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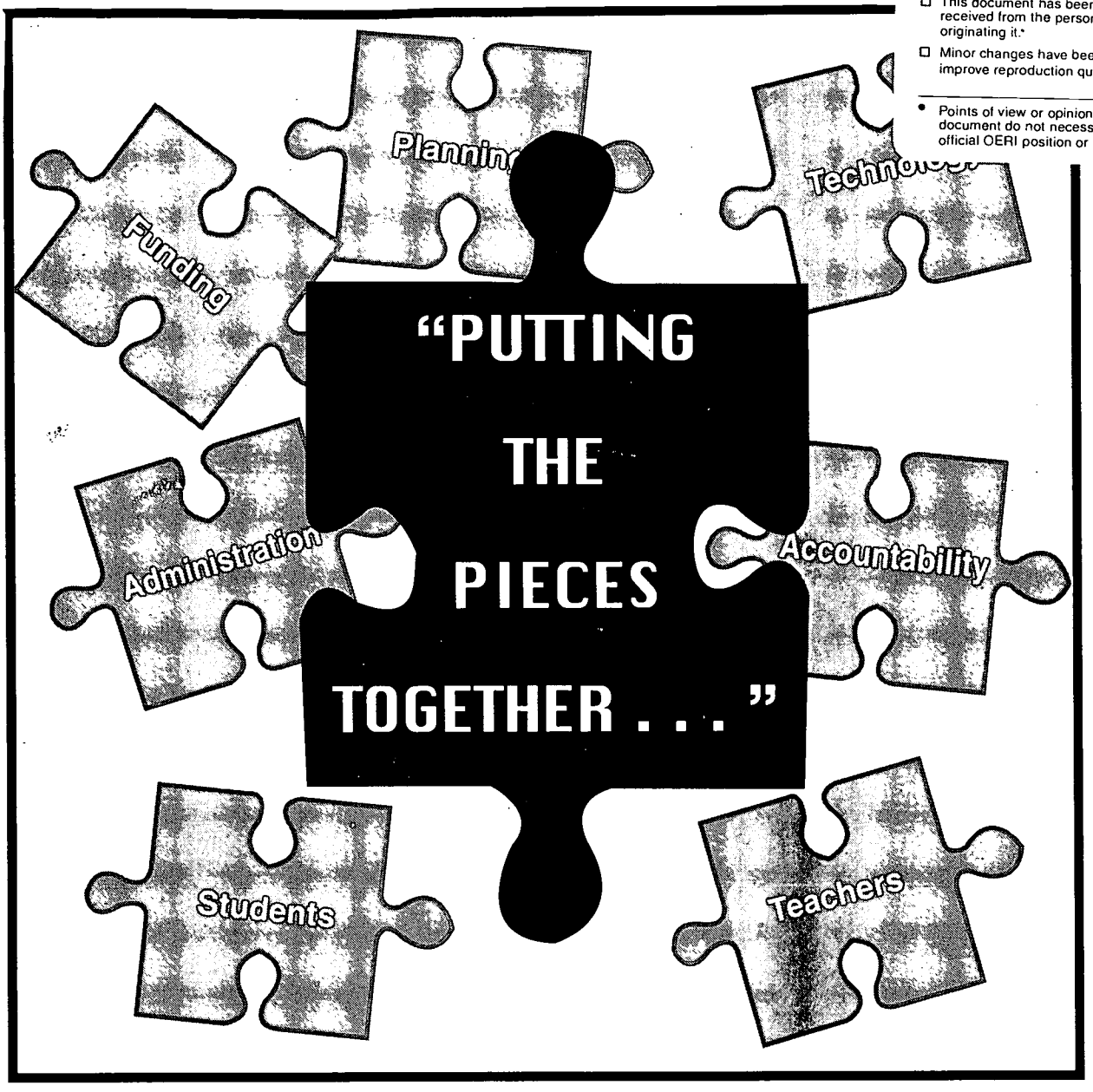
ABSTRACT

This report examines resources supporting technology in New York public schools and how well state policies and funding streams support the New York State Regents' goals. It also explores proposed fiscal and operational changes that contribute to or inhibit effective integration of technology within the curriculum. The report discusses some proposed recommendations to address the existing inequities and the lack of curriculum integration. The report includes the following sections: (1) Methodology and Acknowledgments; (2) Executive Summary; (3) Goals for the Integration of Technology in Schools; (4) School Building Technology Resources; (5) Computer and Technology Funding; (6) Special Services Aid for Five Large City School Districts; (7) Instructional Computer Software Aid; and (8) Student Information Systems Grants. Examples are also provided of deficiencies in the data collected, which limited the Committee's evaluation of expenditures and the effectiveness of computer and other technology-based efforts. As a result, a survey which asks schools about computer/technology planning, training, services, and funding was developed. Results from the survey will give state lawmakers a clearer understanding of computer/technology activities, effectiveness, and anticipated future needs, better enabling them to identify how funding and statutory and regulatory policies need to be adjusted. Appendices include a copy of the computer technology questionnaire and list of school district resources. (Author/SWC)



A Report Examining Computer Technology in New York State's Public Schools

New York State Assembly Committee on
Oversight, Analysis & Investigation

Anthony J. Genovesi, Chairman

Sheldon Silver, Speaker

May. 1996

METHODOLOGY AND ACKNOWLEDGEMENTS

The research for this report included both document analysis and personal interviews. Document analysis included a review of: State and Federal Laws; State and local budgets; State and Boards of Cooperative Education (BOCES) rules, regulations, policies, directives and plans; New York State Education Department (SED) data; hundreds of agency documents, state and national studies, audits, journals and news articles. During the course of the Committee's review, there was extensive outreach to State, Federal and local education officials. Staff interviewed, in person, on the telephone or at conferences, many school district officials, district superintendents, BOCES officials, school and district computer/technology coordinators, SED staff, teachers, technologists, and policy experts in the field of instructional technology.[1]

Principle research for the report was conducted by Committee staff Senior Research Analyst Kathleen Fazio, with guidance and editorial support from the Committee's Executive Director, Andrea Zaretzki, and Chairman Anthony Genovesi. Committee Administrative Assistant Julie Ruttan assisted in every stage of the process, and Principle Policy Analyst, Stuart Graham, provided much-needed advice on survey questions and strategy. Michael Rice and Michele Litty, both of the Assembly's Science and Technology Commission, provided strong support, and policy and editorial recommendations. Assembly Education Committee Chairman Steven Sanders, and his Chief of Staff Patrick Taylor, shared their insights and thoughts. Other Assembly staff who contributed to this report include: former Committee graduate scholar Jenny Rizzo, Ways and Means education analyst Bob Lowry, Janet Mannella, Patrice Kuzniak, Bill Ubinas, and Jocelyn Dax.

The Committee's efforts benefitted from the input of many individuals at SED, especially Peter Stoll and Lynn Reuss, of SED's learning technology team, and Walker Crewson and Chuck Devoe, of SED's Office of Telecommunications, Policy Analysis and Development -- all of whom patiently provided background, direction and views on technology in schools. Other SED staff persons who were instrumental throughout the process include: Ron Danforth, Steve Kidder, Ann Ardell, former staff member Liz MacNamara, Gene Smith, Suzanne Spear, Benita Stambler, Greg Illenberg, and Chuck Szuberla.

[1] Absent any compelling reason to link specific comments with individuals, the sources of comment in the report are not identified.

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EXECUTIVE SUMMARY

For more than a decade, New York State has supported the use of computers and other technology resources in schools to enhance education and ease administrative burdens. State commitments have been substantial, at least $140 million in 1994 alone. The New York State Assembly Oversight, Analysis and Investigation Committee has taken a broad look at current State funding streams and policies supporting computer use in schools, and oversight by the State Education Department (SED).

> *At one point in history it might have been appropriate to debate whether or not Information Technology (IT) had any positive role to play in teaching or learning. But we no longer have that luxury. For better or worse, IT has rapidly penetrated almost every aspect of our society and will impact us whether or not we ever become hands-on users. IT is now something we -- and our students -- need to learn how to live with rather than something we can honestly ignore.*[2]

So what has this money bought, and do these technologies indeed enhance education and administration? While assessment procedures are not entirely defined yet, anecdotal evidence indicates most schools do use computers and other technology resources at least somewhere in the building. For the most part, however, it seems computer use is not integrated within the curriculum. Many studies and individuals' testimony indicate that unless technology is fully integrated into the purposes and activities of the classroom, it is not likely to have a qualitative effect. Only through curriculum integration will students truly use computers and technology resources to improve their research and communication skills and creativity, and further their ability to think.

Study after study demonstrates that unless a school is lucky enough to employ a highly innovative teacher or administrator who can harness widespread support and money for the cause, a school needs to plan effectively, train teachers and staff constantly and dedicate steady funding, interest and time. And the State must provide leadership, support and flexible funding, encourage best practices, and act as a resource to schools.

