schools and public libraries receiving grants will be required to annually report the extent of network access and usage, as well as the extent of educational application.

FULFILLING THE PROMISE

Connecting California classrooms and libraries to the National Information Infrastructure is essential to ensure the state's ability to compete nationally and globally. With the rise of a highly technological global marketplace, learning institutions are faced with the ever-increasing challenge to prepare Californians to compete in the 21st century. Preparing a workforce that is well educated and trained

in information technologies is essential to secure California's economic strength and competitiveness. The development and implementation of a telecommunications network and information infrastructure for the state's public schools and public libraries is an essential component of the plan to improve the state's education system and the quality of life for all Californians.

INTRODUCTION

In the February, 1994 issue of *Intermedia,* columnist Keith Yeomans stated, "The education systems of both rich and poor countries must come up to speed in their use of advanced telecommunications technology or they will fail in their main purpose as a key sector of the information economy: generating a workforce competent in the skills needed to create wealth. Someone must foot the bill."

This message is two-fold. First, preparing a workforce that is educated and trained in information technologies is essential for 21st century work environments and critical to California's economic strength and competitiveness. Second, there is a cost component to educating our populace. Yet, the benefits of a competitive, productive populace far outweigh the costs.

Indeed, the strength of California's economy depends upon creating an environment that attracts and holds businesses and upon maintaining a climate that promotes opportunities for research and innovation in development of new products and services. Because information technologies are the driving force in both national and global business, integrating the information infrastructure into our public schools and public libraries is critical to educating our state's populace and improving our economic competitiveness.

Connecting California to the Information Superhighway is an efficient means of assuring that all California citizens -- regardless of ethnicity, sex, socioeconomic status or disabling condition -- have an equal opportunity to benefit from the advantages of networked telecommunications to support their economic well-being, lifelong learning opportunities and quality of life as we move into the 21st century.

An opportunity to capitalize on the potential benefits information technology can bring to education and, ultimately, California's economy, arose with the introduction of Senate Bill 600 (Rosenthal); the bill created a taskforce to address the exigent need for technology in public schools and public libraries. Comprised of representatives from the telecommunications industry, ratepayer advocacy groups, and educational interests, the taskforce evolved into two subcommittees. One subcommittee examined technological needs and grant program issues for public schools and libraries, while the other group focused on financing issues.

The taskforce report represents the efforts of the two subcommittees. As with any collaborative effort, consensus was developed around some issues, but not all. While recommendations are based upon majority opinions, each taskforce member has been given the opportunity to append this document with comments.

ADDRESSING THE TECHNOLOGY CRISIS

> *"While the rest of the world uses e-mail, our schools are stuck in the age of the Pony Express. I propose we give every classroom in California access to the information 'superhighway' offered by computers and fiber-optic technology."*
>
> — *Governor Wilson, Education Reform Proposal*

Schools and libraries across the nation do not have the resources necessary t prepare citizens for the technological age. This is especially true in California. Onc viewed as the leading technology state, California is trailing behind other states in terms of access to information technology and telecommunications infrastructure by its educational institutions.

The following two sections assess the technological needs of California schools and libraries and recommend how to best meet those needs. Section one begins with a report of the current status of technology in public schools and public libraries. Then, section two provides an assessment of needs in five areas considered vital to the technological survival of California's education and library systems. These areas include:

A) Access/Equipment
B) Staff Development/Technical Support
C) Information/Resource Management and Collaboration
D) Evaluation/Assessment
E) Governance/Coordination

Each area is addressed in the same manner. First, California's current condition is summarized. Next, the desired condition is presented, followed by recommended actions needed to fulfill the desired condition.

I. STATUS REPORT: TECHNOLOGY AS AN EMERGING PRIORITY FOR EDUCATION

The infusion of technology and telecommunications into teaching and learning is widely viewed as an effective means of strengthening America's workforce by increasing opportunities for all students to be prepared as skilled high tech workers, in the 21st Century. As a result, technology is emerging as an educational priority at national, state and local levels. Understanding the need for implementation of an advanced information infrastructure serving industry, education, governmental agencies and the general public, the White House released a document entitled, *National Information Infrastructure: Agenda for Action* (National Coordinating Committee on Technology in Education and Training, 1994 [NCC-TET]). The document outlines its vision of an advanced information infrastructure involving an interconnection of computer-networked telecommunications services and applications that serve this country both nationally and globally.

The *Agenda for Action* (1994) is reinforced by the *Goals 2000: Educate America Act,* which promotes educational reform by establishing national education goals and standards to be attained through state and locally planned initiatives which involve technology. Taken together, Goals 2000 and the National Information Infrastructure (NII) can facilitate the development of world-class educational standards to enable all students to achieve the *National Education Goals* and meet the challenges of the 21st century workplace.

While many states have amassed the resources needed to expand technology in education, California has fallen further behind in its support of technology in public schools and libraries. Fortunately, the Governor, legislators, and education organizations and agencies throughout California are beginning to address the need for technology in all schools and public libraries. This new interest among policy makers is long overdue, as California schools and public libraries have declined in technology access over the past ten years, as compared to many other states.

Status of Technology in California Schools

In recent years, United States comparisons have shown that California has fallen from 44th to 50th in the ratio of students to computers (Quality Education Data, 1994). That same study also indicates that less than 2% of all teachers in California access or use telecommunications. A state-by-state survey of per pupil state fund expenditures for technology (Far West Laboratory, 1994) revealed that

California ranks in the bottom third of states in the United States, spending only $2.35 per pupil per year from state funds for educational technology. This figure compares to $153.20 per pupil in Connecticut; $149.15 in Kentucky; $89.31 in Tennessee; $73.93 in Indiana; $45.95 in Hawaii; $33.00 in North Carolina; and $31.48 in Texas. These findings are consistent with preliminary findings of a study of telecommunications and network technology in California public schools (California Department of Education, Research, Evaluation and Technology Division, 1994) which revealed very limited access to technology in general and almost non-existent use of telecommunications in particular.

Over the last several years, California has reduced its commitment and support for educational technology, as indicated by the elimination of the Teacher Education and Computer (TEC) Centers in 1987 and the subsequent reduction of funding for technology in education. The current lack of State support for educational technology and the education community's lack of access to technology and other resources places California in great jeopardy.

School Libraries

California's school libraries need access to information resources beyond their local collections that can only be accomplished through an integrated information infrastructure to address the state's libraries' needs for facilities, personnel, products and services. Telecommunication connectivity and electronic workstations would provide school libraries with on-line access to catalogs of other libraries such as MELVYL, an on-line catalog of the University of California which is accessible through the Internet. Due to funding decreases over the past ten years, most elementary schools do not have a certified librarian. This underscores the need to make technological resources readily available to teachers and students.

State Education Plan for Technology

Although the *California Master Plan for Education Technology* (1992) set forth a vision for educational technology, no strategic plan was ever developed for the infusion of technology into the State's education system. Further, the Master Plan has only been partially implemented due to minimal funding ($13.4 million in FY 1995).

Status of Technology in California Public Libraries

Public libraries' experience with technology and telecommunications has been advanced primarily through the efforts of the larger urban libraries and networks,

together with the leadership of the California State Library and the California Library Association. Public libraries in California have enjoyed a long history of cooperation – sharing resources and staff expertise – through their own efforts and/or modest funding from state and federal governments.

Recent planning for technology has centered in the work of the State Library's California Library Networking Task Force, whose Network Telecommunications Committee has proposed a telecommunications system that would support the resource-sharing needs of the 8,000 libraries of all types (academic, corporate, hospital, public, school, special, etc.) in the state. The fifteen cooperative public library systems of today, established under the California Library services Act of 1978, will evolve into five Regional library Networks in the future and expand the membership base from public libraries to all types of libraries ("multi-type"). Those five Regional library Networks will serve as the sub-centers of the multi-type library network telecommunications system but could also serve as centers and/or sub-centers of any proposed telecommunication system.

A 1992 State Library study ("California Library Telecommunications Study Report #1") provided an analysis of current library services, a survey of existing/projected state and national telecommunications networks, a description of the use of commercial information utilities, and a discussion of alternative approaches to implementing a library telecommunications network. The second report ("California Library Telecommunications Backbone System Report," 1993) recommended the actual architecture for the library telecommunications network: a hybrid of service providers, taking advantage of available bandwidth from a variety of sources and existing structures, while adding only those new pieces necessary to meet the library goals statewide. The California Library Networking Task Force used these reports as a springboard for its final description of the network telecommunications program, which was adopted in December, 1994. Two guiding principles that emerge from the work of the Task Force are: 1) the basic structure should be flexible and allow for the addition of features to accommodate increased user needs and/or technological changes as they develop; and 2) there should be equitable, affordable, user-friendly access statewide.

Two 1994/1995 subsequent State Library studies detailed the components and costs for the telecommunications backbone statewide and for the individual public library sites. It is estimated that the telecommunications system backbone would cost $5 million and local site preparation would cost $200 million. Very little of the Task Force planning has been implemented to date because funding has not been available.

THE PUBLIC LIBRARY

The public library is the logical centerpiece which can provide the leadership and expertise to the steadily advancing universal access potential to the information highway. It can be used by all people without regard to an individual educational level, income, age or status in the community. It serves all the people. The number of public libraries is small considering the size of the state and the size of the population. There are only 165 public libraries in the 58 counties. They are "governed" by the local entity, county, city or district and have a tie to the California State Library. This relationship, which dates to 1909, has provided stability for Californians and has served as a model for public library development in the other 49 states in the 20th century.

As we approach the 21st century, a momentous telecommunications revolution is taking place.

But what if the child's parents or school can't afford a computer? What if you don't have one in your home – or don't know how to use one? The information superhighway promises vast riches of information, but it also threatens to widen the gulf between the "information rich" and "information poor."

Our forefathers and mothers knew it made good sense to invest in libraries as a shared community resource for books. It makes even more sense to support libraries in acquiring the powerful and expensive technology needed to obtain electronic information.

Nothing is more important to the future of our democracy than ensuring public access to information. That is why we need our nation's public, school, college, and university libraries online.

The technological revolution is happening ***now.*** *And now is the time to support your library and all libraries in their efforts to ensure equity on the information superhighway.*

– *Betty Turlock, President*
American Library Association, 1995

The public policy upon which the institution is based provides service to and resources for all without regard to the status and/or income of an individual. Since the 1960's on sharing resources and expertise, has enabled the library to give better service in a timely manner by cooperating and thus reducing the cost. Since the 1970's, most libraries have also included the private sector in building the collection and providing specialized services. In addition, networks of libraries have linked area libraries to make available greater in-depth resources for the user. Using the large city libraries and accessing university libraries and other institutions of higher learning in the network of information has given access to tax-supported and private collections of millions of volumes and other library materials to all Californians. In the 1990s the network concept was refined, and the speed of obtaining information is constantly improving.

The passage of the Library Services and Construction Act (LSCA) in the 1950s provided the incentive to public libraries to cooperate for the benefit of all library users. Grants and special projects, funded in part by the federal government through the State Library, gave impetus to establish library systems, networks and joint exercises of power arrangements which reduced the number of units and lowered the cost of service. Grants provided the incentive to be imaginative and plan and create new patterns of service which resulted in more and better public library service for all Californians.

Libraries very early joined the automation revolution to speed access to information which could be shared and need not be duplicated at each location. The change from manual to automated can be divided into two distinct areas, access to knowledge and conversion of routine tasks. The labor intensive clerical routines became more and more costly. Online circulation (loaning records) and the overdue process online made it possible to save staff time. Next came the cataloging and classifying process which is repeated at each library. The OCLC system with thousands of members provided uniform cataloging online to all libraries in the United States and Canada. Hence each library needed minimal professional staff to "adjust" the entry to the needs of the local library.

The reference/research knowledge function changed drastically as more and more databases could be accessed at a reasonable cost. In this age of "need to know" instantly, the public library is in the forefront of providing access to the highway through trained staff or to the user. Staff has been trained and receives ongoing training in the use of the latest technology.

The public library is the center of each community. It is the agency which has proven that it can give cost-effective service while it shares resources. It serves people from infancy to senior citizens, from the functional illiterate to the doctoral

researcher, and it is open to all and welcomes the English speaking as well as those who do not speak English. No other educational institution in California can make that statement.

K through 12, universities and colleges, private and public, and other agencies all have a limited specialized clientele. Since 1978, the efficiency and cost effectiveness of the public library has been tested and refined. As wages and buying power shrink, use of the public library increases. Cooperation among all types of libraries and agencies as well as involvement of the private sector has been increasing and has been refined and is successful.

The information age and need to access the new highway comes at a time when job skills must be changed, when reduction of job opportunity is constant and when new skills must be acquired as often as every 18 months..

Life-long learning has been the major concern of the public library. In the past two decades, literacy training for those who did not learn the basic skills in school has been provided by the library. Different skills demanded in the job market is also a major concern as well as the traditional services and the online services.

