The Digital Challenge:

Integrating Educational Technology

into California Classrooms

A discussion sponsored by
The California Education Policy Seminar
and
The California State University
Institute for Education Reform

June 1997

The California Education Policy Seminar

provides a neutral forum for state-level education policy makers and educators to gain in-depth knowledge about emerging policy issues. The seminars have contributed to the development, modification and enhancement of education reform initiatives in California.

The California Education Policy Seminar is funded by the William and Flora Hewlett Foundation, the Walter S. Johnson Foundation, the Pioneer Fund, the Walter and Elise Haas Fund, the Weingart Foundation and the Stuart Foundations.

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Introduction

The Digital Challenge

> *"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!'"*
>
> *from the introduction to Connect, Compute and Compete: The Report of the California Educational Technology Task Force*

Computers aren't just "cool" today, though—they're basic, essential teaching and learning tools for any school that aims to prepare its students for the brave new technology-rich world awaiting them. As communications, research and databasing tools, computers offer unprecedented reach and speed, while as platforms for constructing multi-media reports and presentations they offer increasingly amazing standards of both sophistication and ease of use. Computers have thoroughly permeated American commerce, and estimates are that by the year 2000, 60 percent of all jobs in the United States will require a working knowledge of computer-based information technologies.[1]

Recognition of the need for students to emerge from our schools computer-literate has grown by leaps and bounds over the past few years, extending even to the White House. President Clinton's call for every classroom in America to be wired to the Internet by the Year 2000 carries inevitable echoes of John Kennedy's call for a manned mission to the moon by the end of the 1960s.

California, however, has uncharacteristically lagged behind in catching a ride on this new societal wave. The state which grew an entire Valley of Silicon today ranks 45th in the nation in the ratio of students to computers available for their use (14 to 1). And while a 1995 survey of recent academic studies showed technology-based instruction improving student performance in subjects ranging from English and history to math and science[2], there still exist substantial pockets of apathy, frustration and outright resistance to new educational technologies within California's public education system.

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A key element of the problem is that past efforts to implement hardware upgrades and increased emphasis on educational technology have generally not lived up to the promises made on their behalf. Many computers brought into classrooms around the state during the last decade sit largely unused by teachers who don't know how to operate them or how to incorporate them into their lesson plans.

Computers are not teaching machines; they are tools teachers can use to teach more effectively. But the tools—as valuable as they potentially are—have not been integrated with the needs defined by many teachers in their own classrooms. The challenge, then, is not just to supply more tools, but to make sure they are used to their best advantage; we

1 Connect, Compute and Compete, Report of the California Education Technology Task Force, p. 3.

2 Ibid., p. 4.

must provide teachers with the initial training, on-going professional development and technical support necessary to help them define and sustain methods of using computers to improve teaching and learning in their classrooms.

A Developing Vision: The California Education Technology Task Force and the Digital High School Initiative

Two recent developments have brought the issue of educational technology to the forefront of California's ongoing education reform efforts. One is the recent report of the California Education Technology Task Force, a statewide group of 46 business executives, educators and representatives of organizations, foundations and communities concerned about the issues surrounding the integration of computers into California's classrooms. Convened in October 1995 by State Superintendent of Public Instruction Delaine Eastin, the Task Force issued a report this spring containing recommendations covering areas including: Infrastructure, Hardware and Learning Resources; Student Content and Performance Standards; Teacher Content and Performance Standards; and Technical Support. The Task Force's report recommends spending an ambitious $10 billion over the next several years to meet needs in these areas.

The second significant development is Governor Pete Wilson's recent "Digital High School" initiative, a proposal and set of concepts designed to focus attention on integrating computer technology fully into the high school setting first, prior to focusing similar efforts on elementary and middle schools. The Governor's proposal—embodied in three bills, AB 1011 (Aguiar), AB 1012 (Poochigian) and AB 1013 (Mazzoni)—would appropriate $1 billion over four years in an effort to introduce 1 million new computers into high schools throughout the state.

Taken together, these two approaches offer the rough outlines of a vision for the integration of educational technology into California's classrooms. It is this vision that the California Education Policy Seminar and the California State University Institute for Education Reform sought to have a distinguished group of participants explore, critique, and refine in the course of an afternoon-long seminar.