Based on a broad review of existing financial and operational resources and policies, the overriding obstacles for educational enhancement and effective use of state dollars are: a persistent inequity in resources; and, inadequate levels of staff development and teacher training. The task of determining how computers and other technology resources are used in New York's public schools and how state money is spent is difficult because SED does not have consistent and reliable methods for determining schools needs, how computers and other resources are used, whether schools use cost effective and quality services, and how much money schools

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[2] Steven E. Miller is the author of "Civilizing Cyberspace: Policy, Power, and the Information Superhighway," (Addison-Wesley, 1995). He is on the national board of Computer Professionals for Social Responsibility, and he is the Director of the Mass Ed OnLine Project for the Massachusetts Corporation for Educational Telecommunications.

spend on technology. Furthermore, state aid specifications do not support the human resources factor, which is key to true integration of technology in schools.

The guiding principles for use of technology in schools are based on the Board of Regents Long Range Plan for Technology in Elementary and Secondary Education in New York State (LRP), which was issued in 1990. The plan, soon to be revised, possibly for the 1996-97 school year, provided general direction for local technology planning, staff development, computer integration within curriculum, and equity in technological resources. The plan established a "vision of the future," in which all classrooms would be equipped with clusters of networked computers, trained teachers and sufficient support by 1995. It also directed SED to track technology-based efforts and expenses to document effectiveness.

Encouraged by the Regents, by promises of educational reform through technology, and by forecasts of technology skills needed for jobs[3], most schools are expanding their computer and technology resources -- some full force, some piecemeal, some not at all. On the State level, a new education commissioner is promoting legislation that would create $985 million in new funding streams to connect all libraries and educational institutions, and certain cultural institutions in the State to the Internet.[4]

SED's technology data from schools, which focuses primarily on equipment inventories, shows that while the actual number of computers in the classroom and distance learning activities increase each year, there continues to be a general disparity of resources between high- and low-wealth school districts. This means that while some students may have frequent access to modern, networked computers and the latest educational software in several subject areas, some children may be restricted to 20 minutes per week of basic drills and keyboarding on a 10-year-old computer, and many students may have no access to any kind of computer at school or at home.

While SED's data are useful in determining where regions of inequity exist, none of the data speaks to how this technology is used or whether it has any impact on education or school administration. SED does not know how many schools are planning for technology implementation, how well they are planning, or whether educational goals drive the process. Nor is there statewide information concerning teacher training and staff development or other human investments -- which are all crucial to true integration of technology in schools.

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[3] America's Children and the Information Superhighway, (Washington, D.C.: September 1994), estimates that by the year 2000, 60 percent of American jobs may require technology skills and will reward them with a 10-15 percent pay premium over jobs not requiring such capabilities. (As published in Connecting K-12 Schools To The Information Superhighway, McKinsey & Company, Inc., 1996.)

[4] Omnibus Technology in Education Act of 1996.

State aid for technology in schools -- a driving force in shaping policy -- is divided into more than a dozen funding streams, and mainly focuses on hardware and management applications. The aid offers little incentive for schools to train teachers or integrate computers into the classroom. While schools are encouraged to plan, determine how computers will enhance education, and provide staff development and training for teachers, State aid does not support this in many ways. It is almost impossible to ascertain total technology expenditures in schools. State aid totaled about $140 million in 1994-95, and SED estimates that local technology expenditures may be almost two times as much.[5] Schools also derive funding from Federal aid, private-public partnerships and foundations.

The private-public partnerships program is an LRP goal which SED's instructional technology staff have successfully implemented, bringing almost $18 million in equipment and services to schools throughout the State. The instructional technology office, which includes four staff persons, oversees most of the current SED school-based initiatives and outreach to schools, with what appears to be few resources.

This report examines resources supporting technology in schools and how well state policies and funding streams support the Regents' goals. It also explores proposed fiscal and operational changes that contribute to or inhibit effective integration of technology within the curriculum. The report discusses some proposed recommendations to address or seek to remedy the existing inequities and the lack of curriculum integration. Throughout this report there are examples of deficiencies in the data collected, which limited the Committee's ability to evaluate expenditures and the effectiveness of computer and other technology-based efforts. In light of these deficiencies, the Committee has developed a survey, hoping to fill some of the existing gaps in information.

The survey (found in Appendix A) asks schools a number of questions about computer/technology planning, training, services and funding. Survey responses, which should be returned and evaluated by late-1996, should give state lawmakers a clearer understanding of computer/technology activities, effectiveness and anticipated future needs. With that information, the Legislature will be better able to identify how funding streams and statutory and regulatory policies need to be adjusted.

[5] See Technology Funding Section.

FINDINGS AND PROPOSED RECOMMENDATIONS

FINDINGS

SED OVERSIGHT

- In 1990, the Regents directed SED to track school technology-based efforts to assess their effectiveness, and spending for technology in schools. Despite this, it is still difficult to glean much useful information from the statistical and financial data now collected.

- SED administration has not dedicated sufficient or consistent resources to undertake the intended tasks for tracking the effectiveness of computer use.

- SED's statistical data primarily focuses on equipment inventories in schools, not the effectiveness of technology utilized, and financial data are incomplete. The Department's initial assessment efforts of two SED-sponsored partnerships, in which private companies provided hardware, software and training to certain schools, have been abandoned. And the last statewide survey examining technology use and school connectivity was in 1983.

- The Regents and SED recommend local technology planning, a critical part of integrating and effectively using technology. However, SED does not collect information on whether or how well schools plan, or whether their goals are educationally driven.

- Boards of Cooperative Education Centers' (BOCES) Regional Information Centers (RICS) are required by law to coordinate long-range computer planning for their member BOCES and all of their component school districts to meet the projected need for cooperative computer services. SED does not adequately review these planning documents or enforce these provisions.

- Although required by law, SED cannot determine whether BOCES technology services are cost effective for schools sharing the service.

- SED's organizational structure is fragmented with a number of different Divisions overseeing technology in schools. The primary office overseeing technology in K-12 schools experienced changes in duties and staff reductions, leaving only three employees, and possibly fewer with contemplated budget cuts.

COMPUTER AND OTHER TECHNOLOGY RESOURCES

- SED's data show annual increases in schools' acquisition of computers and other video and technology equipment.

- Students in the Big 5 City School Districts, especially New York City, have less access to computers and other technology equipment than in other schools. (Current data indicates there are 15 students to one computer in New York City schools, compared with 10 students to one computer statewide.) These resource poor schools are among the least affluent and have high percentages of minority students. Statewide, the higher the number of minority students in a district, the lower the wealth and the fewer computers and technology resources schools have.

- About three-quarters of the computers in schools are old, not capable of multimedia[6] applications or running new educational software. Low-wealth districts tend to have the highest percentage of older computers.

- Often school building conditions preclude installation of computers because they are in need of greater electrical capacity, air conditioning and/or asbestos removal, not to mention general rehabilitation, for instance leaking ceilings and crumbling walls -- technology takes a back seat to those huge budget items.

- Installation of networks and telecommuting costs for rural districts is high because school buildings are often far from each other and from points of presence to which they would receive Internet access. Furthermore, telephone service costs for schools and libraries are the same as business rates.

- The quality and pricing of BOCES technology services are inconsistent throughout the State, and in many cases the technology is outdated, according to school and education officials.

- Many schools have purchased equipment without effectively training teachers. According to SED, the overwhelming majority of schools have not integrated computers within curriculum and still treat it as an add-on.

- SED's Basic Educational Data System (BEDS) form is in need of revision to better reflect location and use of technological tools, and to distinguish computers and other technology tools used for instructional purposes from those used for administrative purposes.

FUNDING ESTIMATES AND SED OVERSIGHT OF STATE AID

- Although financial data are incomplete, Committee staff's best estimates indicate that State aid for technology in public schools was about $140 million in 1994-95. SED estimates that schools spent almost twice as much using local tax dollars.

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[6] Multimedia capable computers are computers capable of combining graphics, sound, animation and full motion video.

- SED does not track technology expenditures for several of the State aid funding streams, including Building Aid.

- School financial data are not reported in a format allowing a determination of the percentages of schools' technology budgets spent on computer hardware, software, repairs, technical assistance, training, staff development, and other support; or to compare instructional and management computer expenditures. BOCES aid and costs are almost impossible to determine using SED's data.

- State aid mainly supports hardware and management systems. There is little State aid for several crucial aspects of integrating technology in schools, such as teacher training, staff development and technical assistance.

- State aid for BOCES technology services, which has increased more than any other state aid for technology, is only available to schools that purchase BOCES services. This legally excludes the Big 5 City School Districts which comprise 41 percent of New York's public school student body. BOCES shared services aid is the only steady, State funding for distance learning, Internet services, and planning assistance.

