Technology Planning for the Communication Age

A Technology Planning Template with Focus Questions

If you don't have a destination, then any route will get you there.

— Anonymous

Introduction to the Template:

This document provides a framework for the creation of a technology plan for educational institutions based on the recent shift from the era of information to that of communications. This template contains background material, focus questions, and some reference documents to help you shape your own technology plan. As this document represents certain pedagogical biases of the author, you should edit the plan to reflect the underlying beliefs of your own organization.

Using the Template:

First, provide copies of this chapter to every member of your planning team and have them develop new questions and possible answers to the questions we've included to guide your thinking. (I've placed a DOCMaker version of this chapter on the CD-ROM for you to give out or print for all members of the planning team.)

You might want to schedule several meetings to brainstorm on the ideas raised in this document, and to add your new ideas to the plan. Above all, don't feel restricted by any of the ideas or questions I've raised. You are in the best position to know what the needs are in your community, so trust the expertise in your own home base!

Once you are ready to draft your own document, you can start with this one as a template. Choose Save Text from the Export option in the File menu to create a text file you can then edit with your own word processor or page layout program. Replace the questions we've raised with their answers, create a budget, and you'll be well on the way to having a technology plan designed to meet the needs of your school or district as we prepare for the next century.

I: Underlying Concepts

Educational technology should be used to serve an instructional paradigm needed to prepare students for life in the 21st century. In the past few years we have experienced some "reversals" that shape some of the trends likely to be important for the remainder of the century. A few of these trends are listed below:

- The downsizing of large corporations and the rise of the sole practitioner or small organization: Fortune 500 companies have downsized 25% in the last 20 years, and over 50% of all new companies have only one employee.

- The death of the Information Age and the emergence of the Communication Age: IBM, anxious to recover from a multi-billion dollar loss, is shifting away from mainframes and into communications technologies. Communication industry mergers and the "information superhighway" are daily newspaper topics.

- High-skill workers continue to see their wages and job opportunities increase, while low-skill workers see their wages and jobs disappear: Re-employment and school-to-work educational programs are being designed to insure that everyone has the lifelong educational opportunities needed to acquire the high level of skills needed to thrive in the coming years.

These changes (and many others) are driving the reinvention of America's schools. The educational system of the past is being redesigned to meet the needs of a world that has changed considerably in the past few decades.

Technology has a large role to play in the reinvention of schools, but the implementation of computers, instructional video, and telecommunication links will be meaningless unless they are designed into a curriculum and are chosen to support pedagogical models designed to insure the maximum learning opportunities for all students. Technology, alone, cannot drive reform. If technology is brought into classrooms without revisiting the curricular and pedagogical issues, it risks being used to implement the educational strategies of the past. We will, in effect, have placed a gas engine in a horse, rather than designed an automobile.

This is an important point, one worth stressing. Curriculum and pedagogy must drive technology use. Technology implemented in the absence of a broader plan almost always leads to disaster. One advantage that comes from placing technology in its proper perspective is that technology purchases will have long-term value in the face of constant price/performance improvements. When technology is purchased to meet specific curricular or pedagogical goals, it will continue to meet these objectives when newer technology comes out. On the other hand, technology purchased just because it is the "latest thing" will lose its value the instant the next new technology hits the streets.

It is impossible to keep up with the latest and greatest technological wonders, even if technology budgets are enormous. It is important to insure that technology is purchased to meet a clearly identified opportunity for learning, not just to bring "high tech" into a facility.

Curricular Reform Focus Questions:

If your state has new educational frameworks, this is the time to review those frameworks and think about the role that technology can play in the implementation of a new curriculum. If you are implementing national guidelines (NCTM, etc.) these should be reviewed as well. Enter your responses to these questions below:

- How can technology help in exposing learners to new concepts and ideas in the curricular areas?

- How can technology help learners acquire up-to-date information on the subjects they are studying?

- How can technology help learners work collaboratively with peers both at their local site and world-wide in their pursuit of a topic?

- How can technology be used to help students create interactive multimedia projects that serve as assessment vehicles for their studies?

Pedagogical Focus Questions:

If you are shifting educational strategies to provide improved learning opportunities for all students, review these in the context of the following questions and enter your responses below: (These questions assume an instructional model that accommodates different learning styles, e.g., Gardner's theory of multiple intelligences.)

- What technologies are most appropriate for the variety of learning styles found in your classrooms?

- What types of presentation tools are needed to insure that the needs of the visual, auditory and kinesthetic learners are met?

- What types of technology tools should be accessible by individual students so they can explore subjects in ways that are natural to them?

II: Access

The walls of the classroom must be open to access through a variety of telecommunication services. Most students' homes have telephones and access to cable television. Most classrooms do not. In the 19th century homes were less likely to have access to information than classrooms. Today it is the classrooms that are challenged.