The public library has had long experience in cooperation and in providing leadership in sharing resources. In most of the 58 counties, there is one county library and a number of city libraries. Federal and state grants and incentives are based on sharing and cooperating, therefore the advent of online service will be folded into the ongoing operation of a library.

The sad state or the total lack of school libraries dictates that K-12 must look to public library leadership in providing online access. There must be inter-connectivity, first to the schools' libraries and then to each classroom It is also essential that each school, high school, middle school and elementary school must be interconnected with each other, the public library and many other agencies.

The potential for the public library to build upon its valuable print collection, the audio-visual collection and the other traditional information resources, as well as the staff trained in information retrieval, must be the centerpiece of the online services which will assist students in school and all other Californians in taking advantage of the riches of the information highway.

AMERICA'S LIBRARIES: RIDING THE INFORMATION SUPERHIGHWAY

Librarians paved the way for the information superhighway. Many children and adults have their first hands-on encounter with a computer at their school or public libraries.

Today, an increasing number of public and school libraries offer access by computers to their own collections and to world-wide databases. And librarians are expert at helping others navigate the myriad of electronic networks known as the information superhighway.

Some examples:

In Seattle, a mother researched her daughter's chronic ear condition online at the library before deciding whether to proceed with surgery.

In Clinton, Iowa, library users can view more than 1,500 job listings throughout the state via an electronic bulletin board, then print out the listings that interest them.

In Maryland, residents obtain online stock market reports, travel advisories and job listings at their homes, schools and businesses via a free statewide access to the Internet via libraries.

In New York, a physician saved an infant's life using techniques for treating a rare form of meningitis that he found online in a medical journal published in India.

NEEDED: EQUAL ACCESS

The uneven adoption of new technology threatens to widen the gap between the "information rich" and "information poor even as it promises to revolutionize how we live, learn, work, and govern. Statistics such as these underscore the need for policies to ensure equal access to electronic information:

Those living in rural areas and central cities are least likely to be connected.

Families with incomes over $50,000 are five times more likely to have access to computers and ten times more likely to have access to online services than other families.

African-American and Latino school children are less likely to have access to computers, both at home and at school, than other children.

SOLUTION: LIBRARIES

Libraries have always connected people of all ages and backgrounds with the resources they need for their education and enjoyment. This role is more critical than ever in the new era of electronic information.

At a time when only one of three American households own a computer, our nation's public, school, college, and university libraries are uniquely positioned to serve as the public's on-ramp to the information superhighway -- a place where all people can tap into new technology with the expert assistance of a librarian.

Libraries that are online support equal access in may ways. These include:

providing free public access to vital information resources;

teaching people of all ages to use new technology;

serving as a hub for their community's electronic information;

making collections accessible online in their communities and around the world;

staying abreast with new technology;

advocating free and open access to electronic information.

Unfortunately, the high cost of technology makes it difficult for some libraries to keep pace.

The number of libraries connected to the information superhighway is growing rapidly thanks to the leadership of enlightened librarians, businesses and support from savvy communities. But there is still a long way to go before equity is achieved. A new infusion of support from both public and private sources are needed if Americans are to enjoy the same access to information in the next century as they do today.

The most recent statistics show that:

only 11 percent of public elementary school libraries and 21 percent of high school are connected to the information superhighway.

about 1 in 5 public libraries are connected.

RULES FOR THE ROAD

The new era of electronic information raises many issues of special concern to the nation's libraries and librarians. The American Library Association believes that development of the information superhighway should be guided by the following principles:

1. **Equity** must be ensured via libraries to make information available, accessible and affordable to all Americans.

2. **Open access** to information must be assured in the electronic environment. A balance must be struck between financial return to copyright owners and the rights of library users to reproduce copyrighted materials.

3. **Affordable** telecommunication rates must be provided for libraries. These rates must be predictable and stable.

4. **Privacy** must be protected. Individuals should have the right to inspect and correct data files about themselves. Library records must remain confidential.

5. **First Amendment** rights guaranteed by the U.S. Constitution must be protected.

Individuals must have the right to choose the information they wish to receive.

6. **Easy access** must be encouraged through uniform standards of operation by government, telephone companies, computer manufacturers and other providers. Electronic information must be organized to maximize accessibility.

II. NEEDS ASSESSMENT

As stated earlier, this section provides an assessment of needs in five areas considered vital to the technological survival of California's education and library systems. Following the summary of recommended actions, each of the five areas is addressed in the same manner. First, California's current condition is summarized. Next, the desired condition is presented, followed by recommended actions needed to fulfill the desired condition.

SUMMARY OF RECOMMENDED ACTIONS:

A. Access to High Speed Networks in K-12 Schools and Public Libraries

- -- fully fund and implement the current California Department of Education and Public Libraries' plans for technology.
- -- obtain and install hardware and software and connection to high speed networks.
- -- implement on-going technical support
- -- identify dissemination activities

B. Staff Development and Technical Support for Teachers and Librarians

Implement staff development training and on-going technical support. Provide certification in network technology for teachers and librarians in collaboration with existing staff development funding sources.

C. Information/Resource Management and Collaboration

Establish technology as a key component of State and local education reform efforts.

Ensure that every federal and state funded education program include funds designated for technology.

D. Evaluation and Assessment of allocated funds

Evaluate technology in education and Public library settings.

E. Governance and Coordination

Develop a State Plan for technology that incorporates goals for K-12 schools, higher education and public libraries technology plans. Coordinate funding sources, goals and activities with other federal,

state and local agencies and programs.

Establish grants program recommended by the SB 600 Task Force and the California Public Utilities Commission in its 1993 infrastructure report for schools, public libraries and community centers.

Facilitate implementation of the following telecommunications network infrastructure and dissemination activities for districts and/or regional centers:

- conduct local needs assessment
- establish collaboration with business, government, higher education and community organizations.

A. Access to High Speed Networks in K-12 Schools and Public Libraries

Current Condition

Access to high speed networks in K-12 schools and public libraries is minimal to non-existent. At present, few California schools can boast of a communications network technology system. Preliminary findings from a recent California Department of Education survey (Research, Evaluation and Technology Division, 1994) revealed that less than 9% of public schools in the state have access to the Internet, as compared to 35% nationally (National Center for Education Statistics, 1995).

Desired Condition

To implement full access to high speed networks capable of video, data and voice in K-12 schools and public libraries by 2000. Future developments in the telecommunications world will open new vistas in how information is transported. In addition to land-line technology, wireless is being utilized today and is already changing the parameters of network learning technology.

Recommended Actions

1. Establish a networking infrastructure for all California schools and public libraries.

2. Establish the $150 million annual Schools and Libraries Information Technologies Grant Program recommended by the California Public Utilities Commission in its 1993 infrastructure report to Governor Wilson, according to the criteria framework presented in this document.

3. Target areas or populations within the state that are deemed to be in particular need of achieving more timely access to telecommunications networks.

4. Secure additional funds for these efforts from a variety of sources, as described later in this report.[1] Funds should be used to:

- Develop a strategic plan;
- Purchase and install hardware, software, networks;
- Implement staff training;
- Implement on-going technical support.

Benefits

By implementing full access to high speed networks, the first step toward producing a technology-literate and competitive populace is established.

B. Staff Development and Technical Support for Teachers and Librarians

Current Condition

Staff development, technical assistance, and certification in network technology for teachers and librarians is minimal. Due to lack of training funds, only 2% of K-12 teachers and 21% of librarians in public libraries are trained in the use of network technology. In the vast majority of schools, training for technology users falls far short of the need. Of the few technology users, most are self taught--either at home or on the job--and most are described as having limited computer proficiency. The most apparent problem associated with the technical support issue is that most schools and public libraries lack an official technical support person or network administrator (California Department of Education, Research, Evaluation and Technology Division, 1994).

A study conducted by Far West Laboratory (1991) to review California technology programs from 1984-1991 showed that other than district and school staff, The California Technology Project (CTP) was the only significant source of assistance for school technology projects. CTP consists of 10 regional consortia assigned to work with schools in planning procedures based on client needs ascertained through formal needs assessments. CTP regional consortia provide staff development for integrating technology; assist in project development, implementation, and evaluation; coordinate resources for technology use; facilitate the use of *Technology Resources in Education* (TRIE) information service on

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[1]See Appendix A for a description of costs and assumptions associated with establishing a school networking infrastructure for all California public schools

CSUNet; and provide individualized technical assistance to the schools served.

The California Telemation Project, a CTP project, provides educators with professional development in the use of telecommunications to enhance teaching and learning. The primary emphasis is on integrating telecommunications-based resources into site level planning, curriculum, learning strategies, and student-centered activities to benefit both teachers and students.

Twenty state "telementors" have been selected to develop curricula using on-line information as a learning resource; to transform telecommunication-based resources into California framework-based curricular content, emphasizing the instructional strategies featured in California's reform documents, and to train local telementors to use telecommunications in the classroom. A TeleLearning Mobile Unit (TMU) is utilized as an applied classroom learning center to provide training participants with access to telecommunications and other new technologies. Currently, only 1,000 teachers, out of a workforce of 220,000 teachers, have received preliminary training.

Desired Condition.

To provide staff development, technical assistance and certification in network technology for teachers and librarians in collaboration with existing state staff development funding sources. Without training, hardware and software will be under-utilized and the benefits of the information infrastructure will not be realized.

Recommended Actions.

1. Access existing California Department of Education and library programs funding sources for staff development training including SB 1882, Staff Development, School Improvement Program, Telemation Project, and SB 1510. When available, utilize the $150 million annual funding/grants program recommended by the California Public Utilities Commission for implementation of the telecommunications network infrastructure in schools and public libraries.[2]

2. Establish a significant pre-service activity to ensure that entering teachers can integrate technology into their teaching.

3. Develop a student program, through high schools and regional

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[2]The focus of this staff development is on the integration of technology into the learning environment. This would not include the technical assistance, such as operating and/or repairing equipment, which is addressed below.

occupational programs (ROPs), in which students are trained to fill jobs for technical LAN/WAN support and to provide technical assistance for users. These students can receive on-the-job training by working with the technical personnel at the county office of education, the district, and the school. The course of study would be offered at selected high schools/ROP centers throughout the state, and the program would provide technical assistance at school sites, thus benefiting both student and school personnel.

4. Designate a county office of education within each of the 10 County Superintendents' Service Regions to be developed and supported as the regional network hub or Regional Technical Support and Training Center. This Regional Center would provide services to schools, districts, and libraries within the county service region. The program could eventually be expanded to provide training to parents and the community. These services would include:

- A technical support help desk with an 800 number;
- Management of the hub Internet connection;
- A major training center for technology training;
- Managing and maintaining instructional resources, news groups, etc. for access by California educators, in collaboration with other regional centers.

5. Each district should provide the following technical assistance and support to schools within that district:

- Maintain the Designated Network Server (DNS) for all schools within the district, although large schools should be encouraged to maintain their own DNS.
- Manage the district wide area network (WAN) and e-mail for all schools within the district.
- Develop a cadre of students who provide technical assistance to school personnel. Students who attend a special LAN management and technical training program, offered by the district, will be eligible to work with the district and/or school technical support personnel in support of the district WAN and school LANs.
- Develop a mentor teacher program in which teachers are provided the opportunity to become more technically proficient. Mentors would receive training through the regional center and district.
- Manage specific instructional resources on the district server related to district curriculum plans.
- Provide introductory training classes and/or training not offered through the regional center.

6. Large schools should have technical assistance staff on-site. All schools should support mentor teachers who will receive training through the district and/or regional center to provide site technical assistance to other teachers.

Benefits

Staff development follow-up has been identified as the most critical requirement for the effective and sustained use of technology in education. Staff development and sustained technical assistance creates a competency in information literacy -- the ability to access, evaluate, and use information from a variety of resources.

Benefits to teachers and librarians are the communication with other educators and potential for resource sharing via the California Information Infrastructure and other electronic networks. Benefits to California include a more efficient and educational system.

C. Information/Resource Management and Collaboration

Current Condition

State Activities:

With the $13.6 million currently appropriated from the State General Fund for educational technology, California offers school-based grants, and a variety of services and resources that are of great value to public education.[3] These limited resources have leveraged, through matching funds and business donations, over $15 million in resources. However, even with leveraged resources, California still falls short of meeting its needs for educational technology.

While California's pilot projects have received initial funding, ongoing resources to support these pilots are not available. As a result, other states with more substantial resources committed to information technologies are implementing and benefitting from California project blueprints, while California falls behind.

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[3]For a complete list of California pilot projects, please see Appendix D.

Federal Activities:

Again, a number of pilot programs have been initiated.[4] However, ongoing funding has not been secured. California cannot rely on Federal funds to support information technologies in our public schools and public libraries; it is estimated that California would only receive 8% of any highly competitive Federal funds slated for integrating technology into the life-long learning process.

Desired Condition

Information technology should be incorporated into all federal, state, and local restructuring and school improvement programs.