April 22, 1997 Seminar

On April 22, 1997, a group of 32 California policy-makers, administrators, educators and policy advocates gathered in Sacramento to examine and discuss how and why California is succeeding and failing at incorporating educational technology into the classroom, and what can be done about it. Among the key questions the seminar aimed to address were:

- What is the current state of technological readiness in California's classrooms and libraries?
- What infrastructure, equipment and support do we need?
- How can we prepare teachers and keep their knowledge updated to ensure that technology is integrated across the curriculum?
- How much will the new investment in technology that we need cost?
- How will the investment in technology be financed?

Presenting at the seminar were two key players on the issue of educational technology in California, Dr. Barbara O'Connor and Mr. Joe Rodota.

Dr. Barbara O'Connor, in addition to serving as Co-Chair of the California Education Technology Task Force, is a Professor of Communications and Director of the Institute for the Study of Politics and Media at California State Univer-

sity, Sacramento. She also served for eight years as the chair of the California Education Technology Committee and is the former chair of the California Public Broadcasting Commission. Two years ago she was named as one of *Newsweek's* "50 for the Future" in a feature story profiling 50 people who will set policy and direction for global communications. Last fall, Computer Using Educators (CUE) bestowed their Technology Leadership award on Dr. O'Connor.

Mr. Joe Rodota, Deputy Chief of Staff to Governor Pete Wilson, serves as the Governor's point person on a range of technology policy initiatives, including the Governor's Digital High School initiative and the California Virtual University. Prior to his current assignment, Mr. Rodota was the Governor's Cabinet Secretary. Before joining the Wilson administration, Rodota was president of Benchmark Research Group, a Sacramento-based information retrieval and public policy research firm. He also served on the White House staff through most of President Reagan's second term as deputy director of the White House Office of Public Affairs.

An in-depth discussion of the major policy issues surrounding educational technology followed the presentations of Dr. O'Connor and Mr. Rodota.

Presentation of Dr. Barbara O'Connor

(NOTE: Throughout this report, comments made by individuals participating in April 22 seminar are summarized without quotation; all text contained herein should be regarded as paraphrasing and/or synthesizing what was actually said, and not as quotes attributable to Dr. O'Connor, Mr. Rodota or any other participant.)

The California Education Technology Task Force: Background

The California Education Technology Task Force was designed from the start to be bipartisan, and to address both industry expectations and educational needs. When Delaine Eastin convened the Task Force, she was genuinely concerned about the mixed results on integrating education technology at the school site. Many of the Task Force's educator-members had early, painful experiences attempting to integrate technology into classroom teaching and learning.

The Task Force was different from many other education-focused task forces in that it was more of an industry than an educator group. The feeling existed that a membership with a substantial number of private sector CEOs might have a better chance of producing a report that the private sector would actually read and pay attention to than many of the educator-dominated reports previously published. The Task Force was co-chaired by Bonnie Hargadon, former President of the McKesson Corporation.

The Task Force began its work by trying to map out where California was in terms of its technological infrastructure, teacher training and courseware. The timing of the Task Force's work resulted in a sort of "slice of life" of educational technology conditions as of approximately January, 1996. The Task Force then sought to compare California with other states, and with where the Task Force wanted California to be.

The Task Force Report: From Many Views, Consensus

The Task Force's report is a consensus document. It represents the convergence of many different viewpoints, and there were some differing points of view on specific issues among the Task Force members. For example, the teachers generally believed teachers should be paid for training time associated with integrating technology into their classrooms. And some of the corporate executives wanted sanctions to be applied against teachers who didn't implement the report's recommendations.

The corporate members of the Task Force were truly horrified that California ranked 48th or 49th in the nation in the integration of education technology into the classroom. They were also very generous in their sharing of proprietary information in the course of the Task Force's research.

The cost estimates the Task Force came up with in developing its eventual recommendations were daunting. The Task Force initially concluded that it would take an investment of over $12 billion to move California into the top one-third in education technology nationwide—and that this price tag wouldn't cover all the secondary needs associated with bringing this many new computers into classrooms. The Task Force then looked at ways to divert other existing resources to meet some of the needs, and found ways to bring the total cost down somewhat. Most of the Task Force members would probably add to, or subtract from, the recommendations in some way; again, the report is a consensus document.

