Connect, Compute, and Compete (CCC)

CCC was created in 1995 by a 46-member task force appointed by Delaine Eastin, then Superintendent of Public Instruction. CCC's purpose is the Integration of technology into California's classrooms.

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CCC: Introduction

Connect, Compute, and Compete's purpose in this report is to show how technology has the power to teach, to motivate, to captivate and to transform an ordinary classroom into a training ground.

Any nine year old who has ever commandeered her parents' computer to surf the Internet, asked a NASA scientist about acid rain, or designed a multi-media language arts project knows what dozens of blue-ribbon panels have concluded in vastly more syllables: "Computers are cool!"

Technology has the power to teach, to motivate, to captivate and to transform an ordinary classroom into a training ground for the next generation of artists, entrepreneurs, and government leaders. Unfortunately, California school children have far less technology than they need to take their rightful place in tomorrow's information society. An estimated 60 percent of all jobs in the United States by the year 2000 will require a working knowledge of information technologies.

Even today, where would many workers be without a computer and the links it provides to information? Now, imagine how we are handicapping public school children by sending them to "work" each day without the tools many of us take for granted.

Surveys of California businesses indicate that the majority of 1997 high school seniors will graduate unprepared for the rigors of the workplace. Moreover, 12 years from now, when today's first-graders move into the job market or on to college, technology will be even more pervasive and sophisticated than it is today. What will the gap in job preparedness be then?

Our purpose in this report is not to build the case regarding the virtues of computers in the classroom. We're convinced. What we have taken on is the business of integrating technology into California classrooms -- by setting what we consider to be realistic goals for the process, assessing the cost, and proposing a pragmatic strategy for getting there.

We don't presume that technology is the only issue worthy of attention when it comes to public instruction. Many factors influence education policies: among them class size, teacher salaries, hours of classroom instruction, and adequate facilities. A discussion of these factors, however, is beyond the scope of this report.

Instead, our research has led us to the conclusion that, more than any other single measure, computers and network technologies, properly implemented, will bolster California's continuing efforts to right what's wrong with our public schools. While schools have made progress, much more still needs to be done.

This is a blueprint for action.

"With the Internet, you point, click and boom! It's like having a million books."

Jimi Brown, Student, Lick Middle School, San Francisco

The Task Force

In October 1995, Delaine Eastin, State Superintendent of Public Instruction, convened our task force to study the challenge of integrating technology into California's kindergarten through twelfth-grade classrooms. Our team consisted of 46 members, including business executives; educators; and representatives of organizations, foundations, and communities.

We were charged with answering the following questions:

> What is the current state of technological readiness in California's classrooms and school libraries?
>
> What infrastructure, equipment, and support do we need?
>
> How much will it cost?
>
> Where should the money come from?
>
> Where Are We Now?

California's disinvestment in classroom and library computers and telecommunications infrastructure has left our state lagging other states by most measures of technology. A 1995 report by Quality Education Data, Inc. comparing California to other states finds the Golden State tarnished in its rankings:

> 36th in CD-ROMs
>
> 43rd in network access
>
> 45th in number of students per computer
>
> 50th in video cassette recorders

Even an item as commonplace in most homes as the telephone is virtually nonexistent in California's classrooms. So it is not surprising that nearly 14 students vie for each computer in California classrooms, as compared with about six students in the states which boast the country's best student to computer ratios. Worse yet, closer examination of the statistics reveals that many of the computers counted in this survey are actually outmoded models, incapable of running current software or linking to a wide-area network. "The information and technology explosion will offer . . . to the young people of the future more opportunities and challenges than any generation of Americans has ever seen."

President Bill Clinton

Discounting obsolete equipment, California would more accurately count one computer for every 73 students.

Technology is not the only place where our schools fall behind. For example, the National Assessment of Educational Progress ranks the state's elementary school children in last place of 39 states reporting fourth-grade reading performance.

Admittedly, the case for asserting a cause-and-effect relationship between integrated classroom technology and improved student performance is sometimes anecdotal. Politics and practicality make it impossible to randomly assign technology to one group of students while denying it to another. Thus, the study of classroom technology probably will never lend itself to the rigors of the scientific investigation once accorded the polio vaccine, for example.