This plan addresses these issues as follows:

Communication Access Focus Questions:

- What is the current status of CATV (cable television) to each of your classrooms? What plans do you have to expand this service if needed?

- What type of satellite services do you have on your campus? What plans do you have to increase your access to satellite communication? Do you plan to explore the new direct broadcast satellite services (DirecTV by RCA)?

- What is the current status of outside phone lines to each of your classrooms?   What plans do you have to expand this service if needed? Rather than bring phone lines to each classroom, do you plan to add a "telephone server" as part of a local area network (LAN), or do you plan to install a multiline PBX system with access to each classroom?

- What is the current status of your campus-wide local area network (LAN)?   Is it connected to other services (e.g., an Internet host)? Do you have high-speed network connections to each classroom? What plans do you have to add capacity if needed?

- What is the current status of ISDN (Integrated Services Digital Network) lines on your campus? Is your local telephone company offering special ISDN services for educational institutions?   Do these services afford you new educational opportunities that justify bringing these services to your classrooms?

- If you are in California, have you taken advantage of the Education First initiative through which PacBell provides up to four ISDN lines per school site in its service area with no installation charge, and no service fee for the first year? (1-800-901-2210)

- Does your campus have its own Internet host? Do you intend to secure a high-speed connection to the Internet, or to a local university of college (or other organization) where such a service might be provided? While you might have low-speed (14.4 kb/sec) connections to the Internet over analog phone lines from each classroom, is there one dedicated high-speed digital connection available on campus? Is this connection in the school library or other place providing easy access to students and faculty alike?

- What dial-up connections are available for students to use at home when they want to connect to the school network, or to gain access to the Internet?

III: Destinations

Telecommunication pathways and on-ramps are meaningless without interesting destinations. In order to support the needs of all learners and educators, this technology

plan brings all members of our learning community into contact with vast libraries of information, and into contact with their peers wherever in the world they might be.

In the Middle Ages, information was treated as a scarce resource, and the role of teachers was to disseminate and parcel this information out to the community of learners in their midst. The role of educator as content expert has been defined and refined through the years.

But today's reality transforms the role of educator to that of the Latin root: *educare* — to lead or draw out. Rather than function primarily as a source of information, today's educators become co-learners or field guides in the exploration of content. The content itself is accessible through numerous sources. The community library with 110,000 titles pales in comparison to the vast libraries of information that are available to anyone with an account on the Internet or commercial information service.

The reversal in the educator's role from information deliverer to field guide requires extensive staff development (to be addressed later in this plan). It also requires access to informational destinations. Numerous services are available today, and many more are being added daily. The Internet is adding about 230 new hosts per hour, 24-hours a day, 365 days a year.

Communication Service Focus Questions:

- Do you subscribe to *Cable in the Classroom* magazine (1-800-216-2225) to receive monthly download schedules of educational television programming from A&E, BET, Bravo, CNBC, C-SPAN and 19 other television channels? (Note: Your local cable provider should be arranging for a free subscription to this magazine.)

- Do you have access to X•Press X•Change in your classrooms? This service provides numerous real-time wire feeds from newswires all over the planet (AP, Tass, National Weather Service, CNN, etc.) and is often offered free to schools by your local cable provider. X•Press X•Change uses a special modem to connect your television cable to a computer for the newswire feeds. The received information is then saved on your disk. For information on this service call: 1-800-7PC-NEWS.

- Do you have access to one or more commercial services such as America Online, Prodigy, Genie, Compuserve, etc.? Have teachers been made aware of any special discounts for these services that might be available to them? (America Online, for example, provides deep discounts to NEA members.)

- Does your state provide access to the Internet for educators through its own educational network? Many states have special educational networks for use by educators. If your state has this capability, do all educators know how to get their own accounts and use the variety of services provided?

- Does your local PBS affiliate offer accounts on Learning Link to educators? If so, are educators in your school or district connected to this service?

- Does your site have its own high speed Internet node? Have you explored the possibility of securing a dedicated broadband connection to the Internet (probably located in a library or other place of easy general access)?

While online services are invaluable for correspondence (e-mail) and current information, CD-ROM's are likely to be more cost effective distribution vehicles for archival

information for the next few years. For this reason, CD-ROM access is as important as access to online services. This is why every computer purchased under this plan should have a built-in CD-ROM drive.

CD-ROM Software Focus Questions:
- Do you currently subscribe to the *Nautilus* CD-ROM? This monthly publication, available for both the Macintosh and Windows platforms, provides a rich array of materials relating to education, industry news, desktop media, entertainment, software tools, and public-domain software and shareware (1-800-637-3472).