One of the key issues the Task Force grappled with was how much to recommend spending on teacher training. My own belief is that for every dollar you spend on technology, you must plan to spend a companion dollar—at least—for training,

"...for every dollar you spend on technology, you must plan to spend a companion dollar—at least— for training, and a third dollar on materials development."

and a third dollar on materials development. That's really the corporate model now, learned by trail and error while churning through numerous system upgrades. You can't simply bring new technology into the classroom and expect teaching and learning to automatically improve; training and the acquisition of appropriate, useful courseware are both essential to success. Unfortunately, pioneers in the field of technology generally aren't sensitive enough to the need for training personnel in order to make the technology useful.

The Task Force Report: Recommendations

(NOTE: The text of the Task Force report's Executive Summary is included as Appendix A; the following were Dr. O'Connor's comments on various elements of the recommendations and the Executive Summary; they were NOT intended to summarize all of the recommendations.)

1. Infrastructure, Hardware & Learning Resources

- *Equip every California classroom with technology useful for teaching and learning*

This should be regarded as an essential component of education reform. With regard to hardware/equipment standards, it is best not to define these too rigidly in an area changing as rapidly as computer technology. Nonetheless, the Task Force did feel strongly about one standard: whatever system is adopted should feature an open platform that does not dictate use of any particular type of software or peripheral technology with it.

- *Equip every California classroom and library with full-motion video, voice or data send and receive telecommunications technology*

One-way media such as educational television are light-years behind interactive media in terms of their utility as tools for teaching and learning. Interactivity and the ability for students to seek knowledge that's relevant to them are critical elements in determining the success or failure of attempts to bring new technologies into the classroom. The critical words here are "send and receive"—this capability is the key to making technology a tool everyone can use in the classroom setting.

"Interactivity and the ability for students to seek knowledge that's relevant to them are critical elements in determining the success or failure of attempts to bring new technologies into the classroom.

- *Revamp the instructional materials adoption process*

We need a shorter submission cycle, more supplementary materials and especially to improve the technological expertise of those reviewing the materials. Often the people who are reviewers are not technologically literate. In order to be able to integrate materials that are relevant, we have to have qualified people reviewing them.

2. Student Content and Performance Standards

This recommendation concerns the establishment of technology proficiency standards and assessment measurements for students. The real issue here, though, is how we give the people who face classrooms full of students every day the tools to make their jobs easier, more enjoyable and more fulfilling and also make them able to teach kids better. I am convinced that most teachers want to learn how to be better teachers. We have to figure out how to help them do that—and reward them for it. We need to give teachers the confidence to use technology the way they use the library, or a piece of chalk, right now. They have to be technologically proficient enough to feel comfortable with integrating computers and courseware into everyday classroom teaching and learning. This culture change is going to take time and is going to be very difficult, but we have to do it.

3. Teacher Content and Performance Standards

The critical shift in thinking here is that the Department of Education has finally decided that California should follow the rest of the nation in adopting the ADA (Average Daily Attendance) funding model. Some grants are still reserved for specific purposes, but there is wide recognition now that schools need to be funded as a matter of routine on a per-student basis. The only caveat the Task Force had was with regard to equity. The issue here isn't so much demographics as early vs. late adopters of technology in the classroom. You aren't going to see early adoption in very many inner-city or rural classrooms.

"The great irony is, the kids frequently know more (about computers) than the teachers. And if the teachers don't catch up and start to incorporate this technology into the classroom more effectively, the kids are going to stop coming to class."

4. Technical Support

We also focus on maintenance and technical support. This is our response to the phenomenon of computers hiding in the closet. Either no one was trained to deal with them, or they didn't know what to do with just one, or they put it in a lab, or there was nothing to run on it, or it's old equipment that the new software won't run on. The great irony is, the kids frequently know more than the teachers. And if the teachers don't catch up and start to incorporate this technology into the classroom more effectively, the kids are going to stop coming to class. The classroom is much less relevant to them if the tools aren't available there that they're used to using elsewhere.

The Task Force: Conclusions

The Task Force has sent out a great deal of material and continues to stay in touch as a loose coalition of individuals who have different ideas in some cases but have forged some common ground. Each is continuing to talk to their peers and colleagues about the recommendations, but they are no longer together as one entity; they were brought together to do a job, and it's done.