Recommended Actions

Technology should be a key component of state educational reform efforts. Every federal and state funded education program should include funds designated for technology.

Benefits

By coordinating state and federal efforts, time and money are saved. Planning efforts will not be duplicative or redundant, while knowledge of and access to federal funds will reduce the cost of developing a technology-proficient, information rich California.

D. Evaluation and Assessment

Current Condition

During 1990-91 a comprehensive evaluation was conducted to review a large number of diverse technology projects funded by the State from 1984 to 1991. The evaluation provided useful data that has guided the development of policy, subsequent legislation, and the *California Master Plan for Educational Technology* (1992). As a result of that study, several model multimedia curriculum development projects were initiated, the CalTIP Project was implemented, and school-based grant requirements were expanded.

No funding was available for evaluation in 1991-92, but monies set aside for evaluation in 1992-93 were used to evaluate the Level I and II Model Technology Schools and the 1991-92 School-Based Grants. A Request for Proposals (RFP) to determine the effectiveness of educational technology

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[4]For a complete list of Federal pilot programs, see Appendix E.

programs with an emphasis on programs funded by the Educational Technology Act (SB 1510) has been recently released by the California Department of Education. The study will take place over an 18 month period commencing in Spring of 1995 and concluding no later than December 31, 1996. The evaluation results will provide information in the areas of staff development; information and learning resources; technical assistance, including hardware acquisition, repair and maintenance; telecommunications infrastructure; and coordination and funding.

Desired Condition

All technology efforts in California should be evaluated, based upon cost-effectiveness and cost-benefit analyses.

Recommended Action

The Schools and Libraries Information Technologies Grants Program should fund a comprehensive evaluation of any technology projects currently receiving grant support. The evaluation should be comprehensive and include a view of all technology efforts in California.

Benefits

The evaluation will enable policy-makers and program managers to readily identify successful programs and eliminate marginal projects, thereby saving crucially needed funds.

E. Governance and Coordination

Current Condition

Unfortunately, coordination with other programs and agencies for technology is minimal. Organizations -- such as the Industry Council for Technology in Learning (ICTL), the Education Council for Technology in Learning (ECTL), educational organizations (e.g., CTA, CSBA, ACSA, etc.), and California Department of Education curriculum framework committees, subject matter projects, and others working in program areas ranging from special education to school improvement -- have functioned relatively independent of one another in setting goals for technology in K-12 schools and public libraries.

Telecommunications planning for schools and libraries in a state as diverse and vast as California is inherently complex. Successful planning done in other states such as Utah or North Carolina are often mentioned as examples for California to follow. Unfortunately, what is often overlooked in promoting these planning models is the difference between other states and

California. Successful government planning involves harnessing the various constituencies into a common purpose. Indeed, we have learned that the "successful" states have (1) strong gubernatorial leadership, (2) strong buy-in from the educational community, and (3) strong business support. In California, which resembles a nation-state in many ways, this type of integrated planning is very difficult and requires special attention.

To put this planning into perspective, California has a population and GNP greater than Canada; the Los Angeles school district has more students than Wyoming has population. Several California counties by themselves resemble nation-states. And like nation-states, California has a diverse political landscape which makes integrated planning difficult. Consider the various existing telecommunications forums dealing with education, all created by the legislature or the executive branch: the Education Council for Technology in Learning (ECTL) and its subcommittee The Golden State Education Network (GSEN) Communications Task Force, the Industry Council for Technology for Learning (ICTL), the Governor's Council on Information Technology, and the SB 600 Task Force on Telecommunications Network Infrastructure. Further complicating the planning are the lack of coordination between various national initiatives such as Goals 2000: Educate America Act, the National Information Infrastructure planning groups, the privatization of the Internet, and pending Congressional revision of the Telecommunications Act of 1934.

Desired Condition

A coordinated statewide effort to design and implement and coordinate a statewide telecommunications infrastructure.

Recommended Actions

1. Establish an interagency technology group to assist in designing, implementing, and coordinating the statewide telecommunications infrastructure. The group would communicate with representatives from the Governor's office, the Legislature and other governmental agencies, business and industry, the Superintendent of Public Instruction and educational leaders from public and private schools, the State Librarian and representatives from public libraries, parents and students, individuals from organizations representing diverse ethnic backgrounds, disabilities and gender equity, and other stakeholders.

2. Ensure coordinated planning, through a process designed to assimilate the relevant results from other statewide planning groups' recommendations; and in the process enhance the collaboration needed to

achieve statewide improvement in telecommunications for schools and public libraries. Planning coordination could be facilitated by an independent, impartial agent, such as a consulting firm.

3. Establish a Governor's Task Force to coordinate activities with representatives from private and public groups including the State Legislature, the State Board of Education, the California Department of Education, institutions of higher education, appropriate state agencies, local educational agencies, public and private telecommunications entities, parents, public and school libraries, students, adult literacy providers, and other stakeholders/leaders in the field of technology (e.g., ICTL, ECTL, CTA, Industry Education Council, Goals 2000 Task Force).

4. To ensure coordinated implementation of the statewide telecommunications plan and education grants program, establish a subgroup of the Governor's Task Force to deal specifically with telecommunications.

5. Establish coordination among the SB 600 Schools and Public Libraries Information Technologies Grant Program and other state grant programs.

Benefits

A coordinated governance structure provides for integrated planning and coordination between the state, local education, community agencies and business, minimizes fragmentation of technology resources, and reduces the possibility of duplicative expenditures and services.

III. FUNDING INFORMATION TECHNOLOGIES

Having established the critical need for access to the information infrastructure, as well as ongoing training, the next step is to examine possible funding sources. The following section explores funding accelerated deployment and adoption of telecommunications and information infrastructure for California schools and libraries and outlines some of the main considerations in choosing among potential funding options. Five major types of funding sources are identified: 1) state and federal programs and funding; 2) CPUC-related single event funding; 3) regulatory and legislative rate making; 4) debt financing; and 5) tax financing.

Considering the magnitude of both the initial and ongoing financial requirements, none of the options will provide sufficient funding: to meet the needs of schools and libraries, it will be necessary to employ several of these options in combination. It should also be noted that each funding option has positive and negative attributes -- none is ideal. As a result, these factors also argue for adopting a portfolio of financing methods, rather than relying on any single option.

1. State and Federal Programs and Funding Sources

The financing Subcommittee has identified numerous state and Federal programs for funding educational technology. Schools and libraries should be encouraged and assisted in applying for grants under these programs; and additional research should be conducted to update the information about these programs and identify other programs. With the level of funding recommended above in the needs assessment, it is evident that the funding available through these programs is nowhere near the level required to meet the needs of California schools and libraries. Thus, while a good starting point, additional financing sources will be required.

California Funding for Educational Technology

FY 1994-95 Appropriations. The State Legislature has appropriated $13,398,028 per year for K-12 educational technology programs. Of this $13 million, the following budget items relate to telecommunications for education.

The remainder of funding supports other educational technology programs and resources, such as the program licensing, acquisition of video programming, high technology learning resources display centers, and

bilingual teacher training programs. The fiscal year 1994-1995 budget has been approved by the State Board of Education and Legislature. However, funding distributions are subject to change throughout the year. No additional state funding is anticipated other than the possible user surcharge on telecommunications services or the use of Pacific Bell "spin" money, which seems unlikely for FY 1994-95.

Federal Funding for Educational Technology

The Clinton Administration is promoting the National Information Infrastructure and its potential benefits to education. This has resulted in an increased level of legislative activity and the possibility of some funding for educational technology.

Speaking at the opening of the broadband personal communications services (PCS) spectrum auctions on December 5, 1994, Vice President Al Gore called for Congress to target some revenues generated from PCS license sales for projects to connect schools to the national information infrastructure. The SB 600 Taskforce agreed with Vice President Gore's recommendation, and in support, sent a proposed resolution to Congress via the California Legislature. Chaptered on June 26, 1995, California Assembly Joint Resolution 28 (Knox) requires that revenues received from the spectrum auction "be efficiently expended in a technology and provider neutral manner using California's schools and public libraries as catalysts to accelerate the development of the state's telecommunications and information infrastructure."

Summary

The committee has identified numerous sources available for funding educational technology initiatives. An effort would be made to make information about these sources more readily available to California's school administrators, teachers and librarians. The state might well provide advisory services to individual schools and libraries to assist in obtaining funding from these sources.

2. CPUC-Related Single Event Funding Sources

A. General Issues

This category of funding sources is comprised of sums of money that, for any of a variety of reasons, the California Public Utilities Commission (CPUC) has ordered regulated utilities to disburse. These are one-time

funding sources resulting from a single event.

Some pros and cons of using such funding sources to fund the CPUC's proposed school and library grant program apply to most (perhaps all) of the particular cases.

Pro: Unless the particular sum of money is unusually large, one alternative disposition of the money -- refunding it to ratepayers -- could result in insignificant refund amounts for each of millions of customers. Benefits of using the funds for a concentrated purpose could be lost. As long as the Commission is acting within its sphere of legislative authorization, it has authority to determine the disposition of the money.

Con: The amounts that may be generated in this manner are uncertain. This is not a reliable ongoing source of funding. In certain cases, refunding the money to ratepayers may be legally required.

Following is a discussion of the pros and cons of using particular sums of money that are available or could become available.

B. ***Telesis Spin-Off Refund ($49 million)***

The CPUC ordered Pacific Telesis to pay this sum of money after the Commission determined in its decision authorizing the spin-off of Telesis' wireless operations that, from 1974 to 1982, Telesis had improperly retained money refunded by AT&T that should have been returned to ratepayers.

Pro: Some believe a refund to ratepayers would be a poor use of this money. The amount of a refund received by individual ratepayers would be small (about $5 or less per subscriber). Moreover, most of the refunds would not be received by the customers who should have received the money from 1974 to 1982 (because of turnover in PacBell's subscribers in the intervening 12 to 20 years.)

Con: CPUC may be legally obligated to refund the money to ratepayers. Using this money for schools and libraries bears no relationship to the source of the money.

C. *PacBell's Late Payment Overcharges*

Pacific Bell has been ordered to refund $34.3 million in overcharges for late payment fees and reconnection fees. A special program has been designed to allow affected customers to claim refunds. At the end of the program, there may be some money left unclaimed. The Commission has said that it will decide what should be done with any remaining money at that time.

Pro: Same as the general case discussed above.

Con: It is unknown whether there will be little or no money unclaimed. Pacific Bell might benefit directly or indirectly from money it was ordered to disburse.

D. *Summary*

The only money that is available in this category now is the Telesis Spin-off refund money. Using any of that money for telecommunications infrastructure in schools and libraries is legally vulnerable and, as such, has already been challenged by various parties at the California Supreme Court, based on the arguments that the Commission is obligated to return the money to ratepayers and that the Commission may not invade the province of the legislature by disbursing money to tax-supported institutions of the Commission's choosing. After the Supreme Court issues its decision, this money may become available.

Future new sources of money in this category -- apart from those discussed in Sections B. and C. above -- cannot be predicted.

3. Regulatory and Legislative Rate Making Sources

This category of funding sources represents ongoing, as opposed to single event, funding options which require authorization by either the California Public Utilities Commission or the Legislature.

The following is a discussion of the pros and cons of these types of funding sources.

A. Surcharge on Telecommunications End Users

A surcharge on end-users, with the exception of Lifeline services, of all

intrastate telecommunications services offered by two-way telecommunications utilities.

Pro: Distributes funding burden across wider class of customers than would the use of price cap rate reductions.
Would provide a steady, substantial source of funding. Would also be competitively neutral.

Con: Additional utility-based tax that makes the cost of telephone service more costly for California residents and businesses.
Inconsistent with Commission's goals (robust, competitive marketplace will promote the development of an advanced telecom network) and Infrastructure Report (a lower subsidy burden would allow the California economy to operate more efficiently and competitively overall).
Could increase the perception that California is not business friendly.
Would require legislative authority since it would be perceived as a tax.

B. ***Price Cap Rate Reduction***

Use of New Regulatory Framework (NRF) price cap rate reductions which may result from Pacific Bell's and GTEC's annual price cap adjustments.

Pro: Provides source of funding without an explicit rate increase.

Con: Could discriminate against GTEC and Pacific Bell customers and would deny those customers the benefits of NRF.
Could create subsidies and burden one class of ratepayers.
Inconsistent with the Commission's stated objective of eliminating hidden taxes.
Could require extensive public hearings and/or settlement conferences over extended time frame.
Unstable source of funds; price cap rate reductions vary from year to year.
May require legislative authority.

C. ***Voluntary Discounts***

Allow telecommunications providers the flexibility to offer special rates/programs for schools and libraries.

Pro: Would likely require only CPUC approval.
Allows providers the ability to provide market-based solutions.

Con: May limit choices available to schools and libraries which would otherwise be available using a funding source which disburses funds to schools and libraries directly.
May discriminate against other providers of infrastructure and services by making discounts available from a select group of providers.
Could be anticompetitive to the extent that legal barriers to entry prohibit some companies from providing the same services offered by another at discounted rates.