- The primary funding stream for hardware (Instructional Computer Hardware Aid) is allocated based on attendance with no recognition of variations in pupil needs or local ability to pay for technology. Furthermore, hardware aid amounts to little more than a few thousand dollars for most schools.

- State Building Aid, which is primarily used for new construction and substantial rehabilitation of schools, sets caps for incidental costs, including site acquisition and preparation and certain technology related purposes. This cap is unfair to urban areas.

PROPOSED RECOMMENDATIONS

LONG RANGE PLAN REVISION

- The Long Range Plan for technology in schools -- soon to be revised -- should address funding resources, inequities in resources, teacher training and curriculum development, best practices among schools, ways to make better use of existing resources, assessment efforts, adaptive technology, and SED's data collection.

- The State's LRP revision process should include all sectors of the educational community who will play a role in implementing the plan, including: teachers; school administrators and technology coordinators; community and business representatives; and the various departments within SED that oversee technology in schools.

- Either before or during the revision of the LRP (and certainly before new funding streams are created), SED should conduct a statewide, building level needs assessment to determine what schools need to successfully use computers and other technology resources, how they use and plan to use their resources, what kind of planning, training, technical assistance they utilize, and how they fund or plan to fund technology.

SED OVERSIGHT AND OUTREACH TO SCHOOLS

- SED should implement the Regents' 1990 directive to track computer-based efforts and expenditures. Either through intermittent surveys or an improved BEDS form, SED should improve its data collection on technology equipment in schools to better reflect how these tools are used, and how technology efforts affect education. Survey recipients should include teachers.

- Because it is a primary method of outreach to schools, SED should expand the content of its Technology Applications Quarterly. This useful quarterly on technology in New York State schools, together with regional conferences, can assist school administrators with the best means for training, showcase available resources, and demonstrate best practices among schools.

- SED should create a clearinghouse of educational technology resources, accessible to the entire education community. Perhaps, the Department could expand its Transferring Success program to include technology programs. Through this program, SED validates successful programs by sending a team of staff to study and summarize the school's recipe for success, which is then listed in a book available to all schools. Schools that adopt validated programs are eligible for supplementary State aid.

- SED should expand the New York State Model Schools Technology Staff Development Program, through which teachers teach each other how to use and integrate technology within instruction.

- SED should assess the effectiveness of in-house technology coordinators. If found effective, SED should develop legislative recommendations, for instance revising aid language to allow for subsidization of such employees, especially in low wealth districts with the least resources.

- SED should improve the process for and its review of BOCES five-year computer planning documents. Furthermore, BOCES should be directed to uniformly collect and use local technology planning documents and Teacher Resource and Computer Training Center needs assessment surveys of teachers as part of its computer planning process.

- SED should develop and implement reforms for approval of BOCES technology services to better ensure services are cost effective and enhance education and school management.

- The Regents should direct BOCES to concentrate their efforts on training and staff development services before advocating the next level of technology services, such as Internet access for schools.

- SED should better coordinate all department units that oversee technology in schools.

- SED should develop comprehensive standards for technology in schools. The state of New Jersey based its standards on its LRP for technology in schools, and designed a report for school leaders and design professionals.

- The State should consider revising teacher certification requirements to incorporate instruction and practices in the application of technology to support State curriculum standards.

- The Department should continue its efforts to bring computer costs down for schools, such as its involvement in procuring funding and establishing a company that retrofits used, but modern, computers, and resells them to schools at a low cost.

- SED should continue to urge the Public Service Commission to require that telecommunications providers offer discounted rates to schools and libraries for telecommuting.

FUNDING

- State aid should better support human resources: staff development; teacher training (pre- and in-service); curriculum development; and local planning for all schools.

- Consideration should be given to making teacher training a required component of receiving State aid, as several other states have done in recent years, and to adopting new federal standards so that more aid dedicated to the curriculum is available for technology integration.

- The State should consider merging technology funding streams, allowing local district flexibility in spending for technology-related purposes, and ensuring that districts most in need of financial and technical support receive funding and assistance.

- SED should track Building Aid that is spent on technology related purposes.

- Special Services Aid -- computer management aid for the Big 5 City School Districts -- should be changed to include instructional computer services as well as management services.

- The State should once again consider merging Instructional Computer Software Aid with Textbook Aid, which amounted to $110.42 million in the 1995-96 fiscal year, allowing schools to choose how they deliver content to students. Or Textbook Aid language should be changed to allow schools to purchase software with this money, still requiring that software be shared with private schools. The State should explore ways to ensure that parochial schools are not negatively affected by any such changes. Furthermore, software should be redefined to include access usage charges for on-line services.

- SED should require that wiring/cabling, or just conduits, be installed with new construction and substantial reconstruction. Although most newly built schools are being wired for computers, some with fiber optics, Building Aid language should stipulate this, as well as State building codes.

- The State should consider implementing regional cost differences for Building Aid.

- The Legislature should continue to fund Teacher Resource and Computer Training Centers, with SED better accounting for this funding, and ensuring Teachers' Centers are used for optimal purposes throughout the State.

- The Legislature should continue to fund Learning Technology Grants. This money provided many schools with necessary seed money to begin the integration of computers and other technologies into classrooms. Furthermore, if re-funded, grant amounts should be increased for urban areas.

- The school district annual financial report (Form ST-3) should be revised to better reflect current and future computer and technology application expenditures.

GOALS FOR THE INTEGRATION OF TECHNOLOGY IN SCHOOLS

OVERVIEW

The guiding principles for technology in schools are based primarily on The Long Range Plan for Technology in Elementary and Secondary Education In New York State (LRP). Issued by the Regents in 1990, it urged schools to plan for and integrate technology to enhance education and school administration.[7] This document -- soon to be revised, possibly for the 1996-97 school year -- is used by SED staff in approving the delivery of services through BOCES, grant applications, and the collaboration of schools and private entities.

In 1996, SED submitted omnibus legislation proposing several new funding streams -- $985 million over at least a five-year period -- to ensure all New York State educational institutions and libraries, and certain cultural institutions, have access to the Internet and other remote electronic information resources.[8] Furthermore, SED has established goals for improved student performance, and has revised curriculum and assessment standards for several subject areas.[9]

With direction and encouragement from SED and the New York State Board of Regents, each school district is expected to determine its own plans and goals for the integration of technology in schools. The State does not directly require that technology be integrated within the curriculum or that computer competency be achieved by students.[10] Certain State and Federal aid criteria, as well as grant applications, do stipulate evidence of some local technology planning. Also, Boards of Cooperative Education Services (BOCES) are required to deliver technology services based upon the goals and needs of component school districts.

Much of the 1990 LRP goals were intertwined with the continued statewide development

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[7] New York State. Department of Education - Board of Regents. The Long Range Plan for Technology in Elementary and Secondary Education In New York State. New York: 1990. The report was developed by SED, teachers, district superintendents, superintendents of schools and others over a six-month period. The initial draft was distributed to hundreds of educators and administrators statewide for approval and ratings.

[8] This proposal, The Omnibus Technology in Education Act of 1996, can be retrieved through SED's World Wide Web home page: http://www.nysed.gov.

[9] Learning Standards For Mathematics, Science and Technology, Revised Edition 1-96 Draft; and, Learning Standards for English Language Arts, Revised Edition 1-96 Draft.

[10] A broad vision for educational reform is based on A New Compact for Learning. New York State. Department of Education - Board of Regents. New York: 1991. The Compact set new standards for education results, loosened schools' teaching methods, and established goals that all students demonstrate proficiency in technology and acquire skills needed for employment. As of September 1994, 25 percent of states mandated the integration of computer technology across the curriculum.

of the Technologies Network Ties (TNT) program, a mainframe-based educational telecommunications network, which was primarily used for management purposes by a small percentage of schools. TNT has since been abandoned because it was found to be too expensive, underused and cumbersome[11] (although BOCES still provide TNT mainframe-based management applications to schools). Therefore, many of the goals are no longer applicable, and will not be discussed in this report.

Of the general LRP goals still applicable, the plan recommended local technology planning, staff development, computer integration within the curriculum, and equity in technological resources for all students. The LRP established a "vision of the future," in which all classrooms were to have varied types of technology tools, including clusters of four to five networked computers, trained teachers and sufficient operational and financial support by 1995. The timeline of several of these goals may not have been realistic, but many of the ideas in the Long Range Plan are sound and still worth pursuing, although in need of elaboration and practical steps for implementation.