The Task Force generated what was in most peoples' mind a real bipartisan discussion, which is very appropriate given that the need and the responsibility are also bipartisan. Unfortunately we've seen partisanship creeping back into some of the legislative debates about various elements of the Task Force recommendations.

The total cost of the Task Force's recommendations is probably about $10 billion; we would like to see it implemented over the course of about four or five years. We believe the funding is there. There is a great deal of hardware funding available from the federal government. What the state must produce is the companion dollars for training and courseware, or else we'll end up with more computers in the closet. And finally, we must agree on the tripartite funding principle ($1 for equipment, $1 for training, $1 for courseware/materials development).

The Governor's Digital High School Initiative: Introduction and Principles

We were both inspired by and informed by the work that Barbara and the Task Force did. This is particularly true with regard to the idea that we need to integrate technology into school campuses comprehensively, and get away from this sort of pilot or niche approach to the issue. We also agreed strongly with the determined effort to overcome skepticism on the political side, especially in the Legislature, where people ask why we should spend money on computer technology when some of the kids we're graduating can't read. I think the work of the Task Force went a long way toward establishing a consensus that there is a return on investment in educational technology.

The Governor established a set of goals for Digital High School program early in its conceptualization. He wanted to:

- spend state funds in a way that would generate a return visible to everyone involved—teachers, students, parents and the public;
- promote the integration of technology into all elements of the curriculum, especially math and science;
- create an "evergreen" or permanent program, rather than another pilot;
- achieve an economy of scale in whatever program evolved—a principle which is hard to achieve with regard to educational technology because of the education system's decentralized procurement process;
- avoid freezing the hardware in place as new technology advances occur by putting some flexibility in the procurement scheme;
- ensure funding equity, making sure new technology was brought into every classroom and funding wasn't scattered around; and
- make sure the program was affordable from a state revenue point of view, since so many other states are constantly trying to attract companies away from California by pointing to our burdensome tax and regulatory structures.

Digital High Schools: The Details

Three bills—AB 1011 (Aguiar), AB 1012 (Poochigian) and AB 1013 (Mazzoni)—embody the basics of the Governor's Digital High School Initiative. The plan would provide high schools statewide with an additional $600 per student over a 24 month period for the acquisition and installation of hardware, software and networking equipment. After this initial "build-out" period, an additional $90 per student would be provided annually thereafter for maintenance, training and upgrades.

The total cost of implementation at an average high school would be about $1 million; the total program would cost about $1 billion spread over four years. A key element of the funding is a local match. Our bill says for every dollar we provide from the state, we expect a matching dollar from local, federal and private sector contributions, both cash and in-kind.

Digital High Schools: Anticipated Questions

Let me try to anticipate and answer three of the questions we often hear about the Digital High School Program.

(1) Why start with high schools?

We wanted to start in a place where we could establish momentum and early evidence of success. Because the Governor's term runs out in 1998, we thought it was important to have a program well underway and demonstrating clear signs of paying off before he left office, if we were going to expect subsequent Governors and Legislatures to continue it. We also wanted to have an impact on the college scene by reducing the need for remedial college courses.

It also made sense to us after seeing how the class size reduction program generated a lot of support from folks with kids in the affected grades (K-3), but also got a lot of letters of complaint from the parents of fourth graders. We thought this was a way to improve an entire school pretty much all at once and avoid that pitfall.

(2) Is this enough?

I would say probably not. We'd like to see it expanded in some way by the next Governor and Legislature. We hope they'll look at completing the job that we're trying to start here. But we do think it's a strong start. Also, individual districts can always elect to make additional investments on their own; it's a local decision.

(3) Will Digital High Schools look alike statewide?

No. Our system is decentralized and the wide variety of schools in California, coupled with local control, will generate a variety of approaches and final products. We kept the language of the bills as simple as possible, emphasizing functionality and letting schools evaluate what might work best for them.

It's a real challenge to achieve a statewide objective in a decentralized environment such as we have in California, but we are very enthusiastic about the bipartisan support for these bills. We feel it's particularly good to see something positive happening in our high schools, which have been especially overburdened with social problems in the last few years. We hope the Digital High School program will end up benefiting everyone.

"It's a real challenge to achieve a statewide objective in a decentralized environment such as we have in California, but we are very enthusiastic about the bipartisan support for these bills."