D. ***Preferential Rates***

Schools and libraries may obtain access to intrastate services at preferential rates.

Pro: Would, at the maximum, require CPUC approval.

Con: Maybe inconsistent with PUC Infrastructure Report's recommended reliance on market forces to drive infrastructure development and rates.
Could discriminate against other providers of infrastructure and services.
Could limit the choices available to schools and libraries which could otherwise be available using a funding source which disburses funds to schools and libraries directly.
Could be anticompetitive to the extent that legal barriers to entry prohibit some companies from providing the same services offered by another at discounted rates.

E. ***Summary***

While these funding options may appear attractive due to the relative ease in implementing them, this factor must be balanced against equity and telecommunications policy considerations. From an equity perspective, the surcharge and price cap reduction funding options are satisfactory in achieving a broad funding mechanism for a program which will lend itself to broad societal benefits. From a telecommunications policy perspective, all of the identified options, in varying degrees, maybe inconsistent, the California Public Utilities Commission's telecommunications strategy of pursuing an advanced telecommunications infrastructure in California and fostering a competitive environment. The Commission/Legislature must determine which sources are synchronized with a competitive environment.

4. Tax-Related Sources

There are a number of tax-related sources of funds and each needs to be explored before it can be determined whether or not it has potential and should be examined even more closely. Following are some of the sources that have been explored along with the most obvious pros and cons of each.

A. *Tax Credits*

Businesses should be encouraged to invest in and contribute resources to support the education infrastructure. Incentives such as tax credits for business contributions, whether they be monetary or through goods and services, would encourage funding from businesses for connecting schools and libraries to the information superhighway. Such public/private partnerships will support other state economic development efforts. In addition, no one better understands the connection between better educated students, a technologically prepared workforce, and a better economic climate in the state than the business community.

Pro: The closer the percentage was to 100%, the greater the amount of donation would be.
Businesses would vie with one another to be known as "education's best friend."
California would be seen as a state that fostered close ties between business and education.
Businesses could make donations to be targeted to a local school/school district and thereby strengthen the bond between the community and the business.

Con: Verifying the actual value of goods and/or services donated would be a difficult administrative task.
Unstable source of funds; donations would vary from year to year depending on the economic climate within the state.

B. *Taxes on the Retail Sale, Lease and Rental of Specific Goods and Services*

A sales/excise tax would be imposed on computer-related goods and services. Although the cause-and-effect relationship would not be as clear as the gasoline tax for highways, there would be a link between the items taxed and education technology/infrastructure, e.g., computers, monitors, printers, modems, software, etc.

Pro: The tax would not be perceived as regressive since it would apply to discretionary purchases, leases and rentals.
The tax might be seen as a fairly painless way to help the children of California prepare for the information age.
Users paying the tax would be those that were most aware of the need to prepare children for the information age.

Con: Legislators would be loath to pass a bill for increased direct taxes.
Citizens may not perceive the link between the goods being taxed and education.
An additional sales tax might shift purchasers to out-of-state suppliers.

C. *Voluntary Discounted Price/Tax Credit Program*

Under such a program, a business would sell or lease its products and/or services to a school, school district or library at one-third of its market price. The business would then be eligible for a state-authorized tax credit for an additional one-third of its value. The business would not entirely recover the remaining third but would be able to declare it as a charitable contribution on its federal tax return, thereby recovering another 11.7%.

Pro: It lets the school or library negotiate for the best valued product/service and then obtain it at one-third of its market price.
Schools and libraries would be able to purchase/lease three times as much in terms of infrastructure as would normally be the case.
A number of companies competing for school and library business would help insure that the resultant infrastructure would be technologically neutral.
Businesses would be able to forge bonds with schools and libraries with attendant benefits accruing to all parties.
Assuming that the school or library obtained the goods with locally generated funds, the state's general tax fund would be reduced, because of the tax credit, by only one-third as much as it would be if it funded the entire amount.
It would entail significantly less administrative expense on the part of the local entity and little or no expense for the state education administration.
Businesses would gain from the valuable public relations generated by their donations.

Con: Schools and libraries would have to locally obtain their share of the purchase/lease price.
The state's general tax fund would be depleted by its share of the purchase/lease price.

Businesses would not be able to recover the entire value of their goods thereby making it uncertain as to whether there would be a constant source of donations.
Unstable source of funds; donations could vary from year to year depending on the economic climate within the state.
Verifying the actual value of goods and/or services donated would be a difficult.

D. *Taxes on Specific Manufacturers*

Increased income taxes on in-state manufacturers and developers of infrastructure-related goods and services, e.g., computers, printers, related hardware, software, VCRs, videotape, etc.

Pro: The tax would be easily collected.
The public would not perceive they were being directly taxed.

Con: Any increased business tax could further the impression that California is anti-business.
An increased business tax on only in-state businesses might result in California businesses and their products being less competitive than those from other states and countries.
An anti-competitive tax could result in high tech jobs leaving California and/or not being created in the state.
A new state tax collection procedure would have to be implemented.

E. *Taxes on Service Providers*

An increased income tax on infrastructure related service providers. This would include local telephone companies, long distance companies, alternate access providers, cable companies, cellular companies, personal communication service (PCS) companies, information service and content related companies (possibly including television and radio stations), etc.

Pro: Tax would be easily collected.
The public would not perceive they were being directly taxed.

Con: An increased tax would result in higher costs for California's service providers.
Higher costs might be passed along in the form of higher rates.
Service providers might be more willing to invest in "business friendly" states than in California.

A higher tax on utilities and related companies would be a hidden consumer tax and therefore contrary to the position taken by the CPUC in its November, 1993 infrastructure report to the Governor.

F. *Utility User's Tax*

An ad valorem percentage tax is added to a utility bill by a local municipality.

Pro: The tax would be easily collected.
Money collected in a community would be spent in behalf of schools in the same community.

Con: In many municipalities, the tax would be in addition to an existing utility user's tax.
Each municipality would make an independent decision as to whether or not it would impose the tax, thereby making funds unavailable to school districts where it was not imposed.
Could increase inequities that exist between under-funded school and library districts and those with sufficient means.
Local city councils would probably not want to impose such a tax due to recent voter reaction in other municipalities (in 1993 and 1994, voters ousted all council members in Fullerton and Covina and all but one council member in Lincoln due to the imposition of utility user taxes).
Utility user taxes are usually regressive.

G. *State-Wide Sales Tax Increase*

An across-the-board increase in the sales tax applied to all non-exempt goods and services.

Pro: Tax would be easily collected.

Con: Tax would be regressive in that low income consumers would be hit hardest.
Legislators and citizens may not be inclined to increase the sales tax.
The tax could be seen as both anti-consumer and anti-business.
An increase in the sales tax might shift even more purchasers to out-of-state suppliers.

H. *Summary*

The need for a great deal of infrastructure funding in the near future may require California to employ some form of debt financing through the issuance of bonds. To retire those bonds, a reliable revenue source must be identified and secured.

A retail sales/excise tax on the purchase, lease and rental of computer-related goods and services should be explored further as a method of obtaining the needed funding. As outlined above, such a tax would not be perceived as regressive, would be fairly painless and would be paid by people who would most understand the need of preparing California's children for the information age.

An additional tax on computer related goods and services also has merit because it targets goods and service of an industry which is most likely to benefit from the investment in information infrastructure for schools and libraries. The use of information infrastructure in schools and libraries will stimulate increased home use by the children who become familiar with applications in school. This, in turn, will benefit the computer industry which will sell more goods and services to the children's parents. Thus, a publicly financed investment in information technology for schools and libraries is likely to create a positive externality for computer manufacturers and sellers.

According to the California Board of Equalization, the State Agency responsible for administering and collecting the sales tax, increasing the sales tax on a product-specific basis might pose some administrative difficulties for the state and retail sellers, but these difficulties could be overcome and the tax could be collected using the pre-existing sales tax administration structure. Increasing the sales tax on a product-specific basis would require legislative action but would not require a referendum.

5. Debt Financing Sources

Four broad options for local financing of infrastructure improvements have been available in the past ten years: A) pay-as-you-go; B) grants - Federal, state; C) bonds; and D) local financing instruments. Bond financing has been the largest source due to political constraints on expenditure and revenue raising.

A. *Pay-as-you-go*

Pay-as-you-go is limited by various state propositions and voter antipathy to higher taxation. Proposition 13 put a limit on the ad valorem tax on real property to 1% of the value of the property. It impairs the ability of local governments to present general obligation measures to the voters that would top the ad valorem ceiling. Proposition 4, the Gann limit, limits the growth of a wide range of state expenditure categories to the sum of inflation and population increases. Pay-as-you-go does permit some fee-based revenues and expenditures and voter-approved indebtedness. For example: the ability to combine current revenues and lease arrangements to finance telecommunications equipment deployment; simple leases and rentals; lease/purchase agreements (see below); and the use of higher development fees by local communities. Pay-as-you-go rose $1,009 per unit from 1975 to $6,647 per unit in 1983 (real dollars). However, there were still chronic shortages of funding in most localities.

B. *Grants - State, Federal*

State grants come mostly from state general obligation bonds. Prop 13 has led to an increase in state aid to local school funding, a significant share in the form of grants. Federal grants can be combined with debt financing to facilitate or create support for infrastructure deployment. It can also be used as seed money to leverage larger projects (i.e. highways). Finally, federal grant money can be used to build broader community support by demonstrating the usefulness of specific public investments. Federal grants are unlikely to increase as rapidly as in the past but may still be significant.

C. *Bonds*

Bonds are the most likely avenue to support large scale infrastructure investment in schools, but they face several political constraints as well. Local bonds generally need 2/3 voter majorities for approval. This is difficult to obtain. According to School Services of California, since 1986 there have been a total of 298 general obligation bond measures related to education infrastructure in California. Of these, 138 (46.31%) passed with the necessary 2/3 required majority.

State general obligation bonds

State general obligation bonds are made possible by Prop 46 (1986). They work as follows: the state receives proceeds from a bond issue and uses

the proceeds to finance local agency programs through grants to localities and low interest loans. Some revenues from loan repayments by local agencies can be used to retire debt. They are best used to finance equipment and facilities that have a long-term life, about 10-20 years. From 1980-89, $14 billion in general obligation bonds were issued: $7.661 billion for infrastructure, $3.35 billion for school related. Since 1989 50% of all state and local tax and debt issues were approved; 41% in 1992.

Pro: Lowest cost form of borrowing.

Cons: Requires 2/3 voter approval before a locality is allowed to issue bonds and raise tax rates.
General obligation bonds are not self liquidating; debt service is paid out of the state's general fund revenues and the cost will be ongoing.

State revenue bonds

Revenue bonds are attached to a stream of revenues from a specific project. They are therefore self liquidating and require that user fees be charged to school (a "lease-like" arrangement) or to students. This is likely to discourage use. State assistance is limited to the interest rate subsidy from exemption from state taxes.

D. *Local Financing Instruments*

Lease-Backed Obligations

Prop. 4 relaxed Prop. 13 limitations on the issuance of bonds, allowing tax increases to support debt servicing of voter approved projects. According to the School Services of California, since 1986 there have been a total of 28 special tax measures related to education infrastructure in California. Of these 15 (53%) passed. Localities varied as to whether a simple majority or a 2/3 majority was required for passage. In 1989, approximately $2.8 billion were issued by California localities, $350 million in lease-revenue obligations.

Pro: Leased-backed obligations are not considered indebtedness under California's constitution or existing statues therefore:
They do not require voter approval.
They are exempt from statutory restrictions such as interest rate ceilings (which was a problem in the early eighties just after Prop. 13).
They circumvent the 2/3 requirement and other constraints.

Con: requires revenue producing tax or fee increases to support lease payments.

Certificates of Participation (COPs)

COPs are the most prevalent instrument of local finance (about 23% of all long term debt issued by localities in 1989 were COPs). The underwriter raises funds for construction of facilities through the sale of COPs to investors and investors purchase the instruments in return for a fraction of lease revenues associated with the project. COPs are very similar to an actual purchase and less like a lease. Lease revenue bonds are the same as COPs but the legal aspects of the contract are different.

Pro: Facilitates private investment in public infrastructure investment.

Con: COPs are almost always paid out of general obligation funds.
Financed by lease revenues.
COPs are very difficult to set up, requiring SEC filing, the naming of a trustee and significant legal work.
For items in which technology is changing rapidly, i.e. microcomputers, peripherals, etc., a straight lease is more flexible giving shorter terms after which the lessee can up-grade to a newer technology.

Benefit Assessments

Benefit Assessments are one of the oldest financing mechanisms available to local governments. According to School Services of California, since 1986 there have been a total of 168 parcel tax measures related to education infrastructure in California. Of these only 60 (35.71%) passed with the necessary 2/3 required majority. These instruments are different from taxes since they are tied to actual benefits received and different from fees since they are not tied to reasonable cost of providing facility or service. These distinctions were upheld by the courts. Amount approved was $3.8 billion in 1987-88.