The LRP also directed SED to "develop policies and procedures for statewide monitoring and evaluation of implementation of the Long Range Plan and tracking of technology-based efforts and expenditures in order to document effectiveness." Evidence of SED's implementation of this directive was spotty until very recently. Nonetheless, policies and procedures are not in place to effectively assess school efforts, spending or needs. It is almost impossible to determine how effective any of these efforts are except through opinions of specific SED staff who help coordinate or have some involvement in certain projects.

In 1992, SED staff did complete two studies on computer use and effectiveness in selected schools that received computer hardware, software and training through private-public partnerships that SED sponsored.[12] The results were mixed, but showed improved educational performance. Unfortunately, SED staff has not been able to continue these site-based assessment efforts because of inadequate staffing. The last statewide survey of computer uses and connectivity was in 1983.

This section looks at some of the Long Range Plan's substantive goals for planning, staff and curriculum development, and staff training. It explores why these activities are important

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[11] New York State. Office of the State Comptroller - Division of Management Audit. State Education Department: Achievement of Goals for Specific Computer Systems. 94-S-23., New York: March 27, 1995; Technology Network Ties Review, SMA Management Systems, Inc., 1993, New York.

[12] SED/IBM Joint Study...Second Year Report, The State Education Department, December 1992, New York. This report summarized the results of a June 1992 survey of students, teachers, administrators and parents participating in the six-year project after the second year. The purpose of the study was to examine three major areas: 1) the power and benefits of electronic networking among students, teachers and administrators; 2) student, teacher and administrative use of technology; and, 3) long-term effects of technology on students, teacher roles and parents. SED also issued SED/Apple Partnership First Year Report, which summarized the results of a June 1992 survey, issued in January 1993.

and what is known about implementation of those goals, including SED's oversight of school-based efforts. The Committee survey asks schools to indicate whether and how they have developed and implemented technology plans, to assess resources available for planning, and to indicate what obstacles impede planning and implementation of plans. The survey also asks schools about training, staff development and available curriculum development services.

The following points are lessons learned by teachers, school administrators and technology coordinators, excerpted from the Office of Technology Assessment's 1995 report Teachers & Technology ... making the connection.

- **Educational rationale should guide technology decisions.** Developing a technology plan -- thinking through the goals for technology use at the local site and involving teachers in the planning process -- is key to successful implementation.
- **Those wishing to invest in technology should plan to invest substantially in human resources.** Training, maintenance, technical support and time to learn to use the technology have proven to be constant and continuing, yet key expenditures. Recently, several states (e.g. Texas and Florida) have recommended that at least 30 percent of technology funds be spent on training.
- **Teachers cannot use technology without systemic support.** The roles of principals, other administrators, and the community are critical in fostering sustained use of technologies. Other staff, such as media specialists, can provide technical and motivational support for teachers in their building if time is allocated for them to do so.
- **When it comes to learning to use technology, "hands-on" training is more than a gimmick or motivator.** It is a necessity. Teachers must have the chance to make the computer (or camera or whatever) work, and gain confidence in their own competence, before they try the same thing with their own class.
- **Access to equipment is essential.** It is extremely frustrating for teachers to learn to use technology in a workshop, then return to a classroom where the technology is not readily available. Many programs are increasing teacher access to technology by letting them take the equipment home (e.g. laptops, summer loaner programs, etc.) since most teachers put in many hours at home grading, planning, and preparing. Putting technology in the hands of teachers -- allowing them to see and explore how technology can help them do their jobs -- can be an effective way of motivating teachers to learn about technology.
- **Although there are a number of models for training teachers and implementing technology, there is no one best way of using technology or of training teachers to use technology.** Districts are most successful when they have multiple and complementary training and support strategies.
- **Follow up support and coaching is as essential to effective staff development as is the initial learning experience.** Teachers don't "learn it all" at a training session -- even if it extends over several weeks. When they return to the classroom the unexpected inevitably happens. At this point, teachers need to be able to reach out for technical assistance and support.
- **Many technology-rich sites continue to struggle with how to integrate technology into the curriculum.** Curriculum integration is central if technology is to become a truly effective educational resource, yet true integration is a difficult, time-consuming, and resource-intensive endeavor.
- **When conditions are right -- resources, time and support are high -- exciting things happen in technology-rich environments.** Today we are faced with broader issues of how to move these lessons to the second stage of dissemination. How can these lessons be translated when resources aren't as rich? When teachers aren't as enthusiastic or energetic? Issues for policy consideration include the need to consider the development of products based on research and the experience of experimental sites, seeding of more "real world" projects, and better dissemination of lessons learned.

LOCAL PLANNING AND SOME KEY INGREDIENTS FOR TRUE INTEGRATION OF TECHNOLOGY

LOCAL PLANNING

Local planning, a primary recommendation of the Regent's Long Range Plan, is a critical first step to effective use of computers in the classroom and in school administrative offices. It is equally important that educational and administrative goals drive decisions about the type and capabilities of the technology and its location, rather than being an afterthought. Further, plans should include long-term funding strategies for pre- and in-service training, staff development and technical assistance. Education and community representatives, especially teachers, should take part in the planning process.

No statewide information exists on whether or how well schools plan, or whether plans are driven by educational goals. Discussions with numerous state and local school officials indicate that many schools do plan, some more effectively than others. A significant number of educators acknowledge that many schools have squandered substantial amounts of money on hardware because they either failed to plan or did not plan effectively.

Many districts do recognize and support LRP goals. For instance, Herkimer Central School District developed a plan that articulates instructional objectives for each subject in grade levels 7-12 on how computers and other technology resources will be utilized. The following is from Clinton Central School District's technology plan:

> *We believe that technological tools should be used as a means to achieving an end, the development of each student's abilities to his/her level of capability. To achieve this goal we recognize that faculty and staff will need time, training and vision as they work toward the integration of technological tools and teaching.*[13]

The local planning process demands an intense examination of schools' current and future capacities, needs and resources. There are many questions that need to be answered concerning students' educational needs, composition, and the school building's infrastructure, location, resources, and funding sources. At the outset, schools need to decide what type of technology to focus on, how and where it will be installed, the manner in which it will be used, and what support services are needed and available. Some schools with insufficient teaching staff may decide that distance learning via dedicated lines to larger schools may best suit their needs; others may have a sufficient number of teachers, and decide that networked computers in the library and several social studies and language classrooms may best fulfill their needs.

The availability of planning assistance varies throughout the State. All BOCES, either directly or through BOCES Regional Information Centers (RICs), offer their component school

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[13] Plan for the Use of Technological Tools. Clinton Central School District: May 1994.

districts technology planning services. These services are eligible for State BOCES Shared Services Aid. The 38 BOCES in the State are represented by 12 RICs, which offer most telecommunications services either directly to school districts or through the BOCES in their region. The RICs employ technical staff, house mainframes and act as a computer/telecommunications resource to BOCES and school districts. The 12 RICs are required to coordinate long range computer planning, for their member BOCES and all of their BOCES' component school districts, to meet the projected need for cooperative computer services.[14]

Based on conversations with school officials, it seems that many schools within BOCES regions do not use BOCES as a resource for technology planning.[15] Many, if not most, establish their own committees, work with other schools and/or hire private consultants to assist in planning. An increasing number of private consultants offer technology planning services throughout the State.

Boards of Education in the Big 5 City School Districts (New York City, Buffalo, Rochester, Syracuse and Yonkers) vary on the level of assistance they offer to schools within their districts. In Rochester, most schools have technology committees and have been asked by the Central Board to develop long range technology plans, led by groups of teachers who are writing class programs using technology as a tool. The Central Board's instructional technology director then seeks direction from these committee plans. The New York City Board of Education's Office of Instructional Technology, which has experienced tremendous staff and budget cuts, has collected many community school district plans and will excerpt highlights in a citywide plan expected to be issued in June 1996.

A Capital District BOCES official stated in an interview that he felt that local planning is not addressed adequately. "We often go to a school and ask cursory questions, for example, what do you want to do with the computers, and the answers tend to be fairly vague ... if 10 percent had solid technology plans, I'd be surprised." A school instructional technology coordinator in Westchester stated that he has seen many schools purchase equipment first, minimally train teachers, and by the time the teachers get comfortable using the equipment, much less actually integrating technology within the curriculum, it's time for an upgrade. This is a sentiment Committee staff heard from many local school, BOCES and SED officials.

One planning approach recommended by a private consultant is to develop five-year funding strategies which include recurring costs such as technical assistance, training, telephone line fees (many schools work out three to seven year contracts) and network management. The same planning consultant recommends tapping local expertise, such as financial institutions, economic development corporations, local chambers of commerce -- anyone within the

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[14] BOCES five-year computer plans are required by NYCRR Title 8, Section 115.1.

[15] SED's data can not be used to refute or confirm this, as BOCES services are not uniformly defined and therefore not comparable.

community with a vested interest in local schools. The planning participants need to identify funding sources: federal, state, foundations, corporations, and lastly, local revenue. Questions that need to be addressed in formulating a strategy and the processes for doing so are compiled in many reports and sample technology plans, some of which are listed in Appendix B.