The group discussion following the above presentations focused primarily on four major areas of concern relating to educational technology:

- the integration of technology into teaching and learning in the classroom;
- the need for both immediate teacher training and on-going professional development;
- the need for courseware development and technical support; and
- funding and general philosophical issues relating to educational technology.

Technology Integration

There was wide agreement among the group that if educational technology is truly integrated into teaching and learning, it will change not just how teachers teach, but how students learn. But key questions remain about how best to accomplish this change, and how to gauge the effectiveness of changes made. These questions include:

- is the technology effective in helping to achieve educational goals?
- do we have the necessary support systems in place (i.e. teacher training and professional development) to ensure integration works?
- do we have a mechanism in place to measure student outcomes so that we can assess and report on the effectiveness of educational technology?

Several participants felt the educational technology issue is somewhat of a microcosm of education reform in general, in that the key element is making sure students are gaining the kind of knowledge and skills they will need in the adult economy. In the words of one participant, "what the private sector needs is people who keep on learning their entire lives." Some suggested that the problem-solving and experiential learning opportunities offered by some of the better software programs available are more valuable than the drill-and-practice approach.

A related concern was expressed that planners would spend too much time talking about the hardware and software, and not enough about what teachers were going to do with it in the classroom. "The stuff," as one person called it, isn't nearly as important as determining if we've done all the preparation and training and professional development necessary for teachers, parents and students to improve teaching and learning in the classroom. This should include networking school computers statewide so that there can be widespread information-sharing on lesson plans and other teaching concepts.

"The key to the educational technology issue is the same as it is for education in general: we need to teach people good learning skills. From a business perspective, that's a lot more important than producing learned people."

Attention was also drawn to the book *Teaching With Technology: Creating Student-Centered Classrooms* by Judith Haymore Sandholtz, Kathy Ringstaff and David C. Dwyer (Teachers College Press, 1997), which provides an overview of a decade of teachers' experiences with technology in the classroom under the Apple Classrooms of Tomorrow program. The book suggests that the

integration of educational technology into the classroom forces people to confront significant teaching issues. For example, what is the teacher's role when the students know more about a given topic than the teacher does? The book looks at educational technology issues from a teacher's perspective, and may provide valuable input in this ongoing policy discussion since most teachers, like most people, need to see the benefits technology can bring for themselves before they are ready to embrace it.

Several participants also expressed a strong desire for greater focus on assessments and noted the importance of being able to show parents, teachers and policy-makers results from these kinds of efforts. Beyond quantifying educational gains, some also suggested broader issues raised by the whole discussion of technology integration, for example, "what is a learner, and how do we assess that?"

"As a K-12 administrator, I've noticed that we tend to focus a lot in education on what's quantifiable. But we need to look at other, less easily measurable issues, too. What is a learner, and how do we assess that?"

Teacher Training and Professional Development

There was strong support within the group present at the seminar for the Task Force's recommendations to make teacher training and professional development key elements of the educational technology integration effort. Ongoing training and lesson-planning assistance is vital for schools and teachers to gain a full understanding of how hardware and programs can be used effectively; conversely, for the teacher who has no background or training in computers, having a computer in the classroom will likely be useless. One person suggested that simply fostering teachers and administrators' confidence with the technology can go a long way towards resolving many other issues related to technology integration.

One participant pointed out an important difference between training and professional development, in that training teaches people how to operate the technology, whereas professional development teaches people to take the knowledge of how to use the technology, consider the material in the lesson and determine how the technology can be used to improve the lesson.

"There's also an important difference between training and professional development. Training teaches the person how to operate the technology. Professional development teaches the person to take the knowledge of how to use the technology, look at the material that needs to be taught and determine how to use the technology to improve teaching and learning in the classroom."

Another participant stressed the importance of looking at education in California in an all-embracing fashion, from kindergarten through post-baccalaureate work. The University of California is working on a program for teachers based on the tripartite emphasis mentioned in Dr. O'Connor's presentation (hardware, training, courseware); the professional development component of this program is based on the long-standing intersegmental project called the California Subject Matter Project. UC is working on a set of new programs to integrate instructional technology more fully into the Subject Matter Project, and looks forward to continuing to work on an intersegmental basis on this topic.