Pros: Not subject to constitutional restrictions on taxation (like 2/3 voter approval requirement).
Approval requirements vary depending upon the authorizing statute for particular assessment (used for sewers, lighting, streets, sidewalks, and others)

Con: Not clear if statues would allow some use for "telecom infrastructure."

Mello-Roos Financing

Created through the Mello-Roos Facilities Act of 1982 (to, among other factors, circumvent some of Prop. 13's constraints). Allows the creation of Community Facilities Districts (CFD's) for financing a whole array of public facilities through special taxes on that CFD. Considered "the most significant development in recent years regarding the use of special taxes to secure long-term debt." According to the School Services of California, since 1986 there have been a total of 46 Mello-Roos measures related to education infrastructure in California. Of these 27 (58.70%) passed with the necessary 2/3 required majority. Of total amount issued ($750 million), $245 million was for education.

Pro: Can be used for "pay-as-you-go" financing of public utilities, though more often used to secure bonds.
More flexible than benefits assessments because they can be used to finance the construction of facilities which provide a general benefit to a district - such as schools and libraries- in addition to facilities which confer special benefits to particular parcels.
Can be used for equipment as well as facilities.
CFD's can be flexibly designed.

Con: Provides no means of repaying debt obligations.

IV. GRANT PROGRAM CRITERIA

With potential funding sources identified, the final step is determining how to disburse funds. The priority for allocation of funds would be to establish a systematic and equitable process for public schools and public libraries to connect to an available telecommunications infrastructure. A simple solution for disbursing funds is a grant program.

Under such a program, public schools and public libraries would be eligible to receive electronic workstations to access information on behalf of their users. Authorized costs would include workstations (hardware and software), training, publicity, and telecommunications operating expenses as well as subscriptions to the document delivery services most relevant to their clientele.

The application process to receive funding must be simple, fast, and reliable while ensuring funds for those learning institutions with the greatest need and a commitment to using the network. To apply for funds, public schools and public libraries should comply with the following:

- Describe how the funding would support assessment and alignment of local educational needs to telecommunication resources.
- Describe the process to ensure that adequate planning, staff development, and coordinating of existing resources are sufficient to ensure cost-effective applications of telecommunications to support teaching and learning.
- Describe how connectivity to the school or library will demonstrate the support and involvement of site staff and the local community in the planning and incorporation of the telecommunications and related technologies into the existing school or library plan.
- Allocate sufficient release time for each teacher or librarian who will be utilizing the telecommunications resources to participate in staff development programs.
- Annually report the extent of access and extent of educational application of the telecommunications and related technologies both in quantitative and qualitative aspects.
- Provide assurance that the plan encourages and allows for combinations of technologies and vendors to best enhance the local program being funded by the grant.

V. CONCLUSION

THE NEED: This report has chronicled the lack of infrastructure and information technology access for children in K-12 public schools and the sparsity of access for the general public through public libraries. It is simply not good enough for California to rank at the bottom in some categories and at best in the bottom quarter of states in preparing our citizens for the technology tools that already surround them. By providing infrastructure and access through schools and public libraries, California can provide stimulus and leverage to command our rightful economic leadership and vitality.

THE PLAN AND GRANT CRITERIA: The report proposes criteria and a plan for development which reaches all segments of the state. It is a minimum level of infrastructure and not the ultimate level of technology, but it is a beginning that can be built upon. The report recognizes those schools and libraries who have developed models under tremendous constraints and capitalized on what has been learned in the deployment of information technology. The plan and criteria mitigates barriers of distance, language and physical disabilities that can stratify a diverse state. It does require an investment, so that funding is not the only barrier that will continue to divide Californians.

FUNDING: The funding potential mirrors the speed and complexity of the technology industry. The report therefore recommends a portfolio approach, with analysis of the various funding options and their potential yield. Great care is taken to not preclude any avenue that can add to and enhance the funding pool. The need will grow. The use and innovation in learning can only be expanded by appropriate use and attraction of additional funds. It is an investment and can lead the way to the new era of deregulation of the convergent industries that have provided many of the vehicles of information technology to date. The investment must be shared by all, as all will benefit from the knowledgeable, skilled worker and consumer.

THE CHALLENGE: The challenge to keep California's economy strong and reestablish the educational superiority of California's children can be met by building a telecommunications infrastructure which will enhance learning, develop skills to create leaders of the information technology industry, consumers for new products, and economic vitality for California. We must also recognize that education does not end with formal K-12 educational institutions.

Learning is and must be lifelong. The American worker must continually improve, using all strategies and skills not only to create new jobs, but also to maintain employment.

The challenge is more than buying and building knowledge as individuals. For if we continue to guild a deeper rift between the information rich and information poor, the social and economic consequences will be devastating. But, let us not address the challenge with fear and defensiveness. Let us embrace the challenge and make a proportionately low investment now to bring us to the wave of the year 2000.

This will take leadership, determination and unprecedented collaboration. The melding of the public good with the strength of private and public partnerships to seek complex and multiple solutions is the strength of California. It is also the appropriate legacy as we move from regulatory policies to a dynamic market driven solution to educate through our schools and the people's schools, the public library.

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APPENDIX A: From the SB 600 Task Force on Telecommunications Network Infrastructure

Charter

*...To begin the process of implementing its recommendation to the Governor, the Commission opened an investigation that addresses the establishment of the Grant Program, its administration, and funding mechanisms...While the results of the Commission investigation may result in more specific guidance to the Task Force on Telecommunications Network Infrastructure, **a series of tasks exist**, consistent with the legislative mandates of S.B. 600, that are necessary to begin the process...**Those tasks include**:*

1. **Assessing the nature and magnitude of need** throughout California schools for additional funds for planning, staff development and equipment purchases which will spur statewide development of valuable telecommunications applications which connect schools and libraries to the telecommunications network.

    a. This statewide needs assessment might **focus initially on the funding required for local schools districts and library systems** which have not done so to complete an initial assessment of local needs and to develop a plan of action. It might **also include an assessment of funding requirements**, beyond existing sources, for network facilities, and applications hardware and software where local needs and plans have been established.

    b. The needs assessment should also **determine the extent and type of training** that would best accomplish the objective of securing access to telecommunications networks by California schools and libraries and a projected dollar cost to provide that training on a state-wide basis.

2. Making recommendations for appropriate priorities, if any, with regard to **target areas or populations** within the state that are, for any reason, deemed to be **in particular need of achieving more timely access to telecommunications networks**.

3. Making recommendations as to an approach that might best prove equitable in balancing the disbursement of limited funds across the state and between urban and rural schools and libraries.

4. Considering other existing programs on the federal, state or local level that are designed to achieve similar goals and objectives, and the manner in which coordination, if any, should appropriately be implemented.

5. Identifying and analyzing existing models utilized in implementing telecommunication technology in school and library settings.

6. Making recommendations regarding legislation, if needed, to provide for an on-going source of funding sufficient to complete the program of providing access by schools and libraries to the telecommunication networks.

7. Considering additional areas for applications development and training in the use of advanced telecommunications technologies as set forth in S.B. 600, consistent with the time available to the Task Force after completing its priority tasks related to schools, libraries and community centers.

APPENDIX B: Estimated Costs to Establish a School Networking Infrastructure for All California Public School

Two cost estimate options are provided. The first (Option A) describes costs associated with a school networking infrastructure designed to connect all classrooms and school libraries in all 7,731 of California's public schools. The second (Option B) describes a scaled-down version designed to link two locations per school. Each option provides an overall estimate consisting of costs in five areas: wiring, hardware, basic network software, training, and connectivity. It is important to note that these estimates do NOT include funding for: (1) learning materials; (2) equipment repair and system maintenance; (3) other hardware required to establish an effective learning environment, such as additional computers (more than those included in the estimates below), CD-ROMs, VCRs, television monitors, and telephones; (4) professional development for incorporating technology into all subject-area curricula; and (5) school district and/or county office of education Internet connectivity costs (DNS server, T1 line, etc.). Schools will not be connected to the Internet unless districts or the DOE are also connected. A Regional Frame Relay Hub, as described in the Golden State Education Network (GSEN) plan, would be the most cost effective approach, with a T1 connection(s) to an Internet Service Provider (BARRNet, SprintLink, CSUNet, etc.) at a cost of approximately $15,000 to $20,000/year, or $150,000/year for 10 regional hubs. The regional hubs would provide the Internet connection for the entire county service region.

Assumptions

Estimates: Costs are based upon retail prices without benefit of group buys or other discounts.

Network Design: The school network must be designed on sound, technical principles of Internet working including ability to scale the network to address technological advances without replacing the entire network.

Wiring: The distance between school buildings on most K-12 campuses in California is 20 to 60 feet, and averages approximately 40 feet. The estimated costs of installed wiring, whether fiber or UTP, is approximately $26 per foot. Wiring prices range from $6 to $26 per foot, but given the condition of most public school facilities in California, the higher rate is advised.

Hardware: Standards are based on using Macintosh 68040's or 486 PCS with a minimum of 8 MB RAM, a 230 MB hard drive, and Ethernet card, at an estimated

cost of $2,000 per system. Printer estimates are based on laser printer costs of $1500 for each peripheral.

Network Software: Software considered is based on licensing agreements for network software for general word processing and spreadsheet applications, and instructional software such as *Science 2000*. The electronic mail system can be a function managed by the district or by the school. A number of graphically-driven communication systems are available that include user management capability and electronic mail functions.

Connectivity: The costs for connectivity is based on a recommendation under consideration by the GSEN Communications Task Force describing plans for the initial use of regionalized frame relay hubs in each of the ten county superintendent service regions located across California. Each regional hub would provide Internet connectivity to districts and libraries within that region.

OPTION A

COMPLETE School Networking Infrastructure
(Based on an Average 27 Classrooms per School with a Network Server)

$440 million	**WIRING:** Five (5) buildings as described below.
$1.3 billion	**HARDWARE:** Twenty-seven (27) classrooms (2 computers and 1 printer in each), the school library (5 computers and 1 printer); and school office (2 computers and 1 printer) for a total of 61 computers and 29 printers per school.
$150 million	**BASIC NETWORK SOFTWARE:** Instructional management system, and basic spreadsheet, word processing, and graphics programs @$20,000 per school.
$800 million	**TRAINING:** Technical assistance and staff development to support the basic components of the school network infrastructure.
$ 8 million	**CONNECTIVITY:** One-time cost for 56 Kb circuit and frame relay connection @ $995 per school. On-going costs $125/month.

Total Estimated Cost for California's 7,731 Public Schools: $2.7 Billion

Option A School Wiring Requirements (Revised March 13, 1995): These estimates are based on an average school size of 27 classrooms per school and 5 school buildings including the school office. Each classroom and library/media center will have at least five outlets (RJ-45 wall jack) for computers with individual Ethernet connections; the office will have at least five outlets for computers with individual Ethernet connections. All wiring within a building (premise wiring) will be "unshielded twisted pair" (UTP) wire that meets the Electronic Industries Association category 5 standards for high speed data communication service. It is recommended that fiber optic cable be used for cabling between buildings. The topology will be a "star" where each computer is wired directly to a 10 BaseT hub site in an apparatus closet within each building, and a star topology where fiber from each building connects to the school central hub.

For a description of base wiring, equipment and costs refer to the Table 1 (shown on the following page). Refer to the Figures 1 and 2 (on succeeding pages) for a hypothetical view of a basic school site wiring layout.

Table 1

Option A Estimated Network Costs Per School

(With Network Server)

Description	Quantity	Cost	Extension
Outlets for classrooms/library/office (27x5+5=140)	140	$200	$ 28,000
56 K CSU/DSU	1	$550	$550
Gateway Router	1	$2,250	$2,250
12 Port Manageable Network Hub (cascaded)	5	$825	$4,125
12 Port Network Hub (cascaded)	9	$550	$4,950
Network Server	1	$10,000	$10,000
Fiber Optic or UTP between buildings	4	$1,040	$4,160
Terminators	16	$26	$416
Patch Panel	5	$120	$600
110-Style Cable Termination Block	5	$300	$1,500
Option A Total Cost Per School			**$56,851**

OPTION B

PARTIAL School Networking Infrastructure
(Based on Two Locations Per School with Multiple Buildings and a Network Server)

$143 million	**WIRING:** Two (2) locations as described on the following page.
$134 million	**HARDWARE:** In a classroom (2 computers and 1 printer); in a library (5 computers and 1 printer).
$ 77 million	**BASIC NETWORK SOFTWARE:** Instructional management system, and basic spreadsheet, word processing, and graphics programs @$10,000 per school.
$400 million	**TRAINING:** Technical assistance and staff development to support the basic components of the school network infrastructure.
$ 8 million	**CONNECTIVITY:** One-time cost for 56 Kb circuit and frame relay connection @ $995 per school. On-going costs $125/month.