Even states with advanced technology and diligent record-keeping have had neither in place for enough time to bear out long-term results. Nor have any states instituted programs as comprehensive or as broad-based as those we propose.

Yet there is much evidence regarding technology's value for students in acquiring the skills demanded by employers, as well as in improving student achievement. That is why it is so important to look at some things we do know and to become advocates for technology:

A 1995 survey of more than 100 recent academic studies indicated that technology-based instruction significantly improved student performance in English-language arts, math, history/social science, and science.

The U.S. military found that trainees reached required competencies in 30 percent less time with computer-based instruction than with standard methods.

A computer pilot program targeted to remedial students in New York City demonstrated 80 percent gains in reading and 90 percent in math.

If we were to hypothesize the kind of school best able to enhance students' learning by incorporating technology, we would likely call to mind Clear View Elementary School or classrooms in the Hueneme Elementary School District.

"Kids may be young, but they're not saps. They've been to the mall where every clerk has a computer and a phone. We tell our children school is important, but too often the school doesn't look important."

Delaine Eastin, State Superintendent of Public Instruction
Clear View Elementary School
Chula Vista, California

A LOOK AHEAD: Eight miles from the Mexican border, 575 children attend Clear View Elementary School. Most come from low-income families, including many newly arrived immigrants. English is a new language for 68 percent of the youngsters.

Since 1991, Principal Ginger Hovenic has worked to secure educational grant money and donations from the business community to purchase computers; equip the school with fiber, satellite, and cable communications; and invest in training for teachers and administrators. As part of a joint venture with San Diego State University, Clear View is designated a professional development school where student teachers receive experience in an innovative classroom.

In a science lesson, for example, a group of Clear View students collaborated with students from around the country to collect data on local weather conditions, while others worked with an electron microscope 26 miles away, under the direction of a professor at San Diego State University. Clear View history students wrote and published a book on Supreme Court Justice John Marshall.

Another class collaborated with students in Rhode Island, Nebraska, and England to study V-E Day. Even first-graders know how to use computers to "drive" a scale model car they built from LEGO tm through their model LEGO tm town. And administrators use e-mail, accessible 24-hours a day, to communicate with parents, teachers, and students about homework assignments, school events, and other news.

"We see computers as . . . tools to promote thinking on the part of students and teachers . . . [Children who graduate from our elementary school] are pushing the bar at middle school."

Dr. Ginger Hovenic, Principal
Clear View Elementary School
Hueneme Elementary School District
Port Hueneme, California

A VIEW OF A MODEL PROGRAM: Sixty-five miles north of Los Angeles, the Hueneme Elementary

School District has produced profound changes in student learning environments through the use of interactive, networked technology. Port Hueneme is a community of racial, linguistic, and economic diversity. Over the past decade, the school district has used state grant seed money, local resources, and help from private industry to fuel an aggressive research and development program combining technology with a focus on student learning. The district has created networked "Smart Classrooms," which provide a seamless integration of dissimilar data, audio, and video learning resources to teachers and students.

All 11 schools, plus the district office and maintenance facilities, have local area networks that are linked to the World Wide Web. Each classroom has a telephone, and each teacher has voice mail which can be used for parent communication.

Both junior high schools have direct connections to Lawrence Livermore Laboratory's computers which allow students to review alternative strategies for solving complex math and science projects.

Another network donated and maintained by the local cable company provides for a multiple integration of audio and video among all district classrooms. Each school also participates with a national school partner connected by United States Department of Defense communication lines.

More recently, Hueneme has explored the potential of distance learning and telecommunications and established classroom-to-classroom and school-to-school networks, within Hueneme and across the nation. Currently, Hueneme teachers are working directly with private industry researchers, using state-of-the-art technology to author a CD-ROM interactive electronic curriculum that brings the sophistication of multimedia networks to any school or learner with access to a CD-ROM player and the Internet. Potential revenues from this joint venture will provide direct compensation for the teachers involved and a continuing stream of revenue to fund future district research and development projects.