Finally, cautionary notes were sounded against what happens when teacher training and professional development are not a key element of technology integration. One teacher noted that his school had installed computers in classrooms in several cycles beginning in 1983, with the same result each time: those teachers who are comfortable with computers use them, and those who aren't, see them as a threat and ignore them. The same speaker also suggested that the process of integration can snowball if there's an investment in staff development, and that good staff development, unlike technology, never becomes obsolete.

"Staff development is absolutely vital... When computers come in, those teachers who are comfortable with them start in using them right away, while those who don't know how to use them see technology as a threat, a distraction that takes away from "real" teaching time."

Courseware Development and Technical Support

Two elements of the technology equation, in the view of many seminar participants, are too often given scant attention: the need for better teaching courseware and the need for reliable, on-going technical support.

As important as it is to involve teachers in decisions about hardware procurement, it is equally if not more important to get them involved in the process of procuring software for the classroom. The relative drought of software aimed specifically for use in the classroom has actually been somewhat of a positive, according to one participant, because it has meant teachers using educational technology have been forced to move away from the traditional drill-and-practice model toward incorporating some of the existing problem-solving-type software into educational approaches that focus more on building critical thinking skills.

What works best in terms of software is using programs that students are likely to use in the real world, and posing problems with that software that will engage students' interest. The program *Hyperstudio* was cited as "a great environment both for solving problems and for communicating what you're about." The bottom-line message was that technology needs to be viewed as a tool to help students figure out how to solve problems and interact effectively with other people.

"Software that is designed to teach content doesn't work; software that lets students solve problems works. Technology needs to be viewed as a tool..."

Throughout the K-12 system, teachers are generally moving into multimedia approaches and away from drill-and-practice. One reason cited for this was that K-6 teachers have realized the drill-and-practice approach doesn't work as well for some cultures and genders as it does for others. Basic skills are important—the drill-and-practice approach is not inherently bad, but students need both skill sets and the exploration of multiple approaches makes a lot of sense. California schools should also try to work with some of their colleagues in states such as Texas and Florida who are coming up with creative approaches to teaching in multiethnic classrooms.

Technical support was described as "vital to what we're talking about trying to do here." Computer technology can offer a great deal to

"I've been working on a number of projects that reflect the recommendations made in this report and proposal, and technical glitches are a constant, major problem. We need strong professional development, but we also need strong technical support."

teachers and students, but technical glitches are a constant hurdle that must be addressed aggressively if educational technology is to become a useful classroom tool.

Funding and Philosophy

Several private sector participants and Task Force members stressed that industry expects California's K-12 system to deliver them kids with the technological skills they need to compete in today's workforce. Almost all of the new jobs being created right now require technological skills, and too many California companies are resorting to bringing in workers from out of state because there aren't enough workers in California with the technological skills they need.

The Task Force saw its purpose going beyond simply teaching students basic computer technology skills; its broader goal was to help students learn faster and better with the aid of computer technology. The modern workplace demands certain competencies like critical thinking and analytical skills, and the right technology and software can help develop these skills in students. One teacher illustrated this point by noting that there was a lot more to her job than simply "making sure I'm teaching with the computer on those days when I'm supposed to be doing it." The key lies in teaching the kids in her classroom *how to think* and *how to learn*—which, when used effectively, educational technology can help her do.

"I'm very concerned about the obsolescence factor in what we're talking about here. The cycles of innovation in computer technology are moving so fast that by the time we implement what we're talking about here, it's probably going to be obsolete and irrelevant."

One speaker expressed concern about the emphasis in the two proposals being discussed on math and science over the arts, and about the potential risks of a large investment in educational technology. The cycles of innovation in computer technology are moving so fast, it was argued, that relying on technology is essentially planned obsolescence.

"On obsolescence, this is why we (the Task Force) recommend simply that hardware be functional and open platform, and don't recommend anything more specific. That's all you can do. The alternative is to wait another fifteen years and we'll be 89th (instead of 49th in the nation). I don't think we have any choice about it."

Task Force members cited this concern as the reason why their recommendations on hardware are so simple and non-specific, i.e. the hardware should be

(a) functional and (b) open platform. The feeling was expressed that there is no real choice involved in the decision to integrate computer technology into the classroom; we have to do it or we will continue to fall farther and farther behind..