Total Estimated Cost for California's 7,731 Public Schools: $762 Million

Option B Wiring Requirements for Two Locations in a School with Multiple Buildings (Revised January 14, 1995): These estimates are based on basic requirements for wiring two locations in a school with multiple buildings. Ample space should be planned to house network equipment and connections. The locations may be in a library/media center and a classroom or in two classrooms. Each location will have at least five outlets (RJ-45 wall jack) for computers with individual Ethernet connections. All wiring within a building (premise wiring) will be "unshielded twisted pair" (UTP) that meets the Electronic Industries Association category 5 standards for high speed data communication service. It is recommended that fiber optic cable be used for cabling between buildings. The topology will be a "star" where each computer is wired directly to a 10 BaseT hub site in an apparatus closet within each building, and a star topology where fiber from each building connects to the school central hub.

For a description of base wiring, equipment and cost refer to the Table 2 (shown on the following page). Refer to the Figures 3 and 4 (on succeeding pages) for a hypothetical view of wiring two locations in a school.

Table 2

Option B Estimated Network Cost Per School

(With Network Server)

Description	Quantity	Cost	Extension
Outlets for classrooms and/or library	10	$200	$2,000
56 K CSU/DSU	1	$550	$550
Gateway Router	1	$2,250	$2,250
12 Port Manageable Network Hub	2	$825	$1,650
Network Server	1	$10,000	$10,000
Fiber Optic or UTP between buildings	1	$1,040	$1,040
Terminators	4	$26	$104
Patch Panel	2	$120	$240
110-Style Cable Termination Block	2	$300	$600
Option B Total Cost Per School			**$18,434**

Source: California Department of Education, Research, Evaluation and Technology Division, K-12 Networking Project (January 1995). Contact: Carole Teach, 916/654-9662 or Bill Padia, 916/657-4978.

APPENDIX C: Estimated Cost to Establish a Telecommunications Infrastructure for California Public Libraries

MAIN/BRANCH LIBRARIES (792)

	Qty	Cost	Extension
Workstations* (30 for public use, 20 for staff use)	50	4,000	200,000
56K CSU/DSU	1	550	550
Gateway router	1	4,000	4,000
Network hub	2	1,500	3,000
Network central hub	1	2,500	2,500
Misc. electronics	3	200	600
Internal/external wiring ($300/outlet)	50	300	15,000
Total cost per site			$230,650
SUB-TOTAL:	$182,674,800		

LIBRARY STATIONS (267)

	Qty	Cost	Extension
Workstations* (5 for public use, 3 for staff use)	8	4,000	32,000
Internal/external wiring	8	300	2,400
Total cost per site			$34,400
SUB-TOTAL:	$ 9,184,800		

*IBM-compatible 486dx running at 66MHz (Intel chip) with an 8K minimum cache, VESA bus, 8MB RAM expandable to at least 16MB, two floppy drives, a minimum 270MB hard disk, 2 serial and 1 parallel port, minimum of 3 expansion slots, and a minimum 14" color monitor. Internal 14,400 Hayes-compatible modems. Hewlett-Packard DeskJet 500 or equivalent printer, with 10-foot parallel cable. MS-DOS version 6.0 or higher, communications software with VT100 emulation. Surge protector, and security systems with cabling and locks. 1 year on-site warranty.

TRAINING

Technical assistance and staff development to operate the basic components of the telecommunications infrastructure.

SUB-TOTAL: $ 3,000,000

OVERALL TOTAL: $194,859,600**

**For California's 159 main public libraries, 633 branch public libraries, and 267 public library stations. This total does not include funding for :

- databases and learning materials
- connect time
- equipment repair and system maintenance
- other hardware required to establish effective community information services, such as additional computers and teleconferencing equipment
- establishing, connecting to, and maintaining a wide area network (e.g., at the library system/jurisdiction level)

APPENDIX D: Current State-Level Funding and Future Prospects

A. Additional Funding and Support Leveraged by State Educational Technology Funding.

AB 1470 mandated a comprehensive study of the programs and projects authorized by AB 1470. The study provided detailed analysis of the programs and the educational technology infrastructure in an effort to make recommendations to the legislature about what programs should be continued and in what form. Programs continued would be those with the greatest cost benefit to educators and students in the state. These include the California Technology Project and California On-line Resources for Education (CORE), regional instructional television services, school based grants with increased planning, staff development, and matching requirements, and research and development partnership programs. Some new programs that emerged from the study were the California Technology Information Project–the "one stop" electronic information resource for educators, the Telemation training project to facilitate effective teacher utilization of telecommunications, the California Student Information System (CSIS), and a program for the dissemination of the various programs and practices that were identified as effective resources for teachers to be able to adopt or adapt in their classrooms. The following identifies the documented levels of funding leveraged from a variety of sources that have supported California's educational technology programs.

1. Developmental Partnership Programs (1990-91)

This program funded the development and research of new software and multimedia programs designed to support and expand instruction in alignment with the California State Curriculum Frameworks.

State Investment	Private Investment	Gain
42% ($1.8 million)	57% ($2.4 million)	75%

2. California Technology Project (1990-91)

The California Technology Project provided limited state funding to 14 regional consortia to provide assistance and training to educators at schools sites to facilitate the implementation and effective use of technology to support teaching and learning.

State Investment	Consortia Investment	Gain
32% ($.8 million)	68% ($1 million)	50%

3. Telecommunication Resources for K-12 from CSU-Net (1990-91)

The California State University telecommunication network (CSU-Net) is made available to K-12 through state educational technology funding that provides for the staffing and maintenance of the network for K-12 utilization. The cost to duplicate a similar network for K-12 would be prohibitive and in the millions of dollars.

State Investment	CSU Investment	Gain
70% ($.6 million)	29% ($.25 million)	41%

4. Instructional Television Agencies (1990-91)

The state provided funding as an incentive for public television agencies and county education offices to assist the use of instructional television and to provide information on how to integrate ITV into curriculum and instruction.

State Investment	Matching & Donations	Gain
21% ($1.9 million)	79% ($7.1 million)	373%

5. Model Technology Schools (1989-90)

The state has funded a total of 13 model technology schools projects since 1988. Six of these were K-12 demonstration programs (MTS Level I) that would offer educators a resource to visit and then adopt or adapt desired products and practices at any grade level and for all curriculum topics. Seven of the projects were funded to develop adaptable models for integrating technology in specific content areas and at particular grade levels (MTS Level II).

MTS Level I

State Investment	Matching & Donations	Gain
57% ($4.0 million)	42% ($3.0 million)	73%

MTS Level II

State Investment	Matching & Donations	Gain
71% ($1.0 million)	28% ($.4 million)	39%

Undocumented Savings: The study showed that all schools surveyed indicated that they saved time and resources by being able to adopt or adapt resources, ideas, products, and practices developed by the MTS projects. This resulted in a potential saving of cost in re-inventing or developing resources by using those that have already been developed and field tested. SB 1510 makes it possible to issue Dissemination Grants to fund the dissemination of resources developed by MTS Projects as well as others determined to meet state criteria.

6. School Based Educational Technology Grants (1989-90)

Over the past 10 years, the state, with the advice of the educational community, developed a process for effectively distributing funding to schools in ways that would maximize planned change, sustained use, and local investment in school-based educational technology programs.

State Investment	Matching & other sources	Gain
69% ($6.0 million)	33% ($2.6 million)	47%

Sources of School-Based Grant Funding

Source of Support	Average
AB 1470 Funding	$21,000
School District General	$5,003
School Site	$2,763
School Improvement	$2,113
Business and Industry	$1,225
Lottery	$1,098
Chapter I	$1,038
Mentor Teacher Programs	$496
Private Foundation	$429
Community Donations	$276
Chapter II	$207
Prop. 98 Supplemental	$80
Federal Grants	$60
State Funding other than AB	$45
Colleges and Universities	$25
Average Grant Value	$35,858

In one year, the state invested $15.1 million in the development and implementation of a variety of programs just summarized. The return on this investment was $16.75 million–over 100% return on the state investment in educational technology. This does not include the undocumented value added by the schools and districts utilizing the services of the regional programs (that they would need to finance without this resource) and the value of the CSU-Net provided for access by K-12. Additionally, the state now has a valuable resource and infrastructure to support the expansion and use of technology in its schools. All agencies surveyed mentioned that, without the state support (small as it is), they would not be able to justify and obtain the funding to accomplish their objectives. Businesses mention that the state must show some support and be an active partner in the development and implementation of the statewide technology infrastructure.

B. The National and State Need For Access to Technology in Schools

Schools across the country do not have the resources to prepare citizens for the technological age. This is especially true for California. Reed Hundt, head of the Federal Communications Commission, recently said, "there are thousands of buildings in this country with millions of people in them who have no telephones, no cable television and no reasonable prospect of broad band services. They're called schools."

A recent nationwide survey indicates that only 14% of our public schools used telecommunications networks in classrooms last year. California statistics show that less than 3% of our schools use telecommunications. The national survey also ranks California 50th among the states in the number of students per computer in schools. This document summarizes the efforts to implement and fund technology in education in California.

C. Limited Funding for Many Effective and Valued Programs and Services

With the available $13.6 million, California offers grants, programs, and resources that are of great value. These limited resources have leveraged, through matching funds, dollars and business donations, over $15 million in resources. However, even with leveraged resources, California still falls short of meeting its needs for educational technology. The following are brief descriptions of the current resources:

School-Based Educational Technology Grants. These grants to school districts and county offices of education are to develop, adapt, or expand existing technological applications in teaching and learning. To receive a grant, the school shall develop a Technology Use Plan (TUP) that: addresses the needs of students and teachers, is part of existing district programs, contains school-level planning, supports the local and state curriculum frameworks, includes teacher staff development, and provides for evaluation.

California Technology Project. The California Technology Project (CTP) Regional Affiliates receive limited funding to provide professional development programs and technical assistance to schools.

California Online Resources for Education (CORE). CORE is a statewide information service accessed via CSUnet that offers many valuable information resources to K-12 educators.

Instructional Television Regional Agencies. Seven Instructional Television (ITV) Regional Agencies provide advice on instructional television programming and offer staff development and printed resources to help teachers make better use of instructional television programs.

Model Technology Schools (Level I and II). The Model Technology Schools (MTS) provide information about carefully researched procedures, planning approaches, and instructional practices for implementing educational technology programs.

The Telemation Project. Telemation is a collaborative effort to provide professional development in telecommunications for teachers and administrators. A team of 'telementors' help school teams to integrate electronic learning resources into curricular plans.

California Instructional Video and Computer Software Clearinghouses. These agencies have implemented a nationally recognized system for evaluating instructional video and computer and software programs, as well as CD-ROM and video disc programs. These evaluations are available on request to guide educators in the selection and purchase of technology-based resource to support the California Curriculum Frameworks.

California Technology Information Project (CalTIP). CalTIP offers a toll free "help-line" that provides grant applicants with answers to questions about the SB 1510 grant development process and information about many programs and resources, including funding sources, legislative updates,

curriculum support, and much more. The CalTIP toll-free "help-line" number is 1-800-240-2744.

Special Projects. Included in the special projects are: CalTIP, Telemation, Program/License Acquisitions, High-Tech learning Resources Display Center Software and Video Clearinghouses, California Student Information Services, Building the Future Project, Bilingual Teacher Training Project, and program evaluation and review.

California Educational Technology Projects and Funding Programs	*FY 93-94*	*FY 94-95 Recommended*
California Technology Project, which includes professional development, support of regional services, CTP affiliate agencies, and support of CSU Net access for teachers.	*$1.1 million*	*$1.265 million*
Telemation Project. A project that offers specific training through "telementors" to assist teachers in using telecommunications in the classroom	*$350,000*	*$350,000*
California Technology Information Project (CalTIP). An information collection and analysis service to put content and resources information on-line.	*$294,390*	*$198,028*
California Online Resources for Education (CORE). Telecommunications networking services.	*$0*	*$735,000*
School Based Grants. Grants directly to schools for the planned use of technology, which may or may not include telecommunications access. Average school grants are about $15,000 and can range from $4,000 to $90,000.	*$6.5 million*	*$6.5 million*
California Student Information Services. A start-up project to provide student information and resources on-line.	*$300,000*	*$300,000*
Model Technology Schools. Classroom-tested technology activities and staff development for adoption or adaptation.	*$1 million*	*$1 million*
Instructional Television (ITV) Regional Agencies. Instructional television programming and videos, to include staff development.	*$1.8 million*	*$1.8 million*
Software and Video Clearinghouses. Evaluation and information dissemination on effective instructional video and computer software.	*$300,000*	*$300,000*
Evaluation. Review of state technology programs.	*$14,638*	*$200,000*

D. Education and Business Councils Help Coordinate and Initiate New Programs

The Master Plan and SB 1510 also established the Education Council for Technology in Learning (ECTL) and the Industry Council for Technology in Learning (ICTL). The ECTL is an 11 member council of teachers, administrators, and business representatives that advises the State Board of Education, with input from the education community and the California Department of Education, on funding and program priorities.