SED OVERSIGHT/ASSISTANCE WITH LOCAL PLANNING

No statewide information exists on whether or how well schools plan, or whether plans are driven by educational goals. SED does not sign off on local plans, nor does it even require school districts to forward plans to the Department. In the 1980's, SED had attempted to collect all local technology plans but that effort soon died out after a reorganization of the instructional technology department. Based on SED's current technology staffing, it is unlikely that it could review 716 school district plans.[16]

Currently, SED's involvement with local technology planning consists of the following activities:

- More and more, Federal and State grants are generally requiring plans based on educational goals, such as New York State's Learning Technology Grants and Legislative grants. These grant applications are reviewed by SED's instructional technology staff, who try to ensure that plans are driven by educational goals.

- Instructional Computer Hardware Aid requirements mandate a technology plan as a condition of receiving aid; however, the degree to which this requirement is being enforced is questionable. SED officials acknowledge their review is cursory. The Department reviews the list of hardware that was purchased, attempts to determine whether its intended use was instructional or administrative in nature, and then issues the aid.

- Building Aid requires plans for construction projects that receive this State aid; however, SED does not track the portion spent on wiring and computer installation.

- SED does receive and review BOCES regional computer plans annually, however SED does not summarize BOCES' reports, nor do the formats of these reports lend themselves to summation. Most BOCES seem to be collaborating on planning, but the plans do not clearly identify actors involved in the planning process, and the extent to which they are involved. The plans tend to give a better idea of what services are being offered rather than what school districts actually need. Furthermore, it seems that SED's review of the plans is not sufficiently substantive. The BOCES five-year computer plans should be the basis for all telecommunications services offered to school districts through BOCES. This is an important

[16] SED's primary office overseeing technology in K-12 schools, which would seem to have the greatest capability in approving technology plans, has experienced changes in duties and staff reductions, leaving only three people (as of May 1996), and possibly fewer with contemplated cutbacks.

tool for SED to determine whether individual services should be approved. Additionally, BOCES do not collect local technology plans from their component districts as part of their Chapter 793 process, unless schools purchase a BOCES planning service.

- SED staff encourages local planning and has commissioned the development of planning guides for schools, such as Technology Planning for Improving Schools (TPIS). This manual is designed for school districts to plan for the purchase and use of technology to best fulfill local needs as envisioned by the Long Range Plan. The manual is detailed and informative, and it is specific to New York State. (BOCES also provides a planning service based upon this approach.) SED had begun to develop a much more practical guide, "Building a Technology Planning Process," in November 1995, however, it has not been finalized in part due to an inability to devote adequate staff resources for its completion. This new planning guide includes steps for integrating technology within curriculum, a clear articulation of technology applications for all grades and advice on how to use technology within the context of new curriculum standards. The draft also includes surveys for local use to identify needs and inventories, and lists potential providers of services.

- SED also publishes Technology Applications Quarterly, which highlights model computer, distance learning and other telecommunications programs in schools throughout the State. The quarterly publication features many BOCES programs, lists federal and State grant programs, and public-private partnerships in school districts throughout New York. Based upon a review of five editions, TAQ appears to be a useful guide for school districts in their planning process, and alerts them to what is available and how to obtain more information. TAQ is sent to all school buildings, but distribution within each building may be limited, therefore never reaching the hands of teachers and technology coordinators. TAQ should include excerpts of or contacts for exemplary local plans.

- SED manages a shared listserv[17] used by 200 schools, which provides a forum for schools to discuss techniques, successes and information on new New York State curriculum frameworks, technology planning, public and private technology partnerships, and staff development at pre-service and in-service levels, and it allows SED to distribute breaking news, such as upcoming grant deadlines.

- SED regional technology conferences, with seminars on training, planning and curriculum development, are a tremendous vehicle for bringing schools together, highlighting effective programs and procedures, and informing schools about the services that exist. The first such conference was held in March 1996, and attracted approximately 500 educators and administrators, many of whom were about to start or had just commenced their planning process.

[17] A listserv is an electronic discussion group which can be accessed only if participants sign up. (See Appendix B for directions to sign up.)

TEACHER TRAINING/STAFF DEVELOPMENT

National studies, SED officials, and many local school personnel indicate that ongoing funding and support for teacher training and staff development is largely overlooked.[18] To effectively integrate technology, teachers need training to master its use and to learn new teaching methods that incorporate the technology into the existing curriculum. In addition, there is a need for professional development for those who advise and support teachers: school librarians; media specialists; technology coordinators; and, administrators.

Many local school officials in New York describe their district's training as being done in a piecemeal fashion; usually strong on rudimentary computer skills, whenever there is available funding or free training offered, and weak on in-service training that would enable a teacher to easily understand the potentials of the technology and enable them to use the technology in the instruction process.

This phenomenon is echoed in national studies, which indicate that most teachers have had very little technology training. In one survey, less than half of American schools reported that an introductory computer course was available for teachers.[19] This and other studies suggest that the training that is available only addresses basic uses of technologies, rather than helping teachers learn how they will use the technology or particular types of software to actually teach a class. Research, as well as common sense, indicates that to most effectively use technology, a teacher must be comfortable with it and knowledgeable of its potentials. This kind of experience is essential to true integration within the curriculum.

Data from a Utah study (1992-93), indicated that in-service training had an important effect -- teachers who received in-service training were more likely to use computer technology than teachers who did not receive training. Furthermore, teachers receiving training were more likely to use computers to stimulate high order thinking and creativity.[20]

Many studies also show that training is most effective when teachers have regular access to equipment, rather than solely relying on intermittent training seminars. A 1996 McKinsey & Company study cited a successful example of in-district training in which a large portion of teacher training occurs at a computer training laboratory at the local district headquarters. The lab is equipped with various types of computers, some multi-media capable. Twelve teachers, who are given a supplementary salary stipend, provide many levels of training in the lab, as well

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[18] Again, there is no statewide data or information on who gets trained and to what extent, or the effectiveness of different types of training.

[19] United States. Congress. Office of Technology and Assessment. Teachers and Technology: Making the Connection. Washington, DC: 1995

[20] Mergendollar, John R. et. al. The Utah Educational Technology Initiative: Evaluation Update. Beryl Buck Institute for Education, Novato, CA: January 1994

as one-on-one training and curriculum development in the classroom. The following table estimates the time and training needed for effective professional development.

TECHNOLOGY SKILL STAGES FOR TEACHERS[21]

Skill Stage	Description	Professional Development Needed
Entry	Teachers struggle to cope with technology and new learning environment, or have no experience at all.	----
Adoption	Teacher moves from initial struggle to successful use of technology at a basic level (e.g. can use drill and practice software).	• 30 hours training
Adaptation	Teacher moves from basic use to discovery of potential in a variety of applications. Teacher has good operational knowledge of hardware and can perform basic troubleshooting.	• 45+ hours training • 3 months experience • Just-in-time support
Appropriation	Teacher has mastery over the technology and can use it to accomplish a variety of instructional and classroom management goals. Teacher has strong knowledge of hardware, local area networks, and wide-area networks.	• 60+ hours training • 2 years experience • Just-in-time support
Invention	Teacher actively develops entirely new learning techniques that utilize technology as a flexible tool.	• 80+ hours training • 4-5 years experience • Just-in-time support

It also seems that applicable training resources and available funding vary throughout the state. For instance, New York City stopped funding its technical training centers two years ago, and must rely completely on Teacher Resource and Computer Training Centers and vendor training, which is usually not ongoing or comprehensive. Although New York City schools house about 80 centers, not all have enough computers and technological resources to train the City's thousands of teachers and administrators.[22]

The New York State Model Schools Technology Staff Development Program, which is coordinated and encouraged by SED throughout the State, including the Big 5 City School

[21] Connecting K-12 Schools to the Information Superhighway, McKinsey & Company, Inc., 1996, New York.

[22] As of May 1996, there were 114 Teacher Resource and Computer Training Centers throughout the State, many of which conduct needs assessment surveys of teachers to determine what types of training are needed and will be offered.

Districts, is provided through most, if not all BOCES, and through Teacher Resource and Computer Training Centers. The Model Schools Program, which has been in exsitence for about 10 years, uses teachers to teach each other how to use and integrate technology within the classroom. While this is reportedly an effective and relatively inexpensive method of encouraging integration of technology within the curriculum, only BOCES component districts, not the Big 5 City School Districts, can get State aid for Model Schools. The Model Schools program is growing annually, although it appears that the majority of schools are not taking advantage of this program.