> *"It's ironic that we're so worried here about obsolescence, when it's a constant in our daily lives. We don't* not *buy a new TV or a new car because a better one might be out in two years; when we need one, we buy it then, and expect to upgrade later... Kids are going to school now from homes with PCs in them; the education system has to keep up with the rest of society."*

Another participant suggested it was ironic to be spending time worrying about obsolescence, when it has become an everyday fact of life in the 20th century. The technology curve is moving very quickly in all facets of our lives to day, and California policy-makers need to get used to the idea that money needs to be spent on a regular basis—in education as in any other aspect of modern existence—to keep bringing things up to date.

Another speaker suggested a stronger focus on the symbiotic relationship between the various segments of California's public education system. The Digital High School proposal is a solid start, but it only addresses one piece of the larger challenge; kids may go through a Digital High School, come to the CSU and go back to a situation where overheads are the instructor's primary visual teaching tools. The state's investment in educational technology should be significant, spread throughout the segments, and integrated among them.

One teacher present noted that her school's long range development plan was assembled with great thought and effort, but that there was no sustained follow-through afterward. In contrast, the ADA-based approach in the Task Force's recommendations offers a long-range, sustainable vision.

Technology is not being integrated in many classrooms, noted one participant, and available resources are a key reason why. High income districts generally have good access to technology; low income districts also have good access thanks to programs offering them extra help, although they typically don't spend the additional funds on technology. The districts in the middle are the ones which are frequently stumbling the most in terms of incorporating technology into the school. Many in the group believed that we need to raise all boats together, to work on all levels at once, and that site-based management can help address equity problems, because the local staff and parents very often know what's needed and have a good idea of how to create a model that works for them.

Closing Thoughts From Dr. O'Connor and Mr. Rodota

BARBARA O'CONNOR: The Task Force viewed their recommendations as necessary but not sufficient. None of us assumed our recommendations were enough to solve the problem; they were simply the necessary minimum. We need kids to learn basic critical thinking skills, whether it's math or science or English or the arts that they're studying. I should also note that we don't expect technology to solve the persistent problem of uneven learning outcomes between different ethnic groups. Our recommendations, again, are necessary, but *not* sufficient.

JOE RODOTA: I know some of you feel the Digital High School approach doesn't target a broad enough group of students, or maybe doesn't target the particular group of students you would like to see targeted. I think in another state, you might have had support for an approach that focused more on K through 6 initially—but not in California. Class-size reduction was a reading initiative; in this particular climate, there is open skepticism toward spending money on anything that doesn't work directly to improve reading scores. We're hoping to minimize the "triage" effect of targeting one group of students by making sure this is implemented in every high school so that everyone graduates through this funnel, and we hope to see the program expanded to lower grades in the future.

Building a Sustainable Strategy

During the course of the seminar, participants identified a number of key issues which they believed should form the nucleus of California's long-term strategy for integrating educational technology into the classroom. Consensus among the group was that an effective, sustainable strategy must include:

- full integration of computer technology into the daily classroom routine of teaching and learning (as opposed to computers sitting in a corner unused or grouped in labs that are used only sporadically);
- both strong initial training for teachers to allow them to operate the technology, and on-going, high-quality professional development to help them identify and implement effective uses for technology in their classroom;
- on-going, easily accessible technical support; and
- a strong funding base, including:
    - sufficient initial funding to introduce technology resources in all schools;
    - on-going, predictable support funding sufficient for maintenance and upgrades; and
    - funding of all three necessary elements of implementation, i.e. every dollar spent on equipment must be matched by a dollar spent on training and a dollar spent on technical support.

With regard to current legislative proposals, the Governor's Digital High School initiative originally promised $50 million annually for the next four years; as a result of favorable news regarding state revenues in the annual "May revise" budget update, the Governor has doubled the amount to $100 million annually. In addition, various pieces of state legislation have been put forward that would generate up to $500 million in education bond money to support a statewide educational technology infrastructure.

These proposals exist in part because of the many pockets of technological innovation and excellence which have already sprung up in schools throughout California. But these largely isolated examples must be regarded as only a promising beginning. If we hope to realize anything approaching the "learning revolution" some observers see as the logical outcome of efforts to integrate educational technology into the classroom, we must move from admiring these scattered outposts of change to adopting a comprehensive approach to technology integration that directly affects teaching and learning in every classroom in the state.

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