Technology Planning in Transition

The goal of Effective Planning for the Technology Literacy Challenge is the establishment of an effective technology program, resulting in a technology-enriched high performance[1] educational environment that effectively supports all students in meeting challenging academic performance standards.

We are entering into a new era of technology in education. Society is moving rapidly into the Information Age and schools must do the same. For the last decade, education has been in an innovative phase where technology has basically been viewed as a "nice-to-have" component of education. In the relatively near future, technology will be considered an essential component of the educational environment to achieve instructional goals and to ensure productive and cost-effective organization operations -- This will be the period of mainstream adoption. But we are not at this stage yet. We are currently going through a transition era. There is a need to shift the technology planning model to a more dynamic, ongoing process to make a successful transition from the innovative phase to mainstream adoption.

The explosive growth of home computer acquisition and use of the Internet and underscores the fact that society is rushing into the Information Age. Business and government agencies made a transition to distributed computing environments in the 80's. K-12 education remains the last major social institution to make a transition to a technology-enriched operational environment. If K-12 educational institutions fail to rapidly embraced this technology they will rapidly become "out of sinc" with society and will be unable to fulfill their critically important mission of preparing students for future success in life and work.

The U.S. Department of Education's new Technology Literacy Challenge Program and the F.C.C. e-rate discounts for educational telecommunications are providing significant impetus for the educational community to shift to a technology-enriched environment. The U.S. National Technology Plan, entitled *Getting America's Students Ready for the 21st Century* is available at URL http://www.ed.doc/TechnologyPlan/NatTechPlan/. This document provides an overview of federal and state activities in technology. Many states have also provided strong leadership and funding for educational technology.

There is not uniformity of agreement that technology has a future in education. Those who argue against educational investments in technology generally raise factors and incidents that they suggest demonstrate the failure of educational institutions to use technology effectively. Frequently, the concerns that are raised, such as computers sitting unused because the teachers were not adequately trained, are issues that must be addressed by more effective planning and implementation. As we enter this transition era, effective planning and implementation processes are absolutely critical. **Accountability will be the key to success!**

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[1] "High performance" is a term that comes from business. It describes an organization where people at all levels are empowered to perform at their highest level of proficiency and where innovation flourishes. These organizations have reduced levels of administration, with decisions made by the people closest to the operations. There is a high degree of both internal and external communication. A high performance organization sets high standards and measures its effectiveness in meeting these standards.

The technology planning model developed in the 1980's served the innovative phase well. Frequently, the impetus for the creation of a technology plan was the opportunity to obtain some special funding for technology, through a capital asset bond or state funds for technology. The technology plan was generally drafted by an intrepid band of district technology enthusiasts. To be honest, the plan generated minimal "buy-in" from the mainstream education community of the district. Additionally, the plan rarely functioned as an operational document. It was essentially a marketing tool which, after serving its purpose of obtaining the special funds, ended up collecting dust on the shelf until the next funding opportunity, several years in the future.

The innovator phase technology plan model had its good points. Frequently, it was effective in raising funds and the equipment those funds acquired was used effectively by the district's technology enthusiasts for a range of innovative educational activities. The successes and failures of the technology enthusiasts provide a rich information resource to guide future planning and implementation. Insisting on too much accountability during the innovative phase would likely have hampered innovation.

But as we move into the transition era it is very important establish a planning model that will ensure accountability and move districts forward to establishing a technology-enriched environment where technology is being used effectively throughout the educational community for instructional and operational activities. This model should include the following:

- **Understanding the Critically Important Role of Technology in School Improvement.** There must be a recognition that technology is not an end it itself, rather, technology is the means -- a tool for better teaching, learning, management, and communication. Technology is not a "nice extra." It is an essential tool for school improvement as we are moving into the Information Age.

- **Technology Planning and Implementation as a Process, not a Product.**

  Districts must shift from a focus on the development of technology plan, to the establishment of an ongoing planning and implementation structure and processes that are effectively integrated into other relevant district planning and implementation structures and processes.

- **Ongoing Assessment of Status, Program Effectiveness, Priorities, and Needs.**

  Districts must ensure accountability through regular assessment of progress towards district goals in technical infrastructure, staff competency, integration into the curriculum, and other related areas. Routine assessment of status, program effectiveness, and needs, will provide the district with information necessary to guide investment and program implementation activities.

- **Ensure Integration of Technology into the Curriculum Across the Disciplines.**

  Technology literacy is more than just knowing how to use a word processing program and instructional use of computer is more than just plugging a kid into a drill and practice program. Integrating technology into the curriculum requires considering how technology can be used by teachers and students as a tool to assist student learning across the curriculum -- English, math, science, social science and other disciplines -- in a standards-based educational environment. Successfully integrating technology into the curriculum will require that technology enthusiast teachers to join forces with district curriculum specialists in planning, action research, implementation, and ongoing evaluation to identify effective strategies for the use of technology to improve student learning.

- **Ensuring that Teachers have First Priority for Access to Computers**

Teachers cannot learn how to use computers by osmosis. Computers are, first and foremost, productivity tools. Teachers need access to a networked computer on their desk to increase their productivity with administrative tasks, to communicate with other teachers, and to gain sufficient familiarity with the technology to be able to use it effectively instructionally.

- **Establish Effective Programs for Training, Support, and Professional Development.**

  There must be a recognition that to achieve necessary instructional goals and to have a fully functional organizational environment, all educators -- administrators, teachers, and staff -- must be competent in the use of technology. Training and support structures must be established to accomplish this. Additionally, teachers need ample ongoing professional development opportunities and sufficient time to effectively integrate technology into the curriculum to assist all students in achieving high academic standards. Administrators need to gain a better understanding of the use of technology for effective organizational operations.

- **Understanding the True and Full Costs Implementation and Operation of the District's Network Infrastructure[2].**
  Too often, during the innovative phase, districts have set forth bold and ambitious goals, without ascertaining or providing information about the true and full costs of achieving those goals. The district's technology budget must that reflect all of the associated costs of technology. Without funds for training, professional development, support, network operations, equipment upgrade, repair, and maintenance services, and timely equipment replacement, taxpayer resources are being wasted on the acquisition of very heavy paperweights.

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[2] Edupage, 24 June 1997 BUY IT AND THEY WILL LEARN More than 2,800 pieces of classroom computers, printers or terminals are broken or neglected in Fairfax County (VA) public schools. A school official says: "The focus of attention was on buying the equipment, and the support of that equipment was not taken into account. It was assumed the current support systems would be able to handle things and that has not proven to be the case." The school board's budget panel chief says the board's decision not to hire additional technicians for this fiscal year was influenced by its budget policy to hire administrators only when absolutely necessary. (Washington Times 24 Jun 97)

Technology and School Improvement

School Improvement Planning

Under the Improve America's Schools Act, states and districts are required to develop comprehensive educational improvement plans that are focused on assisting all students in achieving challenging academic performance standards. Districts may opt to include a technology plan that meets the criteria of the Technology Literacy Challenge program as a component of their comprehensive educational improvement plan. Other districts may develop a technology plan as a separate document. In either case, the focus of attention in technology planning must be on how technology will assist the district in achieving its goals in school improvement.

How Technology Contributes to School Improvement

There are four major ways in which technology will contribute to school improvement. These are:

Enhancing Student Learning

Technology enhances student learning and will assist all students in achieving the academic performance standards.   When combined with appropriate teaching methods, it has been found that technology increases academic achievement. Positive effects of technology have been found in all major subject areas, from preschool to higher education and for both regular and special needs students. Educational technology has also been found to have positive effects on student attitudes toward learning and on student self concepts. Introducing technology into the learning environment has been shown to make learning more student-centered, to encourage cooperative learning, and to stimulate increased student-teacher interaction. Technology facilitates a shift from a focus on memorization to complex interdisciplinary problem-solving, necessary understandings for students to meet challenging academic performance standards. Through the use of technology, learning opportunities become unrestricted by time or place, thus facilitating lifelong learning. Student use of technology for communication can also enhance access to career and continuing education opportunities.

Facilitating Access to Professional Development

Technology and telecommunication systems provide enhanced access to professional development opportunities for educators. Technology systems facilitate access to instructional resources and information, participation in online classes and workshops, and communication with education colleagues from throughout the world. Access to professional development opportunities is not limited by the traditional restrictions of time and place.

Enhancing District Productivity and Decision-making

Current practices and business trends demonstrate that technology and telecommunication systems can increase productivity and efficiency and can foster shifts in organizational structure that lead to

accountability and effectiveness[3]. Technology and telecommunication systems can increase productivity and efficiency in routine information management and administrative functions. Effective use of technology can enhance accountability by facilitating the gathering, analysis, and reporting of assessment data to improve decision-making.