While private vendors are cutting back on free training for schools, more and more New York State public schools are hiring in-house instructional technology coordinators to coordinate ongoing training for teachers and help them develop projects for integrating technology within the curriculum. Chappaqua Central School District recently hired two such coordinators, who identify training needs for various grade levels and subject areas and schedule courses among a variety of providers. According to SED, more than fifty percent of all schools have at least one half-time person performing this function. Many of these coordinators meet regularly to share ideas. The Oversight Committee survey asks schools to indicate whether they have hired such a person, and asks schools to identify and assess training providers.

The states of Florida and Texas recently revised their policies on technology training. Both require that schools applying for instructional technology and software funds set aside at least 30 percent of the money for training. Also, New Jersey recently required that staff training in technology be included with all technology purchases made by districts. This approach should be considered as a condition of aid in New York State.

PROPOSED RECOMMENDATIONS

LONG RANGE PLAN REVISION RECOMMENDATIONS

SED has four separate divisions, each of which includes technologists who work to some degree with K-12 schools. Several years ago, these officials met regularly to coordinate projects. This is no longer the case. As part of its revision of the Long Range Plan, SED should revisit its organizational structure or at a minimum direct these departments to work together. SED should also address the following concerns:

- **The Long Range Plan needs to address more issues.** The revised plan should discuss funding resources and resource inequities among schools, ways for schools to make better use of the existing resources, adaptive technologies for special education students who are being mainstreamed into classrooms throughout the State, teacher training, technical assistance, curriculum development, and business partnership resources for schools.

- **As with the first LRP development process, the revision should start from the bottom up, by including teachers, school administrators and technology coordinators,**

community members, business representatives, and SED staff -- all within and outside of SED who will be involved with implementing the plan.

OTHER PROPOSED RECOMMENDATIONS

- **Either before or during the revision of the LRP (and certainly before new funding streams are created), SED should conduct a statewide, building level needs assessment to determine what assistance schools need to successfully utilize computers and other technology resources, how they use and plan to use their resources, what kind of planning, training, technical assistance they have, and how they are funding or plan to fund technology.**

- **As recommended in the LRP, SED should conduct a representative annual survey of teachers to determine access to and effectiveness of tech-enhanced classroom resources as intended in the "Vision of the Future."** The survey should also assess the level and effectiveness of training teachers receive and their involvement with local technology planning.

- **The LRP should establish goals, timetables, and requirements for coordination for the various units within SED that work with schools and BOCES to develop technology.** As noted in the Federal Goals 2000[23] literature: "The most often reported barrier to statewide technology implementation is lack of state level coordination among various agencies with the local needs and resources of education, community agencies, and businesses."

- **The revised plan should better reflect the Federal Goals 2000 Act planning requirement**, which mandates a state technology plan that includes the objectives for impact assessment -- the impact on student achievement and aggregate achievement -- and a followup report to the U.S. Department of Education. Goals 2000 aid also stipulates that each state should ensure sufficient and ongoing funding for districts and schools to sustain the continued use of technology as articulated in the state plan.

- **SED should establish a process for ongoing review and modification of the plan to meet the changing needs of students, with consideration for new educational reforms and emerging technologies.**

- **The Department should include a summary of all the State funds available for technology equipment, services and planning in its revised Long Range Plan, or as a supplementary document for school district and building use.**

- **SED should create a clearinghouse of educational technology resources, accessible**

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[23] Developing the Goals 2000 State Educational Technology Plan by John Cradler, et. al. Second revision, Executive Summary, June 1994. Produced by the funds of the U.S. Department of Education. The Federal Goals 2000 act promotes the integration of technology in schools, provides funding for staff and curriculum development.

to the entire education community. (As recommended in New Jersey's Educational Technology Plan). Perhaps SED could expand its Transferring Success program to include technology programs. Through this program, SED validates successful programs by sending a team of staff, and summarizes the school's recipe for success, which is then listed in a document available to all schools. Schools that adopt validated programs are eligible for supplementary State aid.

- **The LRP should include other Goals 2000 recommendations**, such as how technology will be used in regard to: performance standards; the opportunity to learn; school-to-work activities; performance assessment; research and development; resource dissemination; and, at-risk students.

- **SED should finalize the current draft of "Building a Technology Planning Process," and distribute it to all schools. Perhaps surveys could be included within this document to assess school uses of and needs for technology.**

- **SED should consider including technology plans in The New Compact For Learning, which requires "all school districts to develop long-range educational plans."**

SED should:

- **Help coordinate the expansion of Model Schools, especially in New York City and other Big 5 City School Districts;**

- **Simplify the Chapter 793 five-year computer plans, and more carefully review their content and better enforce statutory provisions;**

- **Expand the content of Technology Applications Quarterly; and**

- **Continue holding regional technology conferences.**

SCHOOL BUILDING TECHNOLOGY RESOURCES

OVERVIEW

New York State's K-12 public school system comprises more than 2.7 million students in about 4,065 buildings, each building with varying technological resources and capabilities. While the number of computers in schools increases each year[24], the overwhelming majority of schools do not have clusters of five to six networked computers in classrooms, as envisioned by the Regents Long Range Plan for technology, and most students do not have regular access to current educational software.

Every one of the State's 716 school districts has technology and audio visual resources for instructional purposes, including: computers, although very few are high-powered and/or networked; CD-Rom players; VCRs; and television sets. Many innovative programs are underway throughout New York, in which students learn Russian through interactive distance learning, collaborate on projects with foreign and other New York State school students over the Internet, and use the Internet to explore the galaxy, dig in Mayan ruins, and converse with their favorite authors.[25] In fact, New York boasts one of the highest speed K-12 educational computer networks in the country -- the Living Schoolbook project, through which students in five schools can see and talk to each other while working on the same project.[26]

Although the primary question that should be asked is how well do technological tools in schools help teachers teach and children learn, this question cannot be answered qualitatively because no such statewide data are collected in New York. SED's data speaks only to equipment inventories, and, as of 1995, the existence of local area networks in schools and Internet access in school libraries. The Department's data show that although New York State public schools are acquiring more resources annually, there is a potentially widening gap among technology-rich and technology-poor schools. Across the board, SED's data shows that students in large city school districts, especially New York City, have far less access to just about all technology resources than students in suburban school districts.

Aside from physical technology equipment, the types of services and providers available to schools in different regions of the State vary; it is unknown what services and which providers schools are using, and how effective these services and providers are. For the most part, schools outside the Big 5 rely on BOCES to deliver computer and distance learning services. These schools also participate in regional groups, and hire consultants and/or in-house

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[24] The student to computer ratio declined from 28 to 1 in 1985 to 10.3 to 1 in 1995, meaning more students had access to a computer.

[25] New York State. Department of Education. Touching Lives. New York: March 1996

[26] See page 37.

technologists. The Big 5 primarily rely on their central boards of education (Buffalo purchase BOCES services), but also hire consultants, vendors, or in-house experts. The Big 5 City School District Boards of Education vary in the extent to which they offer their schools instructional and management computer services. For the most part, Syracuse is the only big city district that offers ongoing instructional support and services to its schools; while all of the other districts either directly provide or offer management computer services to schools.

This section of the report attempts to illustrate what is known about computer and other technological equipment in New York State public schools.

STATEWIDE STATISTICS FOR COMPUTER/TECHNOLOGY RESOURCES

Throughout the past ten years, SED has kept an inventory of technology equipment in each school building. Each public and private school building in New York State is required to annually complete a Basic Educational Data System (BEDS) form, which includes questions about enrollment, personnel, performance and technology items in the school.[27] The BEDS data show annual increases in schools' acquisition of computers, computer peripherals, (such as modems and CD-ROM players), and video and other technology resources, such as video cassette recorders (VCRs) and cable television access.[28] The following chart shows annual increases in student access to these tools.

[27] McKinney's Consolidated Laws of New York. Education Law. Sections 207, 215. West Publishing Company, 1996.

[28] Computer counts on the 1995 BEDS form, which records 1995-96 school year statistics, will not be complete until June 1996 because many schools misread or misunderstood the revised form. SED is re-surveying these schools.

TECHNOLOGY RESOURCES WITHIN PUBLIC K-12 SCHOOL BUILDINGS OVER THE PAST SIX YEARS[29]

Resource	1990-91	1991-92	1992-93	1993-94	1994-95	1995-96
Microcomputer (student to computer ratio)	14:1	13.3:1	12.3:1	11.3:1	10.3:1	9.7:1
CD-ROM Player (% of Schools with at least one)	NA	NA	NA	55%	71%	80.7%
VCR (student to VCR ratio)	97.6:1	89.9:1	85.3:1	76:1	81.2:1	79.6:1
Television (student to TV ratio)	60.2:1	59.6:1	62.1:1	58:1	59.1:1	55:1
Public TV reception (% of schools)	86.9%	87%	85.9%	86%	88%	86.3%
Cable TV reception (% of schools)	65.9%	69.8%	70.8%	73%	79%	79.9%
Distance Learning (% of schools)	NA	NA	10%	NA	14%	14.4%

The BEDS data also reveal a persistent inequity in computer and other technology resources. School districts with the greatest financial need, New York City, the other large city school districts, and some rural districts, tend to have fewer and older computers and fewer technology resources, such as CD-ROM players, modems, cable television access and computer network connections.