However, of greatest importance, the approximately 8,000 Hueneme learners have responded dramatically to technology. According to Superintendent Ronald Rescigno, students are achieving far beyond their peers in similar communities in California.

"To use technology to promote school reform is like flying with a tailwind."

Howard Mehlinger, Director
Center for Excellence in Education
Indiana University

Timeline

THE CLOCK IS TICKING: Every year that we fail to improve student access to computers and telecommunications equipment, our children fall farther and farther behind. Even if it were magically possible to blanket our schools and homes with technology with one stroke, teachers would remain insufficiently trained to make optimal use of the equipment, and schools would still lack the courseware needed to adapt the new learning tools to core curricula. That's why we have proposed a program timeline of four years.

California competes with other states -- and nations -- for an economic edge by preparing its schools and students for the rigors of the Information Age. A four-year horizon allows us to start at once raising the funds required to ramp up hardware and software acquisition, classroom connectivity, and the necessary staff development beginning in 1997. Simultaneously, we anticipate that private industry will accelerate the development of software based on the state's curriculum frameworks, which guide instruction, as the market for these products grows.

The recommendations that follow are designed to stage in basic equipment and the capacity to use it by

the year 2000, at which time we expect to have achieved four all-important objectives:

1. A student-to-computer ratio of four to one.
2. Telecommunications access for every classroom and library.
3. Technology as an integral resource for all students and teachers.
4. Reading and math scores above the 50th percentile nationally.

How do we get there from here?

"Think about what we should be providing for every learner: the means to access almost infinite amounts of information and communicate worldwide with experts in every field; resources for projects that excite and engage students; teachers who have the time, support and assistance to work more closely with their students as well as with their colleagues in-person and online; parents who have the capability during their work day to participate in their children's education; and businesses who share their expertise so students and teachers have the skills necessary to succeed in the workplace of today and tomorrow."

George Lucas, Film Maker

CCC: Recommendations

Connect, Compute, and Compete's Recommendations for Telecommunications, Infrastructure, Hardware, and Learning Resources.

Recommendation 1: Equip every California classroom and school library with the technology resources needed to create a learning environment that will improve student achievement.

In an arena changing as rapidly as technology, a too-rigid definition of equipment or material standards risks "fighting the last war." To avoid creating a Maginot Line through our classrooms, we chose to focus on functionality, rather than on specific device features or attributes, which would quickly become obsolete. The recommendations that follow represent benchmarks for technological resources, rather than a final destination. Although other states will also undoubtedly increase their efforts to integrate technology into their classrooms, we believe that attaining these benchmarks will bring us to the top 10 percent of states. From here, we hope classrooms will adjust their technology upward in support of specific curricula and classroom needs.

The acquisition of the recommended telecommunications infrastructure, hardware, and learning resources will make possible viewing video presentations in individual, classroom, and small group settings; running animation-based simulations; accessing the Internet with evolving digital capability; and preparing multimedia presentations with full-motion and still-frame animation linked to the curriculum. It will also facilitate communication between and among school constituencies -- parents, teachers, students and administrators.

Specifically, we recommend the following:

Telecommunications Infrastructure

Equip every classroom and school library with the telecommunications capability to support interactive, high-speed transmission of full-motion video, voice, and data.

"As increasingly capable machines join Americans at the workplace -- join them as both co-workers and competitors -- the payoff to education and training has soared, and the penalty for lacking skills has stiffened."

Robert Reich, United States
Secretary of Labor

Hardware

In every classroom provide:

six to eight networked multimedia computers with high-quality monitors

special interfaces for persons with disabilities

scanner

networked laser printer

27-inch or larger television monitor

overhead projector and screen

telephone

For every five classrooms, provide:

color printer

audio recorder

liquid crystal presentation panel

video recorder

videodisc player

For every 15 classrooms, provide:

fax machine

high-speed copier

Learning Resources

Although we do not recommend particular technology-based learning resources in this report, we do recommend the revamping of the current instructional materials adoption process. The process by which the California State Board of Education currently adopts instructional materials is insufficient to the task of evaluating and acquiring technology-based learning resources. Formulated for an earlier era that was dominated by printed texts, the adoption process is unable to accommodate either the short-term publication cycle or highly focused nature of courseware, CD-ROM, or video resources.