Increasing Communication to Improve Education

Technology enhances information sharing and communication within the district and between the education community and other education stakeholders, including parents, businesses, and the community. Greater communication tends to reduce hierarchical structures and empower all participants.

Strategies to Enhance Use of Technology for School Improvement

A plan of action to address how technology will enhance school improvement could include:

• The development of a planning and implementation structure and process to foster the integration of technology into curriculum and instruction across the disciplines. Reaching instructional goals will require close coordination between the district's technology coordinators and curriculum coordinators. (See *Planning and Implementation* and *Integrating Technology into the Curriculum*)

• A strategy to address administrative and organizational operations, Individuals who are involved in district operations and school restructuring should be responsible for developing, implementing, evaluating, and disseminating strategies to use technology to address district administrative and operational activities. These strategies will include the use of technology by teachers and administrators for efficient and effective record-keeping. The strategies will also include the use of technologies to gather, analyze, and report assessment data to track the effectiveness of school improvement efforts.

• A strategy to facilitate the use of the district's network system to enhance access to professional development. This strategy will include the establishment of a district web site with links to instructional resources, distance learning opportunities, and information on educationally-oriented discussion groups (See *Staff Competencies* and *Communication Strategies*).

• A strategy to enhance the use of the network for internal and external communication and coordination. This strategy will involve the use of network communications (e-mail, e-mail mailing lists, conferencing systems) and the district's web site. Ultimately, the network system will become a major vehicle for coordinating district operations. The individuals involved with technology planning and implementation will likely be the initial group within the district to make use of network technologies for communication and coordination. These individuals will be developing models for the use of the network that can be adapted to other areas of operations.

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[3] The use of network communications will ultimately have a significant impact on the educational environment. Research in the field of business, has examined the cultural implications of the introduction of a new mechanism for communication into a organization. In *Connections: New Ways of Working in the Networked Organization*, (Sproull and Keisler, 1993, MIT Press), which addresses the introduction of network technologies in business, the authors state: "Communication can't be separated from who is in charge of the giving, receiving, content, and use of what is communicated. Information control is tied to other forms of power and influence. When we change information control using technology, we also change the conditions for other control relationships in the organization." These findings have far-reaching implications, especially for the education community which has traditionally functioned in a strongly hierarchical structure.

Planning and Implementation

Technology Plan

During the innovative phase, the primary goal of technology planning was the creation of a technology plan, a visionary document that would lead to funding to acquire equipment. During the transition era, the primary goal is the establishment of an effective ongoing planning and implementation structure and process. The transition era technology plan sets forth the goals and objectives and the framework for accomplishing these goals and objectives. The plan should be a succinct document that can provide non-technologically-literate district decision-makers with the information necessary for them to gain an understanding of what the district's direction is, why, who is responsible, how progress will be assessed, and what the costs will be.

The basic components of a technology plan are:

• The district's goals for the use of technology and how these goals relate to school improvement.
• The planning and implementation structure and processes.
• The overall plan of action.
• Identification of funding options.
• Report on current status
• Short-range and long range action items, together with the projected costs for the action items. On an annual basis, the district will need to revisit the list of short-range and long-range action items to determine priorities for the next budget cycle.

One way to look at a technology plan is to consider the distinction between statutes and administrative regulations. The technology plan, similar to a statute, is a policy document. Operational committees and/or administrators are then responsible for developing additional implementation procedures or regulations as required or deemed necessary to accomplish the action item. The plan, once approved, will remain relatively stable for several years. The procedures or regulations will change as necessary to meet changing circumstances.

The Technology Planning and Implementation Cycle

The technology planning and implementation process must be a annual ongoing process that includes annual assessment. There are actually two activities that are in operation simultaneously: planning and implementation. The following chart demonstrates the Technology Planning and Implementation Cycle:
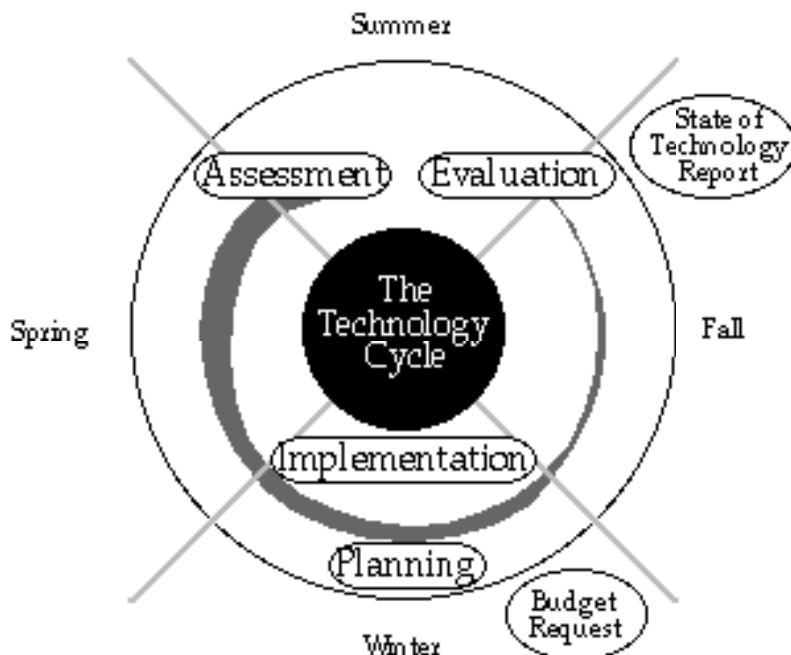
Planning activities must be coordinated with the district's annual budget cycle. To be successfully integrated into the educational environment, technology funds must become a standard component of the district's annual budget. To accomplish this, a budget request for technology must be prepared to be integrated into the district's budget cycle. In most districts, the budgeting process begins in January. Therefore, a budget request for technology should be prepared by this time.

Working backwards from this budget request, fall is the period of time in which the district's priorities for technology for the coming year are finalized and translated into program costs. To effectively establish priorities requires knowledge about the current status of the district's technology infrastructure and programs. This current status is obtained through an assessment process. Assessment data is aggregated and analyzed either in spring or early fall. In addition to information on the current status, the assessment should include an identification of needs and recommended priorities. By early fall, the district technology committee should have a report on the current status, needs, and recommended priorities which will provide the information necessary to identify priorities and costs.

Implementation activities are initiated in the spring, when the district's budget for the next academic year is finalized. The assessment, which informed planning also provides guidance for program implementation. The district staff responsible for the implementation of programs that are included in the district's current budget based on last year's priorities will be able to fine-tune the programs based on the more recent status, needs, and priorities report.

The Technology Planning and Implementation Cycle must function at the school and department level, as well as the district level. Assessment data from teachers and other school staff can be analyzed at the school level to inform school decision-making. The data can also be analyzed by the departments or staff with responsibilities for various technology-related programs. For example, the technology coordinator will focus on data related to infrastructure and services and the curriculum coordinator will focus on data related to curriculum and professional development.

Technology Committee Structure

The following are some guidelines for establishing a technology planning structure[4]. This structure envisions district level committees, school level committees, and special issue-oriented committees.

District Level

District Administration
Many districts have a high-level administrative coordinating committee that includes building administrators and department heads. The district technology coordinator should be a member of this committee because many of the issues before the committee will impact or be impacted by technology. The district administrative coordinating committee would address the integration of technology-related activities into the overall school improvement planning process.

District Technology Committee
    Membership
        District technology coordinator
        District administrator responsible for curriculum and instruction issues
        District administrator responsible for library and media services
        District administrator responsible for special education
        District administrator responsible for school-to-work programs
        District administrator responsible for business operations
        School technology coordinators (or representative group of school technology
            coordinators)

    Responsibilities
        Develop and update Technology Plan
        Coordinate assessment process
        Develop assessment report
        Identify priorities and needs
        Develop technology budget request
        Coordinate and review technology-related programs

District Technology Advisory Committee
    Membership (See *Community Involvement*)
        School Board member
        Site council parents
        Public library representative
        Business and community representatives
        Community college or higher education representative

    Responsibilities
        Review assessment report, provide feedback and input (fall meeting)
        Review proposed technology budget request, provide feedback and input (winter meeting)
        Identify potential collaborative technology-related activities[5]

School Level

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[4] The following technology committee infrastructure is designed for a district of moderate size and will need to be adapted to fit the current operating structure and personnel of the individual district.

[5] The advisory committee members may also participate in ad hoc or ongoing special issue committee to coordinate collaborative technology-related activities.

School Technology Committee
    Membership
        School Technology Coordinator
        Library/media specialist
        Selected teachers

    Responsibilities
        Develop and update school technology plan
        Develop and update building network infrastructure design
        Coordinate school assessment process
        Identify school priorities and needs
        Coordinate implementation of school technology-related programs

School Site Council
    The school site council periodically reviews work of the School Technology Committee and incorporates technology committee plan into school improvement plan.