- Have you started a library of NASA image CD-ROM's from the numerous missions to various parts of the solar system? (National Space Science Data Center, Goddard Space Flight Center, Greenbelt, MD 20771. 301-286-6695)

- Do you subscribe to *CD-ROM Professional*, *New Media*, *Morph's Outpost*, and other journals devoted to keeping you updated on new software being published on CD-ROM's?

- Do you have the latest *Library of the Future* CD-ROM containing about a thousand classical works of literature, or do you have other literary compilations available on CD-ROM?

IV. Equipment and Software

This technology plan is based on the idea that curriculum and pedagogy should drive software selection, and that software should drive hardware acquisition. Today the two common platforms for educational computing are the Macintosh and IBM compatible machines. The recent entry of PowerPC-based computers offers, for the first time, true cross-platform compatibility along with the capacity to run new programs with pronounced improvement in speed and performance over versions designed for either of the native (Macintosh or PC) platforms.

There are other computer platforms of interest to educators for special applications. For example, the Amiga may be an excellent choice for traditional video production since it is designed specifically for compatibility with the U. S. television NTSC standard for color displays. The popularity of the Video Toaster software/hardware add-ons for this platform increases its utility in this domain, making the Amiga an excellent choice for either broadcast of videotape production. (At the time of this writing, Commodore is in the process of reorganization, so the Amiga may find a different and more congenial home.)

Higher-end workstation platforms (such as those from Sun and Silicon Graphics) have their place as well, especially in the realm of network hosts, servers and high-resolution color graphics. In the next few years we will see a battle waged in the higher end of the personal computer platform market as companies like Silicon Graphics lower the prices of their offerings while Apple increases the capability of its product line.

These points aside, technology purchases need to be driven by software, and for education (especially in the K-12 world) the bulk of equipment purchases for the classroom will be split between the Apple Macintosh (or PowerPC) platform and the IBM-compatible machines.

This plan recognizes that computer prices are dropping while performance improves, and that any purchase made today will be out of date in three months. It is also the case, however, that every day's delay in securing the hardware and software needed for education steals precious time from the educators and students who will benefit from these tools. Accordingly, technology purchases are made with the anticipation of a useful equipment life of five years or less.

Computer hardware specifications

Every desk-based computer system should have at least the following: (Note that these are minimum specifications.)

- Color monitor with 256 colors at a resolution of 640x480 pixels.

- Built-in hard disk with at least 80 MB capacity (Macintosh) or larger (for Windows) for application and system software storage.

- Built-in CD-ROM drive (triple or quad speed multi-session mechanism designed to meet the CD-ROM XA protocols).

- Built-in local area network support (based on the capabilities of your LAN).

- High speed modem (14.4 kb/sec) if online services are provided through ordinary phone lines.

- Large capacity removable media storage device for multimedia projects. (Computer images and sound files are typically quite large. While these files can be efficiently compressed once the project is completed, they should be left in their uncompressed state during editing. It is common for a work in progress to require a very large amount of disk space during creation, yet end up on a single high-density floppy disk when completed.)

  This external storage system could be a high speed drive based on the Syquest or Bernoulli technologies, or less expensive, but slower, magneto-optical drives such as the 128 Mbyte MO drives currently offered by many vendors. The Sony Minidisc technology will emerge soon, and this should be added to the possible list of choices. Note that the high speed magnetic media (e.g., Syquest) typically cost twice as much per megabyte as the magneto-optical media.

- Sound capture capability of at least 22 kHz at 8-bits with the option of expansion to 44 kHz at 16-bits (CD quality audio) if needed.

- Analog video capture capability allowing images from student-generated video tapes to be captured as either still images or movies. Still image capture should support full-screen 8-bit (256 colors) or higher resolution.

Additional Peripheral Hardware Includes:

- High-resolution color projection system to show computer images on a screen. This can consist of either a video projector or a liquid crystal color display plate used in conjunction with a high-brightness (5,500 lumens or more) overhead projector.

- High resolution color scanner for flat art (600 dpi or more) for digitizing color photographs or other images that might be already available on paper.

- Digital still camera for capturing color still images that can be transferred directly to the computer without needing any extra equipment for image conversion (Apple QuickTake 100, for example.)

- Copystand type document camera for capturing images of small objects.

- Video Camcorder.

- NTSC scan converter to allow computer images to be mixed with video images and/or recorded on videotape (e.g., the TelevEyes device from Digital Vision.)

- Portable keyboard with data storage capability (e.g., the AlphaSmart keyboard for the Macintosh.)

- Sound system for stereo playback of multimedia sounds.

- MIDI music synthesizer.

- Laser videodisc player with computer interface (e.g., Pioneer 2400).

- Do you plan to provide point-to-point video services over ISDN lines?   If so, are you planning to install special video equipment such as that provided by Compression Labs, or use special software/hardware enhancements on desktop computers? (Cornell University's CU-SeeMe software is free and is enclosed on the CD-ROM.)

- What additional requirements do you have?