Adopt a shorter submission cycle.

Include supplementary materials, not only full courses of study.

Improve reviewers' technology expertise.

Establish a network of Web sites for statewide exchange of information regarding learning resources and their effective use in classrooms.

Set standards for site licensing of software.

Implement an on-line "consumer report" for educational materials, accessible by students and parents.

"One in four California teachers reports using textbooks that are more than 10 years old."

Survey of the Association of American Publishers and the National Education Association

Student Content and Performance Standards

Recommendation 2: Incorporate technology into student content and performance standards recommended by the state for adoption at the district level.

In October 1995, Assembly Bill 265 created a Commission for the Establishment of Academic Content and Performance Standards, charged with developing standards that could be required before awarding a high school diploma.

"Technology is a very important part of today's [education] basics."

Richard Riley, United States

Secretary of Education

Specifically, we recommend the following:

> Extend the mission of this oversight body to include technology-based proficiencies embedded in each content area, at each grade level, and in the design of acceptable mechanisms for testing levels of technology performance including:
>
> - facility with computers and software, such as word processing programs
> - the ability to use technology to organize and prioritize complex problem-solving tasks
> - the ability to access and gather information from electronic data sources
>
> Use indicators in addition to test scores to measure the overall improvement expected to result from widespread technology integration. For example, businesses can be surveyed to determine their satisfaction with students' job preparedness. Other indicators that must be made part of an annual census are: dropout rates, parent participation, attendance, advanced-course enrollment, and participation in scholastic extra-curricular activities.
> Require the California Department of Education, as part of a continuous school improvement program, to collect and publish an annual report of technology-related performance statistics not only to benchmark results, but also to target additional resources where needed. Such information should be made available at local, state, and national levels.

"Students learn nothing when they recopy, but they learn a great deal when they revise, that is, when they take time to see their work in a new way . . . With the added components of graphics, desktop publishing, and other creative uses of technology, writing becomes truly rewarding."

Kaki Logan, Teacher,
and Pat Gemma, Principal,
Alhambra High School,
Martinez, California

Teacher Content and Performance Standards

Recommendation 3: Integrate technology into the content and performance standards that will be used as the basis for setting policies for preparing, hiring, evaluating, and promoting teachers.

The ability of teachers to use technology to promote students' acquisition of basic skills and subject-matter content is critical to education's success. Accomplishing this objective requires front-end preparation, as well as ongoing training opportunities and incentives.
"A congressionally mandated review of 47 comparisons of multimedia instruction with more conventional approaches to instruction found time savings of 30 percent, improved achievement and cost savings of 30 to 40 percent . . . ."

United States Advisory Council
on the National Information
Infrastructure

Specifically, we recommend the following:

> Establish a three-tier scale for evaluating technology competency and use it to monitor attainment of site-specific goals

Level One - Personal Proficiency: ability to use technology for personal use

Level Two - Instructional Proficiency: ability to incorporate technology into teaching and learning

Level Three - Leadership Proficiency: ability to train colleagues to Level One and Two proficiencies

Make grants available for staff development within district guidelines.

Negotiate additional stipends or salary schedule increments for teachers who acquire Level Two and Level Three skills.

Encourage teacher education programs to train prospective teachers in the use of technology and its integration in their subject areas.

Encourage students and teachers to act as mentors to enhance technology skills.

Explore the possibility of requiring Level Two proficiency for new teachers and requiring current teachers to attain Level One proficiency within two years and Level Two proficiency within five years.

Technical Support

Recommendation 4: Provide the expertise and resources to support the effective use of technology for students, teachers, parents, and the broader community.

Anyone who has ever used a computer knows that sometimes things go wrong. When problems do occur, most users have no access to assistance unless they have an expert friend or the number of an industry help line.

Schools with newer hardware may find adequate technical support with one technician per 300 computers. Those schools using older installations or those with more challenging needs may require support closer to general industry guidelines, which call for one technician for every 50 workstations.

Specifically, we recommend the following:

Provide a referral service that includes dial-up help lines, technology specialists, mentors, published materials, and on-site visits to assist in solving technical problems.