Special Issues

Other district committees will have responsibilities that relate to the District's technology efforts. These include:

- Curriculum Committees -- with responsibility for technology integration into the curriculum and professional development.

- District Administrative Team -- with responsibility for developing strategies to use the District's technology infrastructure for administrative and operational purposes.

- Special Education Committee -- with responsibility for determining how to use technology to serve the needs of special education students.

- Library/Media Specialists -- with responsibility for coordinating library cataloging and other library/media center uses of technology.

- School-to-Work Participants -- with responsibility for coordinating use of technology to enhance school-to-work programs and activities.

Additional district-wide technology issues may be addressed by the district technology committee, permanent or ad hoc special issues technology committees, or coordination with other district committees.   These issues may include:

- Equity issues.
- Lifelong learning programs.
- District web site coordination.
- Internet use policy and procedures.

Performance Assessment

What gets measured, gets done.

The most important component of a quality technology plan is the establishment of a process by which the education institution will regularly gather and analyze data to guide planning and decision-making related to the integration of technology into education.

Performance measurement or assessment has increasingly become a requirement of government agencies and nonprofit organizations to demonstrate that programs are successfully achieving their goals[6]. Performance assessment shifts the attention from what was "done" to what was "accomplished." Performance assessment will shift the attention from how many computers are in the schools, to how those computers are being used to improve student performance and school operations.

In the traditional educational environment, assessment was closely tied to a judgment of success or failure, with gradations in between (i.e. A, B, C, D, F). In a standards-based instructional environment, performance assessment a tool to assist the student and teacher determine where the student is in relationship to the performance objective and the effectiveness of certain teaching and learning strategies. Ongoing performance assessment, of the latter sort, is a critical component of technology planning and implementation. Performance assessment is used for the purposes of determining progress towards goals and evaluating the effectiveness of programs, not a judgment of success or failure.

This standard performance assessment model identifies inputs, activities, outputs, and outcomes, including intermediate and end outcomes[7]:

<u>Inputs</u> are the resources, including funds, time, and people, that are allocated to the technology-related activities.

<u>Activities</u> are the specific program activities or tasks that are undertaken. The installation of a computer network, acquisition of equipment, workshops, planning for the integration of technology into the curriculum, and the like are all activities.

<u>Outputs</u> are measurements of the direct products of the program activities. Outputs are usually measured in terms of volume or work completed. Outputs include the number of staff members who participated in staff training opportunities, the status of the technology infrastructure, the development of curriculum goals related to technology literacy, and the like.

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[6] Newcomer, K.E. "Using performance measurement to improve programs. "In Newcomer, K.E. (ed.). *Using performance measurement to improve public and nonprofit programs*. San Francisco: Jossey-Bass, 1997.
[7] Wholey, J.S., Hatry, H.P., and Newcomer, K.E. (eds.) Handbook of Practical Program Evaluation. San Francisco: Jossey-Bass, 1994.

Outcomes are the consequences of what the program did that had an impact on the intended recipients. Generally outcomes are differentiated as intermediate and end outcomes. Intermediate outcomes are expected to lead to the ends desired, but are not themselves ends. End outcomes are the final desired results of the program's work.

Intermediate outcomes are identified through experience, research, or logical analysis as being necessary prerequisites to achieve the end outcomes. Intermediate outcomes focus on what educators do related to technology that is expected to lead to improved student achievement and school performance. For example, staff competencies in the use of technology, the amount and manner of use of technology for instructional and administrative activities, adequacy/robustness of the district's technology infrastructure and technology support are all intermediate outcomes that have been identified as factors that can reasonably be predicted to lead improvements in student achievement and school performance. Intermediate outcomes can also address issues related to the quality of the service delivery. For example, participant evaluation of professional development activities will provide information about the quality of these activities.

Measurement of end outcomes related to the implementation of technology into schools is very difficult outside of a traditional research environment. The two key end outcomes that are anticipated from the integration of technology in our schools are improvements in student achievement and school performance. It is difficult to identify measurable advancements in these end outcomes that can be directly attributable to investments made in technology. This is because there are simply too many variables to consider to effectively ascertain any kind of "causal" relationship between student achievement or school performance and technology. In the future, as we expand our understanding of the use of technology in education and expand the use of technology as a tool to conduct performance measurement, we should be able to do a better job of measuring end outcomes.

The standard performance assessment model yields information about "what" has occurred. It generally does not address questions of "how" or "why" certain results occurred[8]. Given the current stage of the integration of technology into our schools, it is important to consider the "how" and "why" questions. "How" and "why" questions are within the realm of a more traditional program evaluation approach, which is very compatible with the performance assessment model. An in-depth evaluation of performance measurements should help answer important questions about the kinds of investments of resources, personnel, and time and the kinds of activities that are necessary to accomplish the successful integration of technology into education.

As the district's network system becomes operational, the network itself will greatly facilitate gathering data to support the performance assessment, for example, the use of web-based forms for gathering survey data. Assessment strategies involving the use of network technologies can be expected to mature over the next decade.

The most important step in a performance assessment model is the use of the data to inform future decision-making. Measurement of performance is not for the purposes of sitting in judgment, rather for the purpose of providing effective information that will lead to future success.

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[8] Newcomer, K.E. "Using performance measurement to improve programs. "In Newcomer, K.E. (ed.). *Using performance measurement to improve public and nonprofit programs*. San Francisco: Jossey-Bass, 1997.

Integrating Technology into the Curriculum

Planning for Technology Integration

The most important aspect of technology planning is addressing how technology will be integrated into the curriculum to assist all students in achieving challenging academic performance standards[9].

There are two big dangers to watch out for in this area:

- The perception of technology-related curriculum as technology literacy or learning how to use a computer and basic software systems such as word processing. Issues to be determined in curriculum integration are how technology will be fully integrated into the curriculum to assist students in achieving the English, math, social science, science, and other discipline area academic performance standards.
- Segregation of planning between a district technology committee and the committee or committees that are coordinating curriculum and instruction issues. Such segregation is typical in many districts today. The curriculum committees should be charged with the obligation of determining how technology will be integrated in all relevant subject areas. For this to work successfully, technology enthusiastic teachers should be members of the curriculum committees and liaison relationship established between the curriculum committees and the technology committee. If the district's curriculum coordinators and teachers that are active in curriculum planning do not have a deep understanding of how technology can be used in various subject areas, this is an important place to focus the district's professional development resources.

Successfully integrating technology into the curriculum will require active involvement of technology enthusiastic teachers within the context of an ongoing action research approach -- establishing objectives in the context of standards-based performance standards, implementing and evaluating instructional strategies, and disseminating successful strategies throughout district and beyond. The teachers who have access to classroom and computer lab equipment should be expected to be actively involved in this process. Collaborative development with a team of teachers is preferable to isolated development.

In developing strategies for the use of technology, the curriculum teams will address the use of technology as an alternative learning environment for students who are not achieving success in the classroom. The curriculum committees will also address equity issues, including gender, multicultural, and special needs equity. (See *Equity*)

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[9] PL 103-382, Sec 3135, 20 USC 6845 (1) (B) an explanation of how the technologies will be integrated into the curriculum, to help the local education agency enhance teaching, training, and student achievement;
(3) describe how the acquired instructionally based technologies will help the local educational agency -- (A) promote equity in education in order to support State content standards and State performance standards that may be developed; and (B) provide access for teachers, parents and students to the best teaching practices and curriculum resources through technology; and
(4) describe a process for the ongoing evaluation of how technologies acquired under this section -- (A) will be integrated into the school curriculum; and (B) will affect student achievement and progress toward meeting the National Education Goals and any challenging state content standards and State student performance standards that may be developed.

Instructional Uses of Technology

Technology is used instructionally in a variety of ways, including:

Computer-assisted Learning

To assist students in gaining basic skills and to enhance understanding and skills in specific subject areas.

- Technology resources: Tutorial, simulation, guided learning, exploration, educational game, drill and practice, and creative activity software.

- Key to Effective Use: The selection of high quality software that addresses student learning needs.

- Technology Configuration: Full computer lab or mini-lab.

Technology Literacy

To assist students in learning basic computer operations, the use of basic computer tools, and the use of technologies that are related to specific vocational educational activities.

- Technology Resources: Word processing, spreadsheet, database, desktop publishing, presentations, multimedia, graphics, graphing, computer-aided-design/computer-aided-manufacturing (CAD/CAM), hypermedia, e-mail, groupware, web research, web authoring.