Software Specifications:
- Integrated "works" software incorporating word processor, spreadsheet, database, graphics, and basic telecommunications software.

- Presentation and multimedia authoring tools (e.g., HyperStudio).

- Image editing software (e.g., Adobe Photoshop – often included with purchase of flat bed scanner.)

- Sound editing software.

- Search software capable of finding any targeted text in a wide variety of file formats. (This is especially important when you have downloaded large amounts of text from the Net.)

- Telecommunications software with a graphical user interface (e.g., Mosaic).

In addition to "shrink-wrapped" commercial titles, there are many excellent programs distributed as freeware (no fees) or shareware (free trial period and inexpensive purchase fee).   These titles can be found in numerous online sources (e.g., America Online, etc.) or distributed on CD-ROM (e.g., Nautilus and Educorp CD-ROM's). While some of these programs are not very polished, some are excellent. This plan allows for the continuous active search for excellent software that meets our curricular and pedagogical objectives. While we recognize that shareware can be downloaded and

tested for free, our software budget reflects the need to pay for any shareware titles that are used.

- What additional software titles or categories do you want to include? Remember that software decisions need to be driven by curricular and pedagogical objectives.

V.   Staff Development

The goal of staff development is to provide opportunities for educators to acquire, refine and update their skills in areas of curriculum and pedagogy in ways that incorporate educational technology as a natural tool.   While some technology-specific staff development is required, in general all technology-based instruction should be viewed in the larger context of the educational vision of the site.

Staff Development Focus Questions:

Professional Library

- Do you have a professional library for staff members with current subscriptions to educational journals, technology magazines, and other periodicals of interest to educators?

- Do you maintain a library of current books on educational practice, future societal trends, strategies for implementing change and other topics of interest to educators?

- Do you support "book reports" or "salons" in which educators spend time discussing books or articles they have read and applying what they have learned to their practice in the classroom?

Online Resources

- Does every educator have free access to online services from home, as well as from the site, that they can use to keep abreast of the latest issues confronting education?

- Does every educator know how to subscribe to the various newsgroups pertaining to education through which they can share ideas and ask questions?

- Has every NEA member taken advantage of the special reduced rates for America Online through which they can gain access to numerous educational resources as well as maintain dialogues with their peers?

- What technology do you have in place to allow educators to take part in statewide educational summits, "town hall" meetings and the like through the use of satellite downlinks?

Conferences

- How many *educational* (curricular and/or pedagogical) conferences per year does each educator attend through the sponsorship of the site?

- How many regional and/or national educational *technology* conferences per year does each educator attend through the sponsorship of the site?

- What budget for educational materials is each educator given to spend on educational materials discovered at the various conferences he/she attends?

Release Time
- How many days a year is each educator released to visit other classrooms at your site, or elsewhere, for the purpose of seeing or sharing exemplary practices with peers?

On-site Workshops
- How many days of staff development in pedagogy, curriculum, and technology is each educator granted each year with site sponsorship?

- How many days of follow-up to site-based staff development are provided for each day of workshop participation?

College and University Courses
- What plans are in place to alert educators to relevant courses offered at local colleges and universities to help them develop and maintain skills?

- What distance learning services are offered at the site (e.g., Tie-In, MEU, etc.)?

VI. Funding
The creation of a budget for your technology plan is essential, even if you don't have a ready source of funding identified. First, your funding section makes the plan real. Without it, the plan is just a brainstorming exercise. Second, if you already know how much you need to fund the plan, you'll be able to take immediate advantage of grant opportunities as they come up!

 Mariner

My recommendation is to create your funding plan in a spreadsheet (for example, using the Mariner shareware software on the CD-ROM) so you can make changes and additions and see the results immediately.

In developing a technology plan, funding has several components: capital expenses, and recurring costs. Given the rapid pace of technological development, it is probably most realistic to view all expenditures as recurring costs with different timelines. Some costs are incurred every year (e.g., telecommunications services, consumables, staff development, software and upgrades) while others may be renewed every five years or so (computers and other "capital" items).

In working out the funding portion of your plan, here are some ideas that might prove useful:

- Budget 30% or more of all technology expenditures for staff development. (Any less and you risk seeing the technology used not at all, or, worse yet, used to replicate an outdated curriculum.)

- Spend year-end money on software instead of hardware. New computers are often introduced during the summer break resulting in the arrival of outdated overpriced equipment in the Fall based on purchase orders cut during the previous school year.

In the event that software is upgraded over the summer, most software vendors will provide free or very low-cost upgrade options in the Fall.

- Budget for ongoing consumable and maintenance expenditures.

- Think about your staffing needs. For example, if you are setting up a local BBS system for your sites, who is going to maintain it? Don't count on volunteer enthusiasm forever. (However, if appropriate, students might take over much of the responsibility as part of a class project.)