Extend technical assistance to parents and the greater school community by establishing and staffing community technical assistance centers.

Make facilities and technical support available to parents and the community during evening hours and on weekends.

Establish on-line services for frequently asked questions regarding widespread applications.

Encourage development of newsgroups and chat rooms for discussing specific curriculum and problem issues.

"California's schools ... need to adopt some of the ways [leading edge] companies do business. Like companies that are thriving in the face of pressure on costs and performance, government should look beyond increasing efficiency of existing functions and work toward cost-effective results."

The Governor's Council
on Information Technology

CCC: Costs

Connect, Compute, and Compete's view on costs and solving the problem of raising funds of this magnitude.

ESTIMATED EXPENDITURES: There is no argument that putting technology into more than 200,000 California classrooms and school libraries is a massive undertaking. Although some benefits in improved productivity will be realized almost immediately, most children coming into the system today will not enter the labor force for at least 15 years. Bringing California classrooms from the back of the pack to a position of leadership among states integrating technology into classroom instruction will require an investment of $10.9 billion in our kindergarten through twelfth grade schools over the next four years.

We estimate that $4.2 billion-- or nearly 40 percent of the total-- will be derived from existing appropriations, corporate and foundation grants, and volume purchase discounts. The following are some examples of resources that will provide 40 percent of the total need:

- Funds currently provided through the California Education Technology Act
- State buys initiated by the California Technology Assistance Project
- The Computers for Schools Program, which coordinates the collection, repair, and distribution of donated computers
- One-time funds, such as the $279 million in the 1995 state Budget Act, distributed to all school districts on a per-pupil basis for non-recurring expenditures, including the acquisition of technology
- Public Utilities Commission rate payer settlement funds
- Grant programs by corporations and foundations
- Fund-raising efforts by local organizations

Solving the problem of raising funds of this magnitude is not solely a corporate responsibility. It is also a public responsibility. Although the efforts of business, organizations, and individuals will provide significant resources, the remaining $6.7 billion over a four-year period is a gap that must be filled from new public revenues.

Where will the money come from?

"The [information] highway is going to give us all access to seemingly unlimited information, anytime and anyplace we care to use it. It's an exhilarating prospect, because putting this technology to use to improve education will lead to downstream benefits in every area of society."

Bill Gates, Chairman
and Chief Executive Officer,
Microsoft Corporation

CCC: Funding

Connect, Compute, and Compete's Funding and Potential Sources of Income.

POTENTIAL SOURCES OF INCOME: We recommend a funding portfolio that includes several potential sources, such as: a broad sales tax; targeted taxes on video cassettes, software, and computers and peripherals; bonds initiated at the local, regional, and state levels; a surcharge on telecommunications users; taxes on utility users; an increased state income tax; and "growth dividend" funds that will automatically accrue to schools during an economic recovery.

We are heartened that the California Business Roundtable, an organization of 80 chief executive officers of California's major corporations, has agreed to convene a small group representing business, education, and public policy experts to explore the most expedient and pragmatic funding options for generating the $6.7 billion needed to implement the report's recommendations. A Task Force subcommittee will continue participating in these education technology finance deliberations and will submit consensus recommendations to the Governor, the Legislature and the State Superintendent of Public Instruction at the earliest possible date.

CUTTING THE PIE: The total four-year technology budget will be apportioned as follows:

Hardware and telecommunications infrastructure: $5.7 billion
Learning resources and services: $2.9 billion
Staff development and support: $2.3 billion

To ensure that funds will be available to meet the projected cost of an accelerated schedule for infrastructure development, equipment acquisition, and teacher training, funds should be targeted for technology and held separate from the aggregate education budget during the first four years.

Gradually increasing annual funding levels from 10 percent of the total in Year One to 40 percent of the total in Year Four will help encourage a more measured approach to disbursements. The lag time for phasing in full funding will give districts throughout the state time to put content and performance standards in place and to develop detailed plans for integrating technology at the local level.

We expect to have met our objectives for bringing California schools into the top 10 percent of the states in technology by the year 2000. Once technology has become integral to the curricula it advances, ongoing technology expenditures -- to replace and upgrade hardware and acquire new courseware that has since come onto the market-- will no longer need to be a separate item in district budgets.