The ICTL was established to provide executive level involvement of business and industry in the planning and implementation of technology in California education. The ICTL represents over 50 companies that meet monthly to plan and coordinate various initiatives with the ECTL. The ICTL has and continues to be an important advocacy group for educational technology. Presently the ICTL is planning a series of regional forums for the planning and application of technology in education.

Continued funding for SB 1510 Programs. The State budget includes continuation of the $13.6 million to fund the programs authorized by SB 1510 already described in this article. The California Department of Education with local support provided by the CTP Affiliates will soon be announcing another cycle of School-Based Educational Technology Grants to schools. This will fund over 250 projects to schools from a total allocation of $6.5 million for these grants. The state will continue to fund the services and programs already described as well as some additional projects such as the Bilingual Teacher Training Project, the California Student Information Services Program (CSIS), and the High-Tech Learning Resources Display Center.

E. Past Efforts to Implement Technology in California Lacked Sufficient Funding

Major interest in technology for education emerged in 1984 with the passage of legislation that brought together previous initiatives such as the Instructional Television Agency (ITV) funding and grants for equipment to schools. Funding of AB 803 began with about $10 million and increased to $26 million by its sunset in 1989. AB 803 was best known for the school-based competitive grants offered each year. AB 803 also funded the start-up of the model technology schools and the California Technology Project (CTP) and maintained the seven regional ITV Agencies.

Another bill, SB 813, the Hart California education reform legislation incorporated the Teacher Education and Computing (TEC) Centers. This provided approximately $15 million to fund up to 17 regional centers that offered a wide variety of resources to include in-depth training in technology integration, software and video demonstration programs, grant preparation assistance, local business partnerships, and a variety of other support resources to schools. However, in 1987, funding for TEC Centers was eliminated and the AB 803 funding cut from $26 to $13 million. A major reason for this reduction was a lack of widespread interest among the education community in saving these programs when many other issues threatened the state's overall education system.

Subsequently, the California Legislature determined that it would be necessary to develop a strategic plan to improve statewide coordination of technology, reduce duplication of effort, and establish guidelines for planning, implementing, evaluating, and funding technology in California schools. Senator Becky Morgan and Assembly Members Sam Farr and Charles Quackenbush authored legislation (AB 1470) that would establish the California Planning Commission for Educational Technology to develop a Master Plan for Educational Technology and maintain the school-based grants and other basic programs previously funded through AB 803. The plan was informed by a comprehensive study of the implementation, use and impact of technology in California schools (Far West Laboratory, 1991). The Planning Commission issued the Master Plan recommendations that offered an agenda emphasizing:

- Technology in every learning environment
- Professional development and support
- A Golden State Education Network
- Access to instructional resources
- A statewide student information system
- Management information resource
- Coordinated governance
- Comprehensive evaluation
- Sustained and adequate funding

SB 1510, the Morgan-Farr-Quackenbush Educational Technology Act of 1992 was passed to implement the Master Plan and reauthorize and restructure effective components of the state's existing educational technology programs. Most of the recommendations of the Master Plan could not be accomplished, as the funding level remained at $13 million. The Planning

Commission estimated that it would cost at least one billion dollars to fully implement the plan. The result was that equity and opportunity for both students and teachers to access and utilize technology in education could not be realized.

F. State by State Funding Comparison for Technology

Far West Laboratory is conducting a new survey on state funding for educational technology and telecommunications. The enclosed chart shows the initial findings of the Far West study, as well as information obtained from a Council of Chief State School Officers survey to expand the scope of the state comparison. Notice where California is ranked for per pupil expenditures for educational technology.

Information for the Far West Laboratory study is being gathered through a series of phone interviews with each state department of education and/or agency responsible for coordination of statewide technology programs. In order to provide an accurate comparison and include as many states as possible, the figures shown in the chart represent state education appropriations, either general education funds that may be used for technology equipment and programs or funds designated for educational technology.

Educational technology/ telecommunications initiatives also rely on financial assistance from other state agencies, local discretionary funds, public and private foundations, telephone and technology companies, and others. However, accurate records do not exist to monitor the extent to which schools utilize these sources.

Other funding sources may include the following federal funds: Chapter 1, Chapter 2, Special Education, and various other federal sources. Districts may decide whether or not to use these funds for technology, and most of the funds that are used for technology are applied to the acquisition of computers, software, and computer labs -- not for telecommunications. Most state and federal education agencies do not have in place a system to monitor the extent to which these funds are used for technology.

It should be noted that California ranks 50th in computers per student (19.7) as determined by Quality Education Data, and is ranked 44th according to Market Data Retrieval, another national survey agency. Most states are not only ranked ahead of California, but are planning significant increases in funding for educational technology and telecommunications in the next year.

Far West Laboratory is continuing to update this information for comparison of state-by-state educational technology appropriations and eventually collect information on alternative funding sources.

Sources: *Survey of State Funding, Far West Laboratory (1994) (in progress). State Baselines for Goals 2000 Implementation, Council of Chief State School Officers (1994).

G. *Technology is an Emerging Priority for California Education*

The Governor, gubernatorial candidates, legislators, and education organizations and agencies are addressing the need for technology to become a higher priority for California education. This new interest among policy makers is long over due as California schools have declined in technology access while many states have increased over the past 10 years. Evidence of the renewed interest follows:

The California Teachers Association (CTA) issued a report, Rediscovering Education: Creating Schools for the 21st Century which says the state must provide the resources needed to obtain, maintain, and regularly upgrade the hardware and software required to employ state-of-the-art technology. The report also suggests that a bold and comprehensive program to bring the advantages of technology into the classroom is fundamental to creating schools for the 21st century.

The California Business Round table report, Mobilizing for Competitiveness: Linking Education and Training to Jobs, A Call for Action from The California Business Round table, recommends the integration of technology into curriculum and instruction throughout K-12 education and community colleges. The report asserts that "barriers to the full integration of technology into education include inadequate resources with substantial capital investment needed to purchase essential equipment in adequate quantities" and recommends full funding of the California Master Plan for Educational Technology.

Governor Wilson's Education Reform Proposal calls for high technology in the classroom. "While the rest of the world uses e-mail, our schools are stuck in the age of the Pony Express. I propose we give every classroom in California access to the information 'superhighway' offered by computers and fiber-optic technology."

The California Education Summit pointed out the lack of access to technology and the information infrastructure in California schools. Panelists noted current efforts of phone and cable companies to meet student needs through network connectivity and urged the State Legislature to fund and support the means to address those needs.

H. Educational Technology Funding in California May Improve

As mentioned earlier, California is 50th among the states in the ratio of computers to students. Most other states are now moving ahead of California in their support for technology in education. It is hoped that the emerging interest in technology expressed by the state leadership and education organizations will result in some action that will further technology in California. Following are some concrete initiatives and actions that suggest possible increases in future funding for educational technology from both state and federal sources.

California Public Utilities Commission: The California Public Utilities Commission (CPUC) released a report to the Governor, Enhancing California's Competitive Strength: A Strategy for Telecommunications Infrastructure (November, 1993), recommending its plan for developing a state-wide telecommunications infrastructure. To "ensure universal access and enrich the state education system," the CPUC recommended support for the use of advanced telecommunications in California's K-12 schools and public libraries. The CPUC also recommended creation of a Schools and Libraries Information Technologies Grant Program to provide up to $150 million annually. Funding could come from a variety of sources such as issuance of state bonds, a small end user surcharge on telecommunications services, a direct appropriation of state funds, or some combination. Additionally, Governor Wilson has urged the CPUC to allocate the money to support telecommunications access for schools and libraries and endorsed the expenditure of the $150 million for school and library access to telecommunication networks.

AJR 28 (Knox). This measure would encourage the U.S. Congress to enact a law to allow each state to share the proceeds of the current Federal Communications Commission radio spectrum auction to provide funding to schools and public libraries for telecommunications and information infrastructure. This legislation was developed by Assemblyman Knox with the assistance of the SB 600 Taskforce.

AB 575 (Knox). This bill would provide that the legislature establish and expand the regional technology assistance consortia through the public library system to provide for the management of information and media resources. It would ensure that teachers can access information with

sufficient content and quality to have optimal educational value. Major components of this bill are based on early recommendations of the SB 600 Taskforce.

AB 1302 (Murray). AB 1302 provides for a competitive grants program to be administered by the Education Council for Technology in Learning (ECTL) with consultation from the Industry Council for Technology in Learning (ICTL). Schools and libraries with an approved plan may receive funds for connectivity, network services, purchases or lease of hardware and software, and training for teachers, administrators, and librarians. The bill currently has no funding source. A proposed surcharge on telecommunications providers was removed by the Assembly Education Committee.

AB 1519 (Morrow). This bill would create the High School Education Technology Grant Program to be administered by the State Allocation Board. Included in the program are technology implementation grants, staff development grants, and technology demonstration grants. School districts with grades 7-12 would be allowed to apply for these grants, and SAB is required to select three districts, on a competitive basis, for pilot projects to demonstrate the efficiency of technology use. The bill authorizes the CPUC to allocate $40.3 million to fund the provisions of this bill.

AB 536 (Archie-Hudson). Currently, this bill establishes the State Technology Infrastructure Task Force to develop (another) statewide plan for expanding educational technological applications. Proposed changes in AB 536 would allow school districts to issue bonds and at maturity be paid back with local lottery funds.

AB 1215 (Villaraigos). This bill would require $25 million of CPUC "spin-money" be distributed to LEAs based on an ADA formula.

AB 797 (Archie-Hudson, Hauser, and Murray). This bill would authorize $500 million in state bond revenue to be deposited in the State Educational Technology Infrastructure Fund. The fund would provide grants for telecommunications hardware and software.

AB 331 (Alpert). This bill would enact the School Facilities and Education Technologies Bond Act, placing a $2 billion general obligation bond measure for K-12 school facilities before the November 1996 statewide election.

SB 1292 (Polanco). This bill would include within the costs of a modernization project, the amount required to fund the cost of upgrading facilities to meet technology capabilities.

AB 968 (Ducheny). This bill would revise the Leroy Greene State School Building Law, to state the Legislature's intent that all construction projects maximize the use of educational technology.

Telephone Company Support. Pacific Bell announced Education First, an initiative to connect all schools to the information infrastructure to provide free telecommunication connection to two classrooms per school and one year of free monthly service to use these connections. Pacific Bell is now establishing demonstration test sites and a process for distributing the resources. General Telephone (GTE) announced it California Education Initiative which will soon provide technical support to assist schools in connectivity utilizing telecommunication services within the GTE service areas.

I. Research is Documenting the Educational Benefits of Technology

Research consistently shows that with planning, administrative commitment and teacher training and time, technology applications can foster increased student performance, positive school work attitudes and school-to-work preparation. For example, Far West Laboratory studied California technology programs from 1984 to 1991 and reviewed current research on the impact of technology in education. This study showed that technology alone does not have a significant effect on teaching and learning–it is a tool that when used with tested and instructional practices and curriculum can be an effective ingredient to foster change. Examples of the many findings show that for technology applications to be effective:

educators must integrate technology into the ongoing educational programs and reforms.

teachers and administrators must jointly plan for the use of technology.

education agencies must promote educationally sound applications of technology and development of software and video programs that meet educational content standards.

Other findings from this study showed that . . .

student access to technology increases opportunities and incentives

for students to construct and invent their own learning; it gives students more control over learning, while teachers serve as facilitators.

technology provides many new opportunities for students to solve problems and develop solutions.

APPENDIX E: Current Federal-Level Funding

Goals 2000: The Educate America Act: The Act provides funding to support development of a State plan for technology integrated into the State Goals 2000 Improvement Plan. The California Department of Education has received approval for its already authorized $10 million entitlement for the initial planning and pilot testing of a California Goals 2000 Educational Improvement Plan. Of the $10 million, $390,000 is allocated for the development of an educational technology plan that is integrated into the State's overall Goals 2000 Improvement Plan. The state intends to use the Goals 2000 planning as an opportunity to consolidate and coordinate its existing technology plans and initiatives in an effort to efficiently target resources to schools.

The Goals 2000 Plan will serve to guide the use of funding for subgrants to schools that will become available in 1996. These subgrants can be used for educational technology resources to support the state's Goals 2000 Improvement Plan. Congress recently appropriated $388.4 million for Goals 2000 for 1996 with approximately $39 million for California. Although no amount was set specifically for technologies, states may use its Goals 2000 funds for the continued development and implementation of state technology plans.

Improving America's Schools Act: The reauthorization of the Elementary Secondary Education Act (ESEA) will incorporate technology provisions for: regional staff development, technical assistance, distance learning, research and development related to new and emerging technologies to support teaching and learning, and the use of technology in federally funded programs such as Chapter 1 and the new Eisenhower Professional Development Programs. At this point it is anticipated that $40 million will be allocated for technology in ESEA. Of this $40 million, approximately $25 million will be awarded to consortia of education agencies for R&D on new and emerging technologies that would support national education reform initiatives, such as Goals 2000 and School to Work. Approximately $10 million may be allocated for regional staff development and technical assistance to support education uses of technology. It is anticipated that between $3 and 5 million will be allocated to the recently formed U.S. Office of Educational Technology.

School-to-Work: Grants will be available for states to apply for school to work programs and will emphasize the development of local work skill standards and educational strategies for their implementation. These grants can be used to fund the integration of technology into school-to-work programs.

Star Schools: Distance education funding will be increased. California has benefited from Star Schools funding. The TEAMS distance learning program of the Los Angeles County Office of Education has been and continues to be funded by Star Schools to deliver distance education and staff development in math and science for elementary grades. The Distance Learning Resource Network of the Far West Laboratory offers information resources about distance education to educators throughout the western states.

Department of Commerce: The U.S. Department of Commerce issued grants to local educational agencies and schools for the planning and implementation of telecommunications to support teaching, learning, and administrative applications of technology. The funding for this national grants program will increase from its current $26 million to $100 million for 1996.

Education Access to the Information Superhighway: Congress has introduced legislation that would establish regulatory authority and other actions to enhance the availability of advanced telecommunications services to all educational institutions by mechanisms such as preferential rates for telecommunications services.

Technology Reinvestment Program (TRP): TRP is a grants program which emphasizes conversion of defense funding in combination with funds from other agencies, such as NSF, in the form of competitive grants. A few of these grants have been awarded to education agencies for digital libraries and telecommunication infrastructure. However, most of these grants are awarded to defense contractors for the development of high performance computing technology.

Task Force members were offered the opportunity to state their own views. These statements do not necessarily reflect the consensus of the SB 600 Task Force.

P. E. (Pat) Lanthier
Director Director
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July 3, 1995

Kathleen Ouye
Chair, SB600 Task Force
San Mateo Public Library
55 W. Third Avenue
San Mateo, CA 94402-1592

Dear Kathleen,

At your invitation, Pacific Bell submits these comments related to the report of the California Infrastructure Task Force (also known as the Senate Bill 600 Task Force).

Pacific Bell is a California company with a demonstrated and continuing commitment to the State and its people. We are pleased to be actively involved in collaborative efforts, such as the SB600 Task Force, because we seek to improve California's learning environment and enhance California's competitive position in a rapidly changing global information-based economy. We fully support the SB600 Task Force vision - "California Life-Long Learning" - and, we are applying our resources now to achieve CALLL goals - by building a world-class information infrastructure and by fostering a collaborative attitude in the state. Some example include: California First -$16 B. Education First- $100M, CalREN- $25M, PCS - $1B, Education First Coalition, Education for the Future Coalition, California Economic Strategy Panel, etc.

However, we are very concerned about whether the public policy environment will encourage collaborative and progressive action now to help realize the CALLL vision by the year 2000.

Public / Private Partnership

One critical factor - the huge and dynamic gap between where California is now and where it needs to be - drives the need for immediate public / private partnerships based on

a shared vision (the California Life-Long Learning vision). Comparative studies indicate that California is now ranked at the bottom of schools nationally, and other states and countries are already implementing programs to dramatically improve their own learning infrastructure. California not only has a huge current problem but it is likely to get worse because it is a dynamic gap resulting from others' efforts to improve on a current superior position. For example, states like Utah currently enjoy a superior learning environment and yet they have recently embarked on a public / private "excellence" partnership to build "schools without walls" via networked information technologies. Other world-wide examples exist, as countries and states realize that information literacy and knowledge workers are required for economic success.

For California, incremental change is insufficient. We need to create dramatic results as soon as possible via a "total State" commitment to the CALLL vision. "Total State" includes: (1) those in the traditional learning environment (Department of Education, California Teachers Association, Superintendent of Public Instruction, State Librarian, etc.), (2) those in the public policy environment (Governor, Legislature, the Public Utilities Commission, etc.), (3) those in business, and (4) parents. The public policy environment is particularly critical to encouraging public / private partnerships and meeting California's needs in a timely manner.

Infrastructure / Economic Vitality / Public Policy

Virtually all sources of input to the SB 600 Task Force underscore the need for a world-class information infrastructure to support a modern learning environment. Indeed, the CPUC's significant report to the Governor, entitled "Enhancing California's Competitive Strength: A Strategy For Telecommunications Infrastructure", emphasized this critical public infrastructure need and linked it to both economic vitality and supportive public policy actions. The report's cover letter succinctly states: " the strength and success of California's economy depend in no small measure on a world-class public telecommunications network", and, "the strategy outlined...will require cooperation at all levels of government and among the state's many stakeholders" .

This linkage--Infrastructure, Economic Vitality, and Public Policy -- needs to be reemphasized as the SB 600 report is released. Without such emphasis, the SB 600 vision will likely remain unrealized. To meet both educational and economic goals, we need to quickly implement public policies which encourage public telecommunications infrastructure investment now and in the future. Simply put, the infrastructure climate is the investment climate, and for companies like Pacific Bell, the investment climate is largely the regulatory climate. California policy makers must now apply the recommendations of both the CPUC infrastructure report, and the SB600 report, to help improve the climate in California--for investors, for public infrastructure builders, for businesses, for teachers and librarians, and most importantly, for the California Life-Long Learners.

Specific Public Policy Actions

Specific public policy actions must also take place now in order to support the CALLL vision in an evolving competitive telecommunications market place. These specific actions reflect market / economic realities and are designed to remove regulatory disincentives which currently work against the CALLL vision:

1. Implement regulatory reform centered on Pure Price Caps.

2. Institute broad-based subsidy support for Universal Service coincident with the introduction of local competition -- all competitors "pay to play".

3. Support needed Federal relief (no interLATA ban) to enable full use of the California information infrastructure.

4. Simplify and expedite regulatory proceedings, processes and rulings -- link outcomes to California's economic goals and the CALLL vision.

Summary

Pacific Bell supports the progressive and collaborative work of the SB 600 Task Force as it seeks to dramatically improve the learning environment --and the economic vitality -- of California. We are committed to help learners of all ages, throughout our diverse state, to connect and communicate via a world-class information infrastructure. We earnestly hope that the vision of the Task Force is realized, enabled by the specific public policy actions outlined above

Sincerely,

(Signature)

P. E. Lanthier
Director, Public Policy and Technology

cc: SB 600 Task Force

Separate Statement of Toward Utility Rate Normalization (TURN)

TURN attaches this separate statement to highlight the limited focus of this Task Force. Because of its limited focus, the Task Force did not examine issues that need attention before the State of California could wisely decide to spend billions of dollars to deploy state-of-the-art telecommunications and computer technology in our public schools and libraries.

A. The Task Force Did Not Attempt to Assess the "Need" for Telecommunications Technology In Relation to the Other Needs of California's Educational Institutions

The Task Force interpreted its legislative mandate to be the development of recommendations for increasing the deployment of advanced telecommunications and computer technologies in California's schools and libraries. The Task Force has adopted as an operating assumption the view that such technology is absolutely necessary for schools and libraries. Consequently, most Task Force members have considered outside the scope of the Task Force the issue of how the assumed need for networked technologies compares to the other urgent needs of schools and libraries.

Regrettably, we live in a time when we are painfully aware of the limited amount of money available to spend on public projects. More than ever, we must spend our public money prudently, in a way that offers the greatest possible societal benefit. Is the expenditure of more than $2.7 billion to deploy networked telecommunications technologies in California's schools and libraries the best possible use of our limited funds for public education? Would that kind of money be better spent to achieve other goals, such as repairing our crumbling school buildings, reducing class size, or on providing assured funding for financially beleaguered music, art, and athletic programs?

The Task Force has not addressed these questions. When the Task Force has assessed "needs", it has only examined what schools and libraries require for effective and ubiquitous deployment of networked telecommunications technologies, not whether the need for such technology should have higher or lower priority than other apparent needs of our public educational institutions. This comparative analysis needs to be done. A systematic examination of the costs and benefits of the full range of potential uses of educational finding should be undertaken.

B. The Task Force's Cost/Benefit Analysis for Telecommunications Technologies is Deficient

With respect to the costs and benefits of deploying advanced telecommunications technologies in schools and libraries, the Task Force Report is deficient in two respects.

1. The Substantial Ongoing Costs of Telecommunications Technology Have Not Received Adequate Attention

First, the Report's bottom-line cost figures fail to fully identify the substantial costs of

using, maintaining, and upgrading the sophisticated telecommunications and computer equipment that we are urged to install in our schools and libraries. The two total cost estimates in the report of the Needs Assessment Subcommittee ($2.7 billion for Option A and $760 million for Option B) include only the cost for the purchase and installation of equipment, not the potentially large ongoing costs. Appendix A to the Needs Assessment Subcommittee report does offer an estimate for one component of this cost, the monthly costs of on-line connectivity. The estimate is $125 per month per school, an estimate that can only be a guess at this point, since the rate structure for the various services that would be used has yet to be established for schools and libraries. Using this estimate, the statewide cost of on-line connectivity would be almost $12 million per year. This is a significant new sum of money for which funding will be required in all future educational budgets.

Of greater concern, the Report fails even to mention the substantial depreciation costs for computer hardware and software. Any computer user is aware that computers, operating systems, software, printers, and modems change dramatically from year to year. Often, the currently available, upgraded version of one software program won't run on a three-year old computer. Simply to keep pace with the requirements for effective use of on-line capabilities, computer users need to upgrade or replace equipment that has rapidly become obsolete. If the Report's vision of a new education paradigm centered on networked information technology comes to pass, won't we want at least moderately up-to-date equipment for our schools and libraries? How will we be able to afford to buy new computers, printers, modems and software every few years in order to keep up with the fast-changing technology? It seems foolhardy to propose a major reorientation of our educational system around a technology that promises huge and escalating demands on our public budget. There is a serious danger that California could spend billions of dollars for new equipment that will soon become useless and that we will not be able to afford to replace.

2. <u>The Task Force Has Not Attempted to Weigh Potential Drawbacks of Large-Scale Educational Reliance on Telecommunications Technologies Against the Potential Benefits</u>

Second, in keeping with its operating assumption that networked telecommunications technology is essential for public schools and libraries, the Task Force has not undertaken a critical analysis of the non-quantifiable costs and benefits of the significant educational restructuring it proposes.

Many businesses have a huge financial stake in convincing the public that the on-line information technology they sell will provide enormous benefits to all sectors of society. Their efforts have been extremely effective. What has been missing in most of the public discourse --and unfortunately from the work of the Task Force -- is an examination of the potential drawbacks of the new technology.

Technologies always have drawbacks. Television is just one example. In the early days of television, its promise of unlimited educational opportunities was a major selling

point. Its potential as an entertainment medium was also evident. Only after years of experience have we learned some of the less obvious consequences of television. They include the demise of conversation, less active engagement of our intellects, a tailor-made outlet for the promotion of mass consumerism, vacuous political campaigns waged only over the airwaves, and the promotion of a pervasive "image is everything" mentality. The lesson is not that television should be banned, but that new technologies bring many unforeseen impacts. Before we allow new technologies to assume a prominent place in our lives -- especially before we allow them to assume a central place in the education of our children -- we should carefully consider the drawbacks, as well as the benefits. We should shape technologies to suit our purposes, not allow the technologies to reshape our society in ways that later prove to be undesirable.

In the excitement surrounding new technologies, it is easy to succumb to the temptation to view new technologies as the solution to our difficult problems. The proponents of new technologies are good at appealing to that temptation. We need to balance our wishful thinking with some critical thinking.

Here are just some of the questions we need to consider before we retool our educational system around on-line information technologies: Will there be health risks from sitting in front of electronic devices for much of our childhoods? What new behavior disorders will develop? Who will control the information that will come over the telecommunications lines? Will it be just a few powerful corporations? If so, should they have so much influence over education and information? What will happen to information that is not easily accessible (or accessible at all) over the information superhighway? Will that information be as good as nonexistent? Is there any realistic hope that an expensive new technology can do anything but exacerbate the gulf between rich and poor? Will schools become obsolete, with students just receiving their educations at home? If so, what would be lost in terms of socializing our children in an increasingly individualistic world? Is the emphasis on speed in information retrieval and instant answers going to create an even more impatient society? Will receiving so much information and learning from machines and less through direct personal experience further detach us from our environment and other people?

These are complex and difficult questions, which exceed the competence and resources of this Task Force. But before sweeping claims can fairly be made about the ringing benefits of reorienting education around telecommunications technology, these questions, which go beyond purely material considerations, must be addressed. By anticipating some of the less obvious impacts, we may conclude that the new technologies should not be deployed on a massive scale in schools and libraries. Or we may find that there are alternative ways to deploy the technology that will maximize the benefits and minimize the drawbacks.

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