- Key to Effective Use: Identifying technology skills that are essential for all students to be successful in technology-integrated learning activities and those technology skills that are specifically related to vocational programs. Use of a basic technology literacy training model -- instruction and practice -- to assist students in gaining these skills.
- Technology Configuration: Full technology lab.

Teacher Presentations

To enhance the quality of teacher presentations and materials incorporating multimedia or web-based resources.

- Technology resources: Desktop publishing, presentation systems, video disks, web pages.

- Key to Effective Use: High quality (good subject matter and instructional approach) and engaging (effective presentation) material.

- Technology Configuration: Classroom computer and presentation system.

Technology-integrated learning

To assist students in achieving a wide range of disciplinary and interdisciplinary curriculum goals using technology as a tool for obtaining, analyzing, and presenting information.

- Technology resources: All resources listed under technology literacy and specialized tools in specific discipline areas (e.g. sensing tools for scientific research).

- Obtaining - posing the question and researching, gathering, and/or generating information or data.

- Analyzing -- evaluating, problem solving, aggregating , manipulating, and/or analyzing information or data, testing hypothesis, making decisions based on information or data.

- Presenting -- presenting information or data to others in a wide range of forms.

- Key to Effective Use: Deep understanding of the role that technology plays as a tool to assist people in more effectively and efficiently performing a wide range of activities.

- Technology Configuration: Depending on subject matter and instructional activities will require full computer lab or mini-lab access.

Assistive Technologies

Computer-based assistive technologies to address individualized needs of special needs students (See *Special Education*).

- Technology resources: A wide range of assistive technology and software programs meet individualized needs.

Performance Assessment

Facilitating authentic performance assessment and personal educational plans to monitor student performance.

- Technology resources: Enhanced database systems for storage of student work samples demonstrating accomplishment of performance standards.

Staff Competencies

"Just as workers in virtually all industries find computers to be essential, a teacher (or administrator), who is in the communication business already, cannot truly claim competence if he or she does not understand how to use the new technology as a curriculum design, delivery, and assessment instrument and as a means to communicate with students, colleagues, and parents[10]."

Assessment of Staff Competencies

It is important for the district to have a clear idea about the level of staff competency in the use of technology to adequately plan for and evaluate the effectiveness of training and professional development activities[11]. This calls for some manner of ongoing assessment of staff competency. To effectively guide decision-making, such assessment should also address the current manner and extent of use of technology for instructional and organizational activities.

Assessment of staff competency in the use of technology could become a political issue unless handled with care. As discussed in *Performance Assessment*, assessment is for the purposes of planning and evaluating the effectiveness of staff development programs, not evaluating staff. Admittedly, the use of a staff technology competency assessment tool may also be an effective way to communicate to staff the importance of expanding their level of competency in the use of technology.

Training and Professional Development

When developing strategies to address staff competency it is helpful to distinguish between training and professional development. Training relates to basic computer and network literacy skills and the use of administrative software (sort of like Driver's Ed 101). Professional development relates to the instructional uses of technology in the classroom or for high performance organizational purposes (Planning a trip, once you know how to drive).

Training

All school staff, teachers, administrators, and classified staff, will need to gain basic computer literacy and network skills. Such skills are necessary to foster the operations of a high performance

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[10] M. Milone, 1996. *Beyond bells and whistles: How to use technology to improve student learning*. American Association of School Administrators.

[11] PL 103-382, Sec 3135, 20 USC 6845 (D)(i) a description of how the local educational agency will ensure ongoing, sustained professional development for teachers administrators, and school library media personnel served by the local educational agency to further the use of technology in the classroom or library media center, and (ii) a list of the source or sources of ongoing training and technical assistance available to schools, teachers and administrators served by the local educational agency, such as State technology offices, intermediate educational support units, regional educational laboratories or institutions of higher education.

organization. As district staff gain these skills, the manner in which information is shared throughout the district will shift to the electronic medium. Anyone without technology skills will be left out. In a high performance organization it is unacceptable for members of the organization to be left out.

Beyond basic computer and network literacy, the kinds and level of computer skills required will vary by position. All staff will require expertise in basic computer literacy, and e-mail. Teachers and administrators will need expertise in web research, basic word processing, and the use the student records system. Administrators will need additional training in district productivity/ operational tools. Classified staff require training in the use of systems necessary to perform their job functions. The additional kinds of computer literacy skills required by teachers will relate more directly to their grade level and subject area -- English teachers will need advanced word processing expertise; mathematics teachers will require expertise in spreadsheets.

Professional Development

Professional development focuses on the integration of technology-related activities into curriculum and organizational operations. Teachers and administrators directly involved with curriculum activities will require professional development in the use of technologies for instruction. Professional development must be closely linked with curriculum and instruction directed at assisting students achieve new performance standards.

Administrators, teachers, board members, and site council members also need professional development in areas related to the effective use of technology for school operations. This includes the use of technology for performance assessment, to enhance internal and external communication, and to facilitate effective decision-making.

Why Distinguish?

The reason it is helpful to distinguish these activities relates primarily to the method of delivery. Training is best accomplished through direct instruction, in person or through the use of video, audio, and computer systems, and just-in-time follow-up support. The best results are achieved if the skills are broken into segments, with no more than two hours per training session, followed by an opportunity to practice and to come back to the trainer with questions. It is critically important to recognize that training staff who do not have immediate access to a similar machine, software, and level of connectivity for in-depth practice is a waste of time and resources.

Professional development is best provided through collaborative learning opportunities. Ample time must be provided on a continuous basis to assimilate, accommodate, implement, and evaluate new instructional and operational approaches. Providing resources and professional development opportunities and the time for the key educators in the district gain new skills and understanding and then become mentors for other teachers or administrators is an effective technique for professional development.

> "Professional development can no longer be viewed as an event that occurs on a particular day of the school year; rather, it must become part of the daily work life of educators. Teachers, administrators, and other school system employees need time to work in study groups, conduct action research, participate in seminars, coach one another, plan lessons together, and meet for other purposes[12]."

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[12] C.J. Cook & C. Fine. "Critical Issue: Finding Time for Professional Development" (1997) North Central Regional Educational Laboratory. (URL: www.ncrel.org/sdrs/ areas/issues/educatrs/profdevl/pd300.htm)

Many districts rely on one-shot workshops and conferences for professional development. Unfortunately, the impact of such activities in minimal unless there is effective follow-through. Follow-through strategies include teacher reports about insight gained through the experience and teacher mentoring of other teachers who did not attend the workshop or conference. It has also been found that the use of online mailing lists as a follow-up to workshops or conferences substantially increases the impact in the classroom.

Technology and Professional Development: A Two-fold Relationship

The relationship between technology and professional development is two-fold: Educators need professional development to gain skills and understanding in the use of technology for instructional and operational purposes. Technology facilitates and expands access to resources and professional development opportunities, which may or may not be related to the use of technology. The following activities can support professional development in the use of technology as well as a wide range of other professional development activities:

- Providing online access to just-in-time curriculum and instruction resource materials through the district web site.

- Facilitating electronic communication between educators through the establishment of district discussion groups (mailing lists and computer conferences) and by providing information about regional, state, and national discussion groups. Educators should be encouraged to forward high quality posts from external discussion groups to internal discussion groups.

- Facilitating participation in online or video broadcast classes and workshops.

Technology Coordinators

The key group of district educators that will require specialized training and professional development services are the school-based technology coordinators. These individuals are critically-important for the success of the district's technology plan. They are generally required to perform a wide range of activities including first-line network operations services, training and support, planning and budgeting, web site establishment and maintenance, and providing guidance in integrating technology into the curriculum. Focusing strong attention on the needs of these individuals will yield significant benefits. This group also should have their own internal mailing list where they can discuss issues that arise at their school and provide mutual support.

Technology Infrastructure

Technology Inventory

The guidelines for the F.C.C. e-rate discounts include a requirement for districts to conduct a technology inventory[13]. As discussed in the section below on Technology Obsolescence, it will be very helpful to provide adequate information to district decision-makers and the community about the status of the district's equipment that delineates between current/recent models (>3 years) and older models (<3 years). The inventory should also information about the status of the district's technology infrastructure in relation to its enunciated goals (we have X number of computers, we need Y number of computers to reach our goals. (See *Equity*)

Technology Infrastructure Goals

The district technology plan should include a description of the district's overall technical infrastructure design and goals[14]. The federal criteria related to technology uses the term "types of technologies." For the purposes of a district technology plan, this should not be translated to mean an equipment acquisition list which would be outdated very rapidly.