A difficult problem remains: striking a balance between have and have-not schools. We know that a widening gap in student access to technology exists not only in schools, but also in homes and communities. How can we guarantee that all learning environments will meet statewide benchmarks for technology access without penalizing those communities that have led their peers in securing some measure of public or private support for putting children on a technology track? How can we make certain that homes and communities are equally linked to the technology we are proposing?

"You cannot expect a faculty to rethink and change its schools without serious time and money, any more than General Motors thought it could build the Saturn without an up front investment of more than eight years and billions of dollars."

Lewis Solmon, President
Milken Institute for Job &;Capital Formation

Analysts say that changes in the labor market, such as less demand for workers without technological skills, are contributing to a growing income inequality between the rich and poor. Helping the poor get access to the technology they need to become successful is becoming increasingly difficult. In an effort to devise an equitable strategy, we advise that funding be allocated according to a combination of formulas, including a per-pupil distribution, leadership grants, competitive merit grants, and aid for districts with special needs.

"In this Information Age, it is not just what one knows that is so vital, but the ability to think critically and find information when needed. It is the skill of learning that will prepare children to excel in the world where workers must be as flexible as the companies for which they work."

The Governor's Council
on Information Technology

RETURN ON INVESTMENT: In the end, a better question than "How much does it cost?" is "What benefits can we expect?" Although hard and fast numbers remain elusive, various studies demonstrate significant return on technology-related investments. For example, the Milken Institute for Job & Capital Formation estimates a return of $5 for every dollar invested in improving the technology know-how of California's labor force.

Another study by Alan Kruger, a Princeton economist, calculates that computer-savvy employees earned 10 percent to 15 percent more than their non-computer literate colleagues; and recent data from the University of California at Davis Career Center lend support for the proposition that technological skills add hard economic value.

After reviewing the research, we have concluded that students familiar with computers and telecommunications from their early years will be more comfortable in later life adopting new technology to problem solving of all kinds. At the point at which our educational responsibilities end, we will have prepared our students more adequately than we do now to take their next steps into the future, wherever it leads -- to a job or additional education.

"Businesses are spending billions training people because they don't learn how to use technology in schools. From a national-policy perspective, there should be the highest priority around these issues."

Roy D. Pea, Dean,
Northwestern University

CCC: Next Steps

Connect, Compute, and Compete's guide to building the bridge between where we are and where we want to be four years from now.

REVEILLE:

We have, we hope, sounded a call to action for anyone concerned about the continued viability of public instruction: students, who need to discover both how to learn and what to learn; businesses, which require a constant stream of innovation; and community members, who consume the goods and services manufactured and provided by graduates of the state's schools.

Building the bridge between where we are and where we want to be four years from now will take a commitment from everyone involved with the educational system.

The demands of making California's public school children technology-ready recall massive government undertakings of earlier generations: the Rural Electrification Project of the 1930s, the GI Bill of the post-World War II era, and the Interstate Highway System of the 1950s. For all their organizational underpinnings, these programs were sui generis. Without precursors, these programs were spawned by need, founded on judgment, and steadied by commitment. The results propelled a nation forward.

Like these programs, California's proposed public school technology integration project is without precedent. No state or program has ever gone this way before. Uniqueness, however, does not diminish the necessity of staying the course. Measurable goals will be achieved not with piecemeal reform, but with the coordinated advocacy of all concerned -- students, parents, teachers, administrators, government at all levels, businesses, and nonprofit organizations.

Recommended Actions

Although we know that many of you will be very creative in how you support technology integration, we ask that you give high priority to the immediate and future actions recommended in the matrix that follows.