NUMBER OF STUDENTS PER RESOURCE					
School District Types	**CD-ROM Player - Slow**	**CD-ROM Player - Fast**	**Video Disk Player**	**Modems Slow**	**Modems Fast**
New York City	192.10	1156.44	808.61	658.94	5376.83
Large Cities	85.49	1030.76	495.25	558.52	2535.66
Other Cities	91.03	585.54	419.64	348.73	1865.06
Suburban	92.37	341.80	448.10	367.88	1813.73
Rural	67.85	356.81	463.77	281.87	1793.52
Statewide Average	105.77	694.27	527.07	443.19	2676.96

[29] Based on SED's BEDS data over the past six years and New York State. Department of Education - Office of Elementary, Middle, Secondary and Continuing Education Technology Services. Where Are We? A Status Report on Technology in New York State Public Schools. New York: 1994-95 School Year.

In the 1994-95 school year, the statewide average ratio for students to computers in K-12 public schools was 10.3 to 1, in line with the national average.[30] The average ratio in New York City, which comprises 37 percent of the State public school student population, was 15 to 1. While a large percentage of New York City's public school population is defined as minority (82.9 percent in the 1994-95 school year), all high-minority population schools statewide tend to have fewer resources than schools with low minority student populations.

The following chart compares the student to computer ratios across types of districts and the percentage of minority students: (The computers include both old and new models in the 1993-94 school year.)[31]

AREAS	PERCENTAGES OF MINORITY STUDENTS				
----------	0-20%	21-40%	41-60%	61-80%	81-100%
New York City	18.8:1	16.1:1	15.4:1	16.3:1	16.1:1
Large city districts	NA	11.6:1	12.3:1	10.9:1	10.5:1
Non Big 5	9.2:1	9.9:1	8.6:1	9.2:1	10.7:1
Total	9.4:1	10.8:1	12.3:1	12.8:1	15.4:1

COMPUTERS AND THEIR CAPABILITIES

Different schools may have similar student to computer ratios, but the learning experience for students in a school equipped with new, networked computers located in classrooms, compared with a school with 11-year-old models in a computer laboratory is completely different. For instance, one Western New York school district has a student to computer ratio of nine to one, which would be considered technology-rich by most standards. However, 90 percent of those computers are not networked and are capable of only basic drills, restricting use of current educational software.

In another instance, Richmond Hill High School has only four computer labs for its 3,100 students, and all have equipment 8 to 10 years old. With little money to upgrade hardware, the school squeezes the most from what it has, publishing student magazines on the art room Macintoshes. But Richmond Hill also finds itself forced to buy software of increasingly limited

[30] Quality Education Data, Inc. Technology in Public Schools. 1995; 14th edition.

[31] New York State. The University of the State of New York and The Department of Education. New York The State of Learning. 1995. Large city districts excludes New York City.

usefulness for its old machines.[32]

In examining the use of technology in schools, one must look beyond the number of computers in a building and study their use and capabilities. The BEDS statistics do provide some more insight into ages and capabilities of school computers, whether a school building has CD-ROM players, the number of modems in each building, and how many computers are connected to a local area network. What the BEDs data do not demonstrate, however, is how frequently, where, and how the computers are used. And no data show the kinds of peripherals and software the computer can support; how multiple technologies are combined or connected; and whether the location of computers or distance learning equipment is conducive to frequent and effective use by teachers and students.

The BEDs statistics indicate that only 33 percent of the computers in New York State public schools statewide in the 1994-95 school year were considered new and therefore capable of running new multi-media software used for educational purposes.[33] To better reflect the ages and capabilities of microcomputers in schools, the most recent BEDS form was revised. However, SED has reason to believe that a group of schools misread questions about computer types and LAN connections on the new form and is re-surveying schools with a June deadline.

A State-sponsored NYERSNet study, released in April 1996, redefines what are considered new machines as "high powered microcomputers," (486 or higher, or Mac 68040 or PowerMacs) which are "necessary to support the interactive, multimedia and networking applications which are now available."[34] Using that definition, the 1995-96 BEDS statistics reveal that only 20.8 percent of school computers are "high powered."[35] That percentage drops to 14.9 percent for New York City schools, and increases for more wealthy regions, such as Nassau and Suffolk counties, which reported that 24.8 percent of their computers were high-powered, and for the Mid-Hudson region suburbs, were 22.9 percent of their computers were considered high-powered.

These statistics are somewhat misleading for two reasons: the State average is raised by

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[32] Brenna, Susan. "Largess Vital To Literacy In Computers In New York." The New York Times. December 20, 1995: B-1

[33] 1994-95 school year data derived from New York State. The University of the State of New York and the Department of Education. New York The State of Learning. Submitted 1996. Note: BEDS data reveals that 30 percent of the computers in New York City schools were considered new; 47 percent in large city districts; 33 percent in all other school districts.

[34] NYSERNet, Inc. Network Access Use and Costs In K-12 Schools and Libraries. March 1996. The NYSERNet study was conducted under contract by the New York State Science and Technology Foundation. Note: The 1995-96 BEDS form enabled more revealing data on computer capabilities than in prior years.

[35] These 1995-96 microcomputer statistics may not be accurate. SED is re-surveying schools with a June deadline.

the fact that a few schools (one percent) have 100 percent of their computers high-powered; and, these numbers include computers in school libraries or library media centers, and could include computers used for administrative purposes as the BEDS form does not differentiate between administrative and instructional use.

The 1995-96 school year BEDS form asked schools to indicate the speed of their CD-ROM players, which had not been sought in the past. Higher speed CD-ROM players give at least some indication of the capability of a computer. The BEDs data reveals that very few schools, only 10 percent, have triple speed or higher CD-ROM players; and that the average school has about two single or double speed CD-ROM drives, with 10 percent having about 13 per building.

Students in many schools throughout the State, especially in New York City, are at a further disadvantage because of their school buildings' age and condition. Several infrastructure problems limit and/or preclude the use of computers in schools, such as inadequate electrical capacity or wiring, and perhaps lack of air conditioning or security.[36] Additionally, in many school districts, serious infrastructure problems such as collapsing facades and rusted structural beams, take a precedence in the allocation of resources to installation of computers. Not only are basic computer resources scarce now in some buildings, the likelihood of using networked computers or wiring a building for even cable television is slim.[37]

Because of infrastructure and safety problems, many schools have installed all of their computers in one or two separate computer laboratories instead of wiring individual classrooms. This approach limits student and teacher access to computers and is not considered the most effective way of integrating technology within the curriculum.[38]

SED also asks schools in the BEDS survey to list the number of teachers and students who have "regular" access to computer resources. The Department defines regular use as direct interaction with a computer or computer terminal, as part of a planned sequence of instructional activities, either as an instructional tool or as an object of instruction. Over time, the data show increases in regular use. However, not only do the data fail to distinguish between types of uses, it also does not assess the quality and hence utility of the equipment. Teachers and students could have regular use on antiquated equipment, which may be capable of no more than basic drills. Taking these factors into account, one can still see disparities in use by students in different regions. According to the 1995-96 BEDs data, only 59 percent of students in New

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[36] The National Center for Education Statistics estimates that 65 percent of schools are more than 35 years old, and have not undergone a major retrofit. The McKinsey study estimates that it would cost about $63,500 per school for asbestos removal and additional retrofitting for technology.

[37] New York State. Department of Education. The State of Learning. New York: 1995.

[38] United States. Congress. Office of Technology and Assessment. Teachers and Technology: Making The Connection. Washington, DC: 1995.

York City schools had regular access to computers, compared with 81 percent in suburban schools throughout the State.

TELECOMMUNICATIONS/NETWORKING CAPABILITIES

Telecommunications networks, such as the Internet, can greatly expand classroom resources, ensure up-to-date and thorough information, and create new relationships among students and teachers around the world. Universal access to the Internet, a Federal and State goal, is expected to balance current inequities among the 'information haves and have-nots' by allowing all students access to the growing world of electronic information resources. Available data indicate that very few computers in New York State public schools are networked locally or to remote resources, such as the Internet; although about 40 percent of schools do have some level of Internet access somewhere in the building.