Common educational technology infrastructure goals to achieve a technology-rich school environment are[15]:

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[13]F.C.C. 97-157 (572) First, we will require applications to include a technology inventory/assessment. We expect that, before placing an order for telecommunications or information services, the person authorized to make the purchase for a school or library would need to review what telecommunications-related facilities the school or library already has or plans to acquire. In this regard, applicants must at a minimum provide the following information, to the extent applicable to the services requested:
(1) the computer equipment available or budgeted for purchase for the current, next, or other future academic years, as well as whether the computers have modems and, if so, what speed modems;
(2) the internal connections, if any, that the school or library already has in place or has budgeted to install in the current, next, or future academic years, or any specific plans related to voluntary installations of internal connections;
(3) the computer software necessary to communicate with other computers over an internal network and over public telecommunications network currently available or budgeted for purchase for the current, next, or future academic years;
(4) the experience of and training received by the relevant staff in the use of equipment to be connected to the telecommunications network and training programs for which funds are committed for the current, next, or future academic years;
(5) existing or budgeted maintenance contracts to maintain computers;
(6) the capacity of the school's or library's electrical system to handle simultaneous uses.
[14] PL 103-382, Sec 3135, 20 USC 6845 (1)(A) a description of the type of technologies to be acquired, including specific provisions for interoperability among components of such technologies and, to the extent practicable, with existing technologies.
[15] These infrastructure goals identified in the U.S. National Technology Plan at URL: http://www.ed.gov/Technology/Plan/NatTechPlan/.

- District wide area network providing high speed digital connections to every school and to the Internet.

- Local area networks in every school with connections to every classroom sufficient to support the curriculum-based uses of technology in that classroom (e.g. teacher computer, mini-lab, etc.).

- One multimedia teacher workstation, with classroom printer, per teacher and a reasonable number of LCD displays necessary to support instructional presentations.

- One multimedia student workstation for every four or five students.

- A library/media center mini-lab with sufficient computers and research resources (CD-ROM tower, scanner, etc.) to support the student population in the school building.

- Sufficient workstations to support administrative and support services activities.

Can a district achieve these goals in a 5 year period of time? Obviously, not without sufficient funding. The technology infrastructure goals of a technology plan should set forth what is needed and information on projected costs. The implementation strategy will need to be adjusted based on what funding is actually provided.

A district's top priority must be establishing their network infrastructure and providing all teachers with their own workstation with access to this infrastructure. Teachers will not learn to use technology if they do not have a computer readily available on their desk. Providing access for teachers opens the door to a wealth of information and professional development opportunities not only related to technology but across the curriculum. Teacher access to technology also facilitates organizational operations and district communications.

Where the student workstations will be placed within the school building should be determined by curriculum needs. Decisions are best made at the school site and within curriculum departments, with district level guidance and coordination. Don't decide that all of the district's classrooms should be outfitted with mini-labs simply because it sounds like a good idea[16]. The district's teachers will need to decide how they will be using technology to assist students in meeting performance standards and design the classroom and school infrastructure to support such activities. As teachers change their instructional activities, the infrastructure needs will also change.

Schools will also require a sufficient number of student labs with 30+ computers to support school population and meet curriculum needs.   The types of technologies to be included in the labs will be determined by the curriculum needs (e.g. labs for English classes require different technologies than those for science classes). Establishing mini-labs in the school library for student research projects should have a high priority.

The network design for the district WAN and school LANs should be accomplished by a trained network engineer. Some times, districts want to pinch pennies in this regard and assign this responsibility to a technology literate teacher or community member. Bad idea! Whatever the district may save initially, they will likely pay for later. Even if the district is only able to establish the network in a portion of the building, it is helpful to obtain a design for the entire building. This will ensure that the initial components will be compatible with the desired end product. The network design will also address building improvements that will be necessary to install the LANs

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[16] Mini-labs can be a difficult environment to use productively unless your teachers are comfortable in working with a "learning centers" approach.

in the schools, including electricity, heating and cooling, lighting, sound, and general facilities. In many older school buildings, installing a network will require dealing with asbestos.

Districts are being encouraged to participate in Net Day activities where community members come into the school to do wiring. Having a network design by a network engineer prior to such an activity is the only way to ensure the effective use of community involvement.

It is important that the district technology plan convey the understanding of the need for constant upgrading of the district's technology infrastructure. Too often, technology plans convey the idea that a set amount of funds will be required to achieve the technology infrastructure goals and this is all the funds that will be necessary. To provide assistance to district decision-makers in understanding the ongoing investment that will be necessary, it may be helpful to translate the district's infrastructure goals into general financial terms. Here is a formula that may be helpful in this regard:

# of teachers and administrators. ____+
# of support staff who require computers. ____+
1/5 of the total number of students.____+
Equals the total number of computers required to achieve infrastructure goals. (A) ____=

Divide A by 5 A/5
Equals the number of computers that should be acquired **every year** if the district intends to achieve its infrastructure goals in 5 years. This also equals the number of computers that should be acquired every year thereafter if the district maintains a 5-year replacement schedule. (B) ____=

Multiply B by $5,000 BX5,000
$5,000 is the cost of a computer, related peripherals, software, repair and maintenance for a 5 year period[17].
Equals the annual amount the district will need to budget every year to achieve and maintain the desired infrastructure goals. ____=

Note: This formula does not include the initial costs of network installation or the ongoing costs for connectivity, support, training, and professional development.

Technology Infrastructure Priorities

Since technology will be phased into districts in the coming years, it is important for the district to establish priorities for the placement and use of the equipment as it is acquired. The following is a recommended list of priorities for districts:

- First stage priorities:
  - District wide area network with Internet connection.
  - School local area networks.
  - A workstation for every teacher and administrator.
  - Library/media center mini-labs.
  - Selected classroom mini-labs and school computer labs closely tied with technology-integrated curriculum development efforts. Some of these prototype implementations will include cutting-edge voice and video technologies.

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[17] Businesses generally budget $12,000 to $15,000 per computer, but the costs of training and support are included in this amount.

- Second stage priorities:
  - Expansion of classroom mini-labs and school computer labs to achieve student workstation technology infrastructure goals in accord with curriculum integration efforts.
  - Ongoing upgrade of existing technology.
- Third stage priorities
  - Ongoing upgrade of existing technology.
  - Shift to next level of instructional technology -- the technologies that were considered cutting-edge in the first stage.

Technology Standards and Acquisition

The Federal criteria addressing compatible technologies refers to a requirement that districts commit to acquiring "open systems technology" as compared to closed "proprietary technology systems". Open systems technology is based on standards that have been publicly described and documented. Software or hardware based on these standards will work compatibly with each other. Proprietary systems do not allow this kind of flexibility and are to be avoided. Both Apple Macintosh and Windows-based systems are open systems technologies.

Districts should establish a process for the acquisition of technology based on district adopted current technical standards for equipment and software. The district standards will ensure that newly-acquired equipment or software will be compatible with each other and, to the extent possible, with the existing infrastructure. Bulk purchasing can lead to reduced expenditures for equipment. The standards and acquisition process will also ensure the wise expenditure of staff resources for implementation, support, repair, and maintenance.

Technical Support Services

District technology services include:

Network Support Services

Network support services, sometimes called Network Operations Center (NOC) services, include those activities that are necessary to maintain the effective functioning of the district network. Every network needs a network administrator, but not every district will retain staff to perform this function. The technical infrastructure of smaller districts will not be substantial enough to warrant retaining staff. These districts may contract with the regional education service organization, a nearby larger district, or a private firm for such services. It is important to retain or contract with an individual or entity that has a sufficiently high level of expertise to administer the network. If the network is unreliable, staff will avoid depending on it.

Network Information Support Services

Network information support services , sometimes called Network Information Center (NIC) services, are the technical assistance services provided to educators who are having some kind of problem with their computer, software, network connection, etc. Just-in-time support addressing technical concerns is a critical factor in influencing the acceptance of technology. Users, especially new users, need to know that someone will be there to hold their "virtual" hand when they have problems. If such support is not provided, the inclination will be to avoid the computer.

Equipment Upgrade, Repair, and Maintenance Services

The district will need to develop a strategy to manage the upgrade, repair, and maintenance of computers, including how costs will be managed (a district budget item or a school budget item)

The upgrade, repair, and maintenance services should be managed in accord with the district policy on obsolescence.

Distributed Support Services Structure

An efficient organizational structure for the provision of network operations and network information support services in a district is through the establishment of a distributed support structure where the school technology coordinators provide first-line services. If they are unavailable or are unable to solve the problem, then the problem can be raised to the district level of services. Many districts also establish a telephone help desk to field basic technical support questions.

Students, if provided with appropriate training and supervision, can also be utilized in the provision of network operations and support, and equipment repair/ maintenance services. A School-to-Work program where students could receive basic training and education in network operations and support and repair/maintenance activities and have the opportunity to work as interns in the school would be an excellent way to provide local expertise and prepare students for a variety of technology-related community college or university programs and careers. However, because of the confidentiality of data on school network systems and other management issues that can arise with student workers, a student program must be supervised by qualified staff.

Software Acquisition

Some software decisions will be made at the district level, other decisions will be made by schools or by teachers. The technology plan should set forth an intention that the district and/or the schools will establish a software acquisition process that is not overly bureaucratic, but that also ensures that district resources are spent wisely. For example, ability to reduce expenses through the use of site licensing will be undermined if each teacher purchases a single copy. It is also important to have some process to facilitate curriculum software review or to ensure that the acquisition of certain software will be in support of the district's curriculum objectives. Establishing a level of uniformity in district productivity software, such as word processing software is essential to maintaining effective NIC services. The acquisition process will also need to consider ways in which the district will protect against copyright infringement.

Technology Obsolescence

Technology obsolescence is a major concern in education. Relentless innovation is the standard for the technology industries. Unfortunately, the result of such innovation is a very short life cycle for technology products and the need for constant updating and/or replacement. Schools, faced with limited funds and sometimes cumbersome bureaucratic acquisition processes, are rarely able to effectively cope with such a rapid rate of change. But they must.

The bottom line is that technology is a constantly moving target and technology investments in the future will require shorter, and more dependable replacement cycles than currently exist.

It is important to incorporate strategies for dealing with obsolescence into technology planning and implementation. The following are strategies that can be used to address technology obsolescence:

Planning for Technology

- Technology should be acquired in accord with a well-conceived technology plan that includes an assessment process. While the long-range technology plan may set forth overall objectives

and operating parameters, shorter-range plans that are responsive to current needs and resources will more effectively guide the acquisition process.

• Make sure the district's current investment in technology is being used effectively and productively and is contributing to improved student performance and administrative productivity. Requests for funds for new equipment should be accompanied by documentation about the impact of past investment.

• Provide adequate information to the decision-makers and community about the status of the district's technology infrastructure.

• Never speak in terms on finality about the costs of technology -- "Our district needs $X to establish its technology infrastructure." Rather, speak in terms of initial and ongoing investment needs -- "Our district needs $X to establish its networking infrastructure and will need approximately $X per year to build to and maintain the recommended level of equipment."

• Make sure the annual equipment budget includes funds for equipment repair, maintenance, and upgrading.

Acquisition of Equipment

• Keep up-to-date about equipment life cycles by reading the trade press, talking with colleagues, and requesting specific information from vendors. By keeping up-to-date, a district can avoid purchasing equipment that has reached maturity.

• Maintain district-level control over the acquisition of equipment in the form of technical standards and a coordinated acquisition process. This will result in lower costs for bulk purchases and assurance that the equipment acquired is compatible with existing and future technology.

• When a district is preparing a bid for equipment, make sure that it includes detailed specifications about technical requirements. Be extremely wary of bargain-basement prices. Acquire equipment that can be easily upgraded.

• Phase in purchases. The standard process for acquiring technology has been driven by the capitol assets bond process, which results in a massive infusion of equipment at one time. Unless the district has also planned and budgeted for a massive infusion of training and support, much of this equipment will sit unused or minimally used. Then, some years later, the district will be faced with a large inventory of aging equipment that is incapable of meeting current needs. As the district move into the new era of technology in schools, it will need to move to an annual acquisition process that is well coordinated with curriculum planning and professional development.

• Make sure that the level of equipment is justified in terms of the planned curricular uses of the equipment.   A first-grade class learning keyboarding, does not need a Pentium computer lab. Less expensive Internet access devices may be usable for some curriculum activities.

Dealing with Older Equipment

• "You gotta know when to hold them and know when to fold them."   In non-lyrical terms, it is important to know when equipment should be upgraded and when upgrading would only be a waste of resources. A general standard is that if equipment can be upgraded to extend its life for at least an additional two years <u>and</u> if the costs of upgrade are less than 30% of the costs of

a replacement, then upgrading makes sense. If not, the equipment may be able to be repurposed to serve some use until it is time to call for the undertaker.

- Be very careful when dealing with donated equipment. (See below)

- Establish a systematic approach to memory upgrading. By upgrading groups of computers on a regular basis, a district can purchase in bulk through a bidding process to lower the costs.

- Develop an effective repurposing plan. Older equipment can be repurposed to serve useful functions within the educational environment. But successful repurposing must be done in accord with a plan -- identifying a specific useful curricular purpose and supplying the software and training necessary to serve this purpose. Older equipment will likely not run the latest versions of software. The district will need to apply creative approaches to obtaining the rights to use older software in ways that do not violate copyright laws. One approach would be to contact software companies and request a site license to use their older software on this equipment.

Software Obsolescence

- Software upgrades are even more frequent than hardware upgrades and can cause a variety of headaches. This is especially true when the newer software requires an equipment upgrade, typically a memory upgrade, to work properly. Fully evaluate the impact that software will have on hardware when planning a software upgrade and prepare a budget that includes all of the costs.

- When acquiring software that is regularly upgraded, negotiate for a schedule of contracted upgrades at the time of initial purchase. Or pay a maintenance fee that covers all updates for a period of time.

Refurbishing Programs

Some districts have or are considering the establishment of computer refurbishing programs to supplement district purchases of equipment. Companies are requested to donate used equipment to schools. The equipment is refurbished by students as a learning activity and then dissemination in schools. Government agencies are also a source of donated equipment.

A refurbishing program can provide several benefits. It can provide a low cost way to increase the number of computers in the schools. It can also be a good learning opportunity for the students. Where such a program is most likely to work well is in communities with high tech companies that need to upgrade their equipment in very rapid cycles. If a company is upgrading their equipment in 2-year (or less) cycles, then the donated equipment has a reasonable additional life span for use in education.

The refurbishing program does present significant concerns. These concerns and a strategy to address the concerns are as follows:

- Concern: Public (and district decision-makers') perception that a truckload of donated 386s has solved the district's needs for technology

  - Strategy: Don't over sell the program. Always speak in term of supplementing, not solving, district's equipment needs. Establishing an ongoing assessment of progress towards technology infrastructure goals that differentiates between state-of-the-art equipment and old equipment, will be critical to avoid misperceptions that refurbishing program has adequately addressed the need.

- Concern: The district will receive a high amount of unusable junk.

  - Strategy: Establish minimum standards for acceptance.

- Concern: The program will lead to a redirection of district maintenance and repair funds to the donated computers.

  - Strategy: Establish the refurbishing program as a separate program and require that it is financially self-sufficient.   After computers have been disseminated in the district, they are eligible for repair and maintenance by the technical department only if the technical department has determined that they meet district standards. If not, they can be returned to the refurbishing program for repair.

- Concern: The quality of the learning opportunity. Refurbishing work can become non-educational and repetitive activity for students. There are limited future work prospects for student able to refurbish 386's.

  - Strategy: Conduct a careful and ongoing assessment of goals and outcomes of the learning experience. Consider expanding the program to include network operations and support.

- Concern: Inability to get software for older computers fosters copyright infringement.

  - Strategy: In some cases, software rights may also be donated. It also may be possible to arrangements with the software company for site license of older software for computers.

Resources for Technology

The district technology plan should discuss potential sources of funding for technology[18]. In many districts, there is a mind set that the only sources of funds for technology are capital assets bonds, grants, or other special programs. These are the sources of funds that have been used during the innovative phase and reflect a classification of technology as "nice to have," not a "necessary" component of the education environment. As education transitions into the mainstream adoption of technology in schools, district decision-makers will need to identify the sources of steady, ongoing funding for technology. Outlining all potential sources of funding will assist in the transition from the innovation phase to the mainstream adoption.

These potential funding sources include:

General Funds

To adequately prepare students for success in the 21st Century, districts will need to prioritize and reallocate general fund resources to support the action items contained in the technology plan. Technology can be used to accomplish some district tasks in a more cost effective manner, resulting in long term cost savings, for example, reduced paper and copying costs by shifting to electronic distribution of district memos.

Capital Asset Bonds

Capital asset bonds can be used to support the acquisition of technology and the costs associated with the installation of local area networks in the schools. The use of capital assets bonds for funding of equipment raises concerns. Such funding typically results in a large quantity of equipment acquired in a short period of time. If the district does not also make an equivalent level of commitment to training and professional development, much of this equipment will be unused or used infrequently. Because the district has acquired a large amount of equipment at one time, several years later, the district will be faced with a need for substantial upgrading or replacement. It is generally advisable to use capital assets funding to support the costs of networking and other more infrequent expenditures and use general funds for computer equipment.

Federal Block Grants

A portion of funds received from the Federal government through the following block grant programs can be used for technology: Title I ESEA, Chapter 2 ESEA, School-to-Work, Goals 2000, Eisenhower Professional Development, Even Start. The Federal Government has made it easier to use the funds from such programs for technology and is encouraging their use in such

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[18]   PL 103-382, Sec 3135, 20 USC 6845 (1)(H) a description of how the local education agency will coordinate the technology provided pursuant to this subpart with other grant funds available for technology from state and local sources.   Note: The federal government appears to be confusing the requirements of technology plan with information about a small project that can be funded through the Technology Literacy Challenge Program.

manner. The U.S. Department of Education's web site provides information on the source of federal resources for technology (URL: http://www.ed.gov/Technology/tec-guid.html.

The district may wish to ensure that every committee that is responsible for the development of programs and budgets funded through the federal programs include a representative from the technology committee. The technology committee may also wish to pay special attention to providing ongoing information resources to these program committees about how technology can be used to effectively accomplish their goals, for example, providing information to the school-to-work committee about innovative programs in other districts that are making use of technology. The district could go so far as to provide strong encouragement or a requirement for a percentage of the funds requested through these programs be dedicated to technology. Funds available through the Eisenhower Professional Development program can support professional development related to the use of technology.

Competitive Federal Grant and Business or Foundation Grant Programs

Federal competitive grant programs and business or foundation grant programs tend to be long shots. The district will want to establish guidelines for determining when it will devote staff resources to the preparation of such grant applications. Success with such grants appears to require 2 key attributes: a high level of innovation and strong partnerships, especially with the private sector.   The biggest advantage of applying for such funding is that the application process itself generates interest and excitement within the district and generally results in a good plan for a project. Frequently, even though the grant is not awarded, the district and/or community manages to find local funding to accomplish the project.

Adult Lifelong Learning Programs

If the district is providing access to its technology to support adult learning programs, the fees charged should support the program and include a profit margin that is specifically dedicated to a district technology fund. The district can also participate in joint fund-raising activities with its adult lifelong learning collaborative partners. Targets for such fund-raising could be state programs for workforce quality and regional economic development.   Local businesses who need a training facility for their employees may also be a source of funds.

Local Fund-raising Activities

Many schools have relied on local fund-raising activities to support their technology acquisitions. However, in districts where there are income disparities between the various school regions, such local fund-raising can cause inequities in between schools -- the schools in higher income areas have greater opportunity to raise funds, than do those in the lower income areas. (See discussion in *Equity* for strategies to address this.)

State Funds for Technology

Many states are providing state-level funding for technology. Some of these funds have been used the establish the state-wide education network, other funds have been distributed on a per student basis, and other funds have been awarded for innovative projects. The process of funding education differs between states, but it is likely that states will increasingly be expected to establish specific programs for funding technology in an attempt to equalize access to technology throughout the state.

Equity

When looking at equity issues there are a number of areas to consider: socio-economic, multicultural, special education, and gender[19]
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Socio-economic Inequity

Socio-economic inequities in the amount of technology in the various schools tends to occur naturally in medium to large school districts. What emerges is a pattern of disparity, resulting in some schools, almost always in the higher socio-economic areas of the community, with a higher level of technology than those schools located in lower socio-economic areas. The "have" schools are generally blessed with parents who are well-educated and understand the importance of technology in the schools. These parent will have considerable influence on school-based budget decision-making.   Additionally, these parents are often willing and able to assist with outside fund-raising activities, including donations and grant writing.

In the "have-not" schools, social needs generally drive the budget decisions. Parents tend to be less involved and less willing or able to support the acquisition of technology through outside fund-raising. Social needs demands drive school-based budget decisions.

Obviously, all students deserve the chance to be educated in technology-rich environments. Further, research has clearly demonstrated that technology can assist high needs students in gaining basic skills, greater motivation, and higher self-esteem.

Strategies to address socio-economic inequities include:

- Differential analysis of district technological infrastructure data to determine whether socioeconomic disparity exists.

- If inequity exists, consider a district-wide distribution of funds strategy that would assist in addressing the inequity, such as special funds for high-needs districts.

- Specifically target professional development opportunities for teachers and administrators related to the use of technology for high needs students. This will help to educate and perhaps shift the school funding decisions.

- Look for ways to use Title I funds and other special purpose funds to finance technology. There is a natural tendency to continue to do things in the way that they have always been done, rather than to look for new ways to address problems. Research results would suggest that the

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[19] PL 103-382, Sec 3135, 20 USC 6845 (3) describe how the acquired instructionally based technologies will help the local educational agency -- (A) promote equity in education in order to support State content standards and State performance standards that may be developed.

use of technology with high needs students can be very effective. Districts may wish to initiate some technology-related action research projects with Title I students and use the data to guide the future development of such programs.

- Recruit the Chamber of Commerce or other community service organizations, such as Rotary, to adopt high needs schools to assist them in planning and fund-raising around technology.

- Establish after-school labs for students to expand their level of access (they likely do not have computers at home) and for parents for computer literacy and other classes.

- Establish a loaner program with older equipment that encourages parent and child technology activities.

- Work with social service agencies to develop ways to use the school technology to provide electronic access to social service information for high needs parents.

Multicultural Inequity

Research data has revealed a lower level of used of technology by some minorities. This issue is in part driven by the socio-economic factors, but other factors that should also be addressed include potential software bias and the lack of technology-using role models.

Strategies to address multicultural inequities include:

- Assessment minority student use of technology.

- Analysis of software from a multicultural perspective during the curriculum analysis and software acquisition process.

- Connect minority students with minority role models both in person and through the Internet.

- Direct all students to the positive multicultural materials that are available through the Internet.

- Develop technology-related learning activities that allow students to present their own cultural heritage stories.

Special Education Inequity

Assistive technologies are revolutionizing special education by providing special needs students with innovative ways to accommodate their disabilities and expand their abilities. There are three federal laws that relate to access to individuals with disabilities to technology in schools:

- The American's with Disabilities Act (ADA) mandates equal access for individuals with disabilities. The implications of this Act are that if a disabled students cannot use standard technology that every other student is using to do a task that other students are doing, then the district must, in some manner, provide an equivalent level of access. This requirement is for all students with disabilities, not only special education students.

- Section 504 of the Rehabilitation Act has access requirements that are similar to the ADA.

- The Individuals with Disabilities Education Act (1997 revision) **requires** that districts consider the need for technology assistive devices for all special education students during the Individual

Education Plan development process. If it is determined that assistive technology is available that would benefit the student, the district has an obligation to provide this technology.

Strategies to address special needs inequities include:

• The development of a district-level special education technology plan, that is integrated with the overall technology plan and ongoing planning structures to ensure coordination. There are federal and state funds available for assistive technology. In some cases, the technology could be implemented in a way that would, in addition to addressing a specific student's needs, contribute to the overall development of the district infrastructure. Conversely, if strategies to facilitate the ability of the district to meet the needs of special education students are incorporated into the district's overall technology implementation from the outset, this could result in cost savings to the district. These opportunities will be missed without close coordination.

• Professional development opportunities for special education staff and ready access to current information about assistive technologies are critically important to ensure that opportunities are identified, funds are spent wisely, and the technology is used to its highest advantage for the benefit of the students.

Gender Inequities

Research has revealed that boys and girls tend to perceive technology differently. Boys tend to be most interested in the machine itself and how it can extend their power. Girls tend to focus more on how technology can solve problems and enhance communication. In most schools, a trip to the open computer lab will likely verify that boys tend to gravitate to computers more than girls. District will need to find ways to equalize this imbalance.

Strategies to address gender inequities include:

• Assessment of computer usage patterns by gender.

• Analysis of how computers can be used instructionally to encourage the natural inclinations of boys and girls, as well as to expand the range of uses.

• Connect students with male and female technology-using role models, both in person and through the Internet.

• Ensure that computer labs, especially open computer labs, are gender neutral and female friendly. Ask female students what can improve the environment from their perspective.

• Require all students to use technology for school assignments, assuming sufficient technology is available.

Community Involvement

There are several good reasons to foster the involvement of parents, public libraries, business leaders and community leaders in district and school technology planning activities[20]. Such involvement establishes a 2-way communication conduit that can:

- Provide the opportunity for community input and insight into the district's technology activities.

- Provide the opportunity to educate community leaders who, in turn, can help educate the community about the goals and activities of the district related to the use of technology.

- Generate understanding and support for district and school funding of technology and technology-related program decisions[21].

- Facilitate the development of a wide range of collaborative projects and activities.

- Enhance public accountability.

Districts will likely want to avoid asking community representatives to be participants in regular technology committee meetings. The kinds of issues that need to be addressed in these meetings are generally not issues that community representatives can contribute to. Such involvement can be a waste of time for both the technology committee and the community representatives.

The following are some positive ways to enhance the involvement of community representatives:

- Establish a district technology advisory committee that meets several times a year: In the fall, the advisory committee would receive an update of district progress and needs (See *Planning and Implementation*). and to make recommendations for district priorities. In early winter, as the district enters the budget process, the committee would receive a report on the district technology committee's priorities for the following year and their budget request. In the spring, the committee could contribute to the assessment process and review teacher and student projects.

- Use the school site councils in an advisory capacity for the school technology committees committee -- to receive reports on progress and recommended priorities.

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[20] PL 103-382, Sec 3135, 20 USC 6845 (2) describe how the local education agency will involve parents, public libraries, business leaders and community leaders in the development of such plan.

[21] Technology has to compete in the budget process with all of the other necessary educational expenditures. The backing of community leaders for technology expenditures can be helpful in the budget process. To be more blunt, the testimony of a community business leader to the school board about the importance of the district's investment in technology, especially when this testimony is based on this business leader's involvement in an advisory capacity with the district's technology committee, is likely to have substantially more impact than the testimony of the district technology coordinator or a technology enthusiast teacher.

- Establish district-level ad hoc special issues committees with community representatives to address special projects, such as the establishment of a student computer recycling program, community information network, or the coordination of Net Day activities.

- Establish ad hoc school committees to address school-level special projects, such as a special fund drive for technology or a school web project.

- Request community assistance, especially business involvement, to address equity concerns of schools that are located in socioeconomically deprived areas of the community. (See *Equity*)

- Develop a community-wide union catalogue of library materials that includes school library and public library holdings.

- Establish a program to use community volunteers for technology-related activities, such as teacher training, assisting students in repairing computers, hosting open school labs for community access.

Communication Strategies

Communication strategies address both the operation of district's programs and public relations activities to raise awareness about district's technology-related activities in the community. The following strategies address communication related to the district's technology activities. The network communication and information sharing strategies can be used by the district for other school programs and activities.

Network Communications and Information Sharing Strategies

Network technologies offer tremendous opportunities for communication and information sharing. This communication is multi-directional, involving the district education community and the larger regional, state, national, and international community and involving other education stakeholders within the local community and beyond.

Web Site

The district's web site can provide access to a wide range of information about the district's technology activities, including:

- District technology planning and implementation information -- Reports, and plans, acceptable use policy information, technology committee meeting announcements and minutes, etc. The web site can also be used as the vehicle to solicit information or assessment data necessary for assessing the progress of the district's technology activities.

- Network/Equipment Operations and Support Services -- Online equipment troubleshooting guides, information on emerging technologies, etc.

- Training and Professional Development -- Notices of upcoming classes and workshops, information about collaborative online activities, links to curriculum related sites, links to other resources for educators, teacher-mentor contact information, links to professional development organizations, etc.

- Discussion Group Contact Information -- Information about district, regional, state, and international online discussion groups that address various aspects to education and the use of technology in education, including information on how to become involved with these discussion groups.

Online Discussion Groups

Electronic discussion groups (mailing lists and conferencing) provide the ability for groups of people to communicate with each other. Mailing lists establish an electronic list of e-mail addresses of the participants on a mailing list server. When a participant sends a message to the mailing list address, the message is transmitted by the mailing list server to all of the participants on the list.

Mailing lists provide a very efficient and effective way for people to be informed about issues and to ask questions and receive feedback. There are many international mailing lists related to educational issues. Districts can also establish district-level mailing lists.

Conferencing systems provide a "virtual location" for people to join in electronic discussions. Conferencing software allows for the development of discussion threads -- ongoing dialogue related to a specific topic. Currently, conferencing technology is not widely used in education, but will likely become a integral component of school operations in the future. Businesses and government agencies are expanding their use of conferencing technology.

The district can use electronic discussion groups to coordinate the activities of the technology planning and implementation committees. Additionally discussion groups will be created to facilitate communication for various educator interest groups. For example, discussion groups could be established for administrators, for middle school math teachers, for regional special education teachers, etc. As discussed above, the district web site can provide a directory of the district discussion groups with information about how to join a group.

Print Materials

The district may want to periodically publish print materials to be disseminated to educators in the district, informing them about developments and opportunities related to technology and upcoming training, professional, development, or collaborative instructional projects. Ultimately, such dissemination will be done electronically, but as technology is being introduced into the mainstream educational community, it will be important to communicate with educators who are not yet comfortable with electronic communication in a form that they are comfortable with.

Highlighting the activities of innovative district educators through special projects reports in these printed publications can generate interest. This is also a good way to publicly acknowledge the innovative efforts of teachers who are effectively using technology.

External Public Relations

The primary purpose of external public relations activities is to foster public understanding and support for the district's technology efforts and the expanded use of technologies for education. This communication will assist in preparing the community for the changes that are necessary in the schools to facilitate the use of technology and that will occur through the use of technology.

The following are strategies for effective communication that can be utilized:

- Take advantage of every public relations opportunity -- a new lab, an innovative project, student accomplishment. Develop press releases to disseminate to the media about these opportunities and invite the television news stations into the schools to video-tape students engaged in exciting activities using technology. Provide information about these projects to district public relations personnel so that the information can be incorporated into district publications, especially those sent to parents.

- Hold regular outreach activities, such as open houses, ribbon cutting ceremonies for the opening of new labs, special events to celebrate the completion of special technology-related projects. An annual spring-time technology "expo" will provide an excellent opportunity to showcase student technology-related projects.

- Prepare a basic 30 minute presentation for business and civic club meetings to promote district technology activities. This presentation should highlight innovative local student projects and

also make a connection to the importance of technology literacy for the future economic stability of the community.

•   Prepare a brochure about the district's technology activities to be distributed at public relation events and meetings.

•   Incorporate both factual and statistical information in materials, presentations, and press releases. Some people are motivated by stories and pictures of children doing exciting new things. Others want the facts and figures.

Adult Lifelong Learning Programs

As the district's network infrastructure is expanded, the school-based computer labs can support a wide range of education opportunities for adults in the community[22]. Such expanded use of school-based technology is in accord with our nation's need to foster lifelong learning opportunities for all adults. Providing access through school-based computer labs is especially important in communities that are not served by a local community college or other institution for adult education.

Lifelong learning opportunities include:

- Computer and Internet literacy classes taught by district teachers or others, including students.

- Open lab access to the Internet.

- Access to distance education classes offered through higher education institutions and other education and training providers.

- Technology-based training for technical/professional skills.

- Computer assisted learning of basic skills through the use of adult literacy software programs.

The development and implementation adult lifelong learning programs should be done in collaboration with other institutions and organizations in the region and state who are responsible for such activities. Some districts also have their own community education programs which can be expanded to include technology-related or facilitated classes. The district may be able to develop a program where it contracts with local businesses to provide training to their employees. Partners to consider in the development of collaborative plans for lifelong learning programs include: the regional community college or institution of higher education, the public library, agencies working with adults on welfare, the regional U.S.D.A. Extension Service, local business and professional representatives, and the chamber of commerce. In some areas, districts within a wider geographic region may collaborate with each other and the regional community college or institution of higher education to establish a region-wide adult lifelong learning program.

In addition to the community benefit of adult lifelong learning activities, an advantage to districts of such collaborative use of technology is the potential additional funding that can be generated through such use through fees for use of the district's technical resources and collaborative funding-raising activities with partners.

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[22] PL 103-382, Sec 3135, 20 USC 6845 (1)(C) an explanation of how programs will be developed in collaboration with existing adult literacy services providers to maximize use of such technologies. The term "adult lifelong learning" was chosen for these materials because it has a much broader perspective than "adult literacy."

Internet Use Policy

The standard process by which districts seek to manage student and staff use of the Internet is through the development of an Internet use policy (also called an acceptable use policy). These policies become part of the district's student disciplinary code. Violation of the policy is treated in a similar manner to other disciplinary actions.

Policies that govern student and employee behavior raise a number of constitutional concerns. Just as students "do not shed their constitutional rights to freedom of speech or expression at the schoolhouse gate" *Tinker v. Des Moines Independent Community School District, 393 U.S. 503, 506 (1969)*, it must be recognized that students also do not shed their constitutional rights on the school district's on-ramp to the information superhighway. District employees also retain constitutional rights, as well as other rights that are protected by state law and collective bargaining agreements.

An Internet use policy must be viewed as more than just one step in a disciplinary process. The Internet offers a great deal of freedom and with this freedom comes the need for self-restraint and personal responsibility. To function effectively in the Information Age, students must gain a sufficient level of self-control to behave in a morally and ethically manner, even when they have the freedom to do otherwise. The Internet use policy provides the foundation for gaining these critically important skills and values. It should be considered the first step in the development of a character education program to address ethical and moral behavior in an emerging new environment.

The author of these planning materials has prepared an extensive legal analysis of Internet use policy issues and policy templates. These materials are currently available at URL: ces.uoregon.edu/responsibleuse