	IMMEDIATE PRIORITY	FUTURE ACTION
Students	Demand appropriate technology in your classrooms. Actively support district and state technology initiatives.	Increase technology proficiency.
Teachers	Seek technology training opportunities, including those on the Internet, for meeting credentialing and the three-tier competencies. Advocate for more technology in the classroom by actively supporting district and state technology initiatives.	Incorporate technology into traditional curricula. Use electronic methods of sharing expertise with peers.
Parents/ Communities	Advocate for more technology in the classroom by actively supporting local and state technology initiatives.	Establish community-based technology application assistance centers to meet community needs.
Local School	Develop a strategic plan for acquiring and	Upgrade minimum hiring

Boards	integrating technology. Incorporate technology expertise into the teacher hiring and evaluation process. Adopt technology-based student content and performance standards for graduation.	requirements. Institute appropriate incentives to encourage teachers to integrate technology into the curriculum.
School Administrators	Devise an action plan for acquiring benchmark technology. Develop new hiring criteria that incorporate technology expertise. Coordinate the adoption of the technology-based student content and performance standards.	Develop loaner programs to expand teacher, student, and family access to computers and e-mail. Expand personal use of computers and e-mail systems for planning and discharging administrative responsibilities. Involve the community in planning for technology.
County Offices of Education/California Technology Assistance Project	Develop a master plan for coordinating and upgrading a statewide telecommunications infrastructure. Cooperate with the California Department of Education to create data bases for sharing information on students and school finance.	Coordinate submission of applications to federal funding sources. Develop a tool for schools to use in developing technology plans.
Employee Unions	Actively support district and state technology initiatives.	Support the development of content and performance standards.
Governor and Legislators	Provide schools full-scale funding for technology, on a per-pupil basis with adjustments for equity.	Fund research and development that provides guidance and assistance to public schools regarding technology acquisition and integration.
State Board of Education/ Education Council for Technology in Learning	Revise the instructional materials adoption process to foster technology integration. Recommend technology-based content and performance standards for teachers and students.	Support longitudinal studies of technology integration and student performance. Encourage the development of technology-based curriculum materials.
Commission on Teacher Credentialing/ Teacher Preparation Institutions	Require technology competency for granting and renewing teaching credentials. Require technology use in meeting coursework requirements.	Provide appropriate technology in college and university classrooms.
California Department of Education	Embed technology in curriculum frameworks. Develop technology-based content and performance standards for students and teachers.	Gather and report data benchmarking technology integration and its effects on scholastic progress. In collaboration with county offices of education, provide

	Spearhead statewide activities, such as NetDay. Incorporate technology into reading and math initiatives, Challenge districts, the provisions of the "Improving America's Schools Act," and special education programs.	a central information system on technology-related topics. Coordinate purchasing activities to maximize economies of scale. Collaborate with the California Technology Assistance Project in preparing tools for schools to use in developing technology plans.
Businesses, Foundations, and Organizations (such as the Business Roundtable and the Industry Council for Technology in Learning)	Sponsor and support legislation to fund technology integration. Sponsor events and volunteer activities to promote technology awareness, including NetDay; Sign-on Day, where the school community signs onto the Internet; and Cyber-Camps, student technology camps.	Partner with local schools to find more cost-effective ways to provide technology. Develop measures to determine satisfaction with technology expertise of high school graduates. Sponsor courseware development.
Public Utilities Commission	Represent school needs in Federal Communications Commission hearings regarding universal telecommunications services, Snow-Rockefeller provisions in the Telecommunications Act of 1996, the Small Business Development and Economic Development Fund, and others.	Develop affordable connect rates for schools.

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Note: This information is for historical purposes. Some of the links listed below may no longer exist.

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CCC: Appendix

Connect, Compute, and Compete's Four-Year Cost (1996 Dollars) to Reach Benchmarks.

Average school:

700 students
33 staff
29 rooms
(27 classrooms, 1 library-media center, and 1 office)

Number of California schools: 7,818

I. Staff Development and Support

	Benchmark Assumption for Average School	Four-Year Cost Average Room	Four-Year Cost Average School	Four-Year Costs Statewide
A. Trainers	2,000 hours of training @ $35 per hour	$2,414	$70,000	$547,260,000
B. Staff support, materials, mileage, etc.	$2,000 per person (33 staff members)	$2,276	$66,000	$515,988,000
C. District/county technical support	.3 FTE = $ 15,000 per year for 4 years	$2,069	$60,000	$469,080,000
D. School site technical support	.5 FTE = $25,000 per year for 4 years	$3,448	$100,000	$781,800,000
Four-year total (staff development, etc.)		$10,207	$296,000	$2,314,128,000
Percent of total				21%