There are obstacles for certain schools, especially schools in low-wealth districts, that need to be addressed before the potential of these networks can be realized. Services accessible by any given school depend on equipment within the school and the bandwidth available.[39] As warned by the GAO, and certainly a reality New York State must address, differences in school building infrastructures and access to connections could further increase inequality among schools.[40] SED is proposing legislation to help subsidize schools' external connectivity fees.[41]

Computer networks use electronic pathways (wired or radio-based) to connect one computer with others, enabling a person at one terminal to communicate with other users, to transfer information electronically and to use computers in a distant location. A Local Area Network (LAN) usually connects computers in a building, and a Wide Area Network (WAN) connects buildings or more remote computers.[42] These networks are used for multiple instructional and school management purposes, such as enabling teacher access to student

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[39] As defined by McKinsey & Company, Inc., bandwidth refers to the amount of information that can be transmitted over a network within a given time. Just as only so much water can flow through a 12" drain pipe, networks also have capacity limitations.

[40] United States. Congress. School Facilities: America's Schools Not Designed or Equipped For 21st Century. Washington, DC: GAO, April 1995.

[41] The Omnibus Technology in Education Act of 1996.

[42] Wireless LANs have existed for some time and have proven reliable, according to the McKinsey & Company, Inc., study. However, there are a number of limitations for urban and suburban areas: a clear line of sight is required; reliability can be low; only data and digitized video can be transmitted; and there is potential for clogging the bandwidth as more people use wireless connections. It is unclear whether FCC plans to set aside portions of the airwaves for free and unlicensed high-speed communications over short distances (using a band of radio frequencies) will be a solution for some schools that would otherwise be faced with tearing up floors and ceilings to lay cable.

information systems or increasing communications between faculty within a district.

There are several ways that a school can connect to a WAN and/or the Internet.[43] Modems connect a computer to another computer (outside of the classroom) through a regular telephone line. Higher speed options for connecting to the Internet include connections via LANs, high-speed phone lines, and dedicated connections. Other models of connectivity include Integrated Services Digital Network (ISDN)[44], satellites, digital cable, or other linking technologies. Technologists seem to agree that schools will need a certain bandwidth (256 Kb or higher, T-1[45]) to allow multiple users to access the Internet and other electronic information resources, and that dial-up connections are not a long-term solution if a school wants to have widespread Internet access.

Modems: Schools have very few modems, particularly high speed modems, for networking; only 2.6 percent of all microcomputers are connected to a modem, and those could possibly include administrative computers. "This severely limits a school's ability to access highly graphical applications such as the World Wide Web on the Internet," as noted in the NYSERNet study.[46]

While the 1995-96 BEDs form asks schools to report the number of modems per building, these data do not reveal much about the average teacher's access to telecomputing. Many teachers may consider access to a modem anywhere in the school sufficient for the occasional special project. Over the long run, however, if telecomputing is to be used regularly, classroom access to a modem or alternative connection will be necessary. Most schools use a single phone line to dial up modem and computer. According to a national study, a lack of telephone lines in schools and especially classrooms is cited as the greatest barrier to a teacher's participation in electronic communications.[47]

The percentage of classrooms in New York State public schools with telephone lines to

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[43] The levels of Internet connectivity vary, starting with e-mail only access, and progressing through to file transfer capabilities and to other services.

[44] ISDN: Integrated Services Digital Network, a worldwide digital transmission network and format that can carry both data and voice over a single cable at speeds of 56 kbps and higher.

[45] A T-1 Line is a long distance, point-to-point communications channel that is capable of transmitting data in greater quantity and at faster speeds than the majority of existing telephone lines.

[46] The World Wide Web is an Internet interface to help end-user search and retrieval of information.

[47] Statewide information on school building infrastructure is limited. A federal GAO report School Facilities: America's Schools Not Designed or Equipped for the 21st Century, April 1995, noted that the majority of schools surveyed did not have access to major telecommunications information links. "Far from the high-tech world of interactive media and virtual reality, many of our schools are wired for no more than filmstrip projectors." This report found that: more than one-third of schools do not have sufficient electrical power for computers and communications technology.

the outside is very small, with the overwhelming majority of schools reporting zero, one, two or three classrooms with outside lines. The statewide average is five percent of all classrooms, with some individual buildings reporting 55, 74 and more classrooms with outside lines. The NYSERnet study cautions that sometimes schools have a single outside line connected to many classrooms, shared by many teachers. Each classroom can dial out, but only one at a time.

LANS: The 1995 BEDs form reveals that 24 percent of all computers in schools are connected to LANs; however, the data indicates that LANs exist in a small number of buildings. New York City schools have fewer building LANs than other regions of the State, with only 15 percent of computers connected. While most of the City schools have a telecommunications connection to the City Board of Education for computer management purposes[48], wiring classrooms in New York City would be an expensive proposition because of the age and poor condition of most school buildings, safety concerns, lack of air conditioning, and asbestos problems. The City Board of Education estimates it will need about $7.5 billion for school construction over the next few years, which would include wiring for technology.[49]

Internet Access: Based on SED's 1995-96 school year BEDs data, about 40 percent of all school buildings in New York State have some level of Internet access, either in a classroom, library or a business office.[50] Little else is known about the type, use or speed of access. That percentage level is sure to grow in the coming years as many more schools are planning to allow student access to the Internet.

A 1996 national study found that 50 percent of all schools have Internet access, while only 9 percent of all classrooms do.[51] This is a large increase from data reported in a 1995 GAO report[52] which found that nationally 35 percent of public schools have some Internet access, while only 3 percent of all instructional rooms -- including classrooms, labs and media centers -- were connected to the Internet. These studies also found that Internet access is more prevalent in secondary rather than elementary schools.

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[48] "Automate the Schools" -- a computerized student information system -- in New York City connects all city schools with a broadband T-1 connection, capable of accommodating New York City schools' data transmissions, but not video transmissions. New York City Public School System Automate the Schools Project Management Report, SMA Management Systems, Inc., February 1995, New York.

[49] Steinberg, Jacques. "Schools Facing 'Three-Way Squeeze.'" New York Times. February 4, 1996 p. 41.

[50] This statistic is based on a NYSERNet calculation derived by adding BEDS data on Internet access in the library and additional E-Mail accounts in schools that did not report having Internet access in the school library.

[51] Survey of Advanced Telecommunications in U.S. Public Schools, K-12, National Center for Educational Statistics, February 1996, nationally representative sample of 917 public schools.

[52] United States. Congress. Advanced Telecommunications In U.S. Public Schools, K-12. Washington, DC: GAO, Feb. 1995. Differences in numbers could reflect actual increases and/or differences in survey methodology.

To reach the Internet directly, a user must go through an Internet node, which can be installed within a school building. The Ralph Bunche Elementary School in Harlem, where students themselves installed the Netscape browser, take advantage of the World Wide Web through this means. This route may cost a school more money initially but may be more cost effective and certainly less limiting in the long run, as it supports many users at the same time and offers access to innovative and high speed telecommuting innovations. Indirect connections are cheaper, and can be made by connecting a school building LAN to another one nearby that has Internet connectivity, which could be at district headquarters, a college, or a friendly business.

According to the NYSERNet study, schools may find they have connection options, depending on where they are located. Telephone company connections are the most widely available. However, high bandwidth telephone connections are not available in rural areas, and therefore telecommuting costs in these regions are two to four times higher than elsewhere in the State. Cable television is the most prevalent networking connection in schools, 63.5 percent of public and nonpublic schools have at least a central cable connection. These cable connections are generally capable of only one-way broadcast transmission, although cable companies are moving toward installation of lines that would enable two-way, interactive transmissions.[53] The NYSERNet study assumes that telephone companies are likely to provide a "very significant portion of the network connections to schools and libraries for some time into the future."

Within the next year or so many schools in the suburbs outside of New York City may install points of presence.[54] This service is offered by a private consultant through BOCES, and as marketed, is expected to cost schools little money, if any.[55] The vendor pays all costs for the installation and maintenance of the server within the school building, and solicits community members to purchase network connectivity through the school, charging a competitive monthly Internet access fee. The school then receives 10 percent of fees collected from community members to offset their monthly access fees and telecommuting costs. Another component of this service, is the accompanying proprietary software, which enables innovative and educational uses of network resources, and allows teachers to more easily adapt Internet use for classroom instruction.

Technologies Network Ties (TNT) had served as a gateway (an indirect connection) to the Internet and other remote networks for scattered BOCES component schools throughout the State, although accessing information was arduous and slow. Since dismantling this connection,

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[53] Several cable companies are conducting pilot projects in New York State to deliver two-way Internet access.

[54] Pursuant to the Federal Telecommunications Act of 1996 states must establish discounts for services provided to schools and libraries. Selling access may prohibit schools from receiving a discount for telecommunications charges.

[55] Community School Networks, Inc.

many schools throughout the State have begun purchasing Internet services through BOCES or connecting through other services, such as America OnLine, Compuserv and NYSERNet