II. Learning Resources

	Benchmark Assumption for Average School	Four-Year Cost Average Room	Four-Year Cost Average School	Four-Year Costs Statewide
A. Computer software	$2,000 x 29 rooms for 4 years	$8,000	$232,000	$1,813,776,000
B. Upgrades	$200 x 29 rooms for 4 years	$800	$23,200	$181,377,600
C. Other multimedia materials and services	$500 x 29 rooms for 4 years	$2,000	58,000	$453,444,000
D. Communications (connect charges, etc.)	$ 1,265 per month x 12 months for 4 years	$2,094	$60,720	$474,708,960

Four-year total (learning resources)		$12,894	$373,920	$2,923,306,560
Percent of total				27%

III. Hardware and Telecommunications Infrastructure

	Benchmark Assumption for Average School	Four-Year Cost Average Room	Four-Year Cost Average School	Four-Year Costs Statewide
A. Computers	6 computers @ $1,525 x 29 rooms	$9,150	$265,350	$2,074,506,300
B. Special interfaces	$700 for each of 29 rooms	$700	$20,300	$158,705,400
C. Scanners	$675 for each of 29 rooms	$675	$19,575	$153,037,350
D. Networked laser printers	$1,100 for each of 29 rooms	$ 1,100	$31,900	$249,394,200
E. Color printers	5 @ $400 (Shared by 29 rooms)	$69	$2,000	$15,636,000
F. Audio recorders and players	5 @ $75 (Shared by 29 rooms)	$13	$375	$2,931,750
G. Headphones	174 (one per computer) @ $30	$ 180	$5,220	$40,809,960
H. Liquid crystal presentation panels	5 @ $ 1,100 (Shared by 29 rooms)	$ 190	$5,500	$42,999,000
I. Video capture boards	5 @ $350 (Shared by 29 rooms)	$60	$1,750	$13,681,500
J. Video cameras	5 @ $600 (Shared by 29 rooms)	$ 103	$3,000	$23,454,000
K. Videodisc players	5 @ $325 (Shared by 29 rooms)	$56	$ 1,625	$12,704,250
L. Tele vision monitors	$500 for each of 28 rooms	$483	$ 14,000	$109,452,000
M. Videocassette recorders and players	$350 for each of 28 rooms	$338	$9,800	$76,616,400
N. Overhead projectors and screens	$500 for each of 28 rooms	$483	$ 14,000	$109,452,000
O. Fax machines	2 @ $400 (Shared by 29 rooms)	$27	$800	$6,254,400
P. Telephones	$50 for each of 28 rooms	$48	$ 1,400	$10,945,200
Q. High-Speed copiers	2 @ $5,000	$345	$10,000	$78,188,000

R. Telecommunications Infrastructure	$74,000 per School	$2,552	$74,000	$578,532,000
S. Furniture and security equipment	$2,700 for each of 29 rooms	$2,700	$78,300	$612,149,400
Four-year total (staff development, etc.)		$19,272	$558,895	$4,369,441,110
Percent of total				40%

IV. Maintenance, Upgrades, and Replacements

	Four-Year Cost Average Room	Four-Year Cost Average School	Four-Year Costs Statewide
(15% of Installed Hardware)	$5,844	$169,475	$1,324,955,732
Percent of total			12%
Grand total (four years)	$48,217	$1,398,290	$10,931,831,402

Four-Year Costs and Funding Sources

	Four-Year Costs Statewide
Existing appropriations	$1,623,376,963
Corporate and foundation grants	$874,546,5 12
Volume purchase discounts	$1,749,093,025
New public funds required	$6,684,814,902
Total costs to reach benchmarks	$10,931,831,402

Annual New Public Funds Required for Four-Year Phase-in

Year	New public funds	Per-student cost
Year I (10%)	$668,481,490	$121
Year 2 (20%)	$1,336,962,980	$243
Year 3 (30%)	$2,005,444,471	$365
Year 4 (40%)	$2,673,925,961	$486
Totals	$6,684,814,902	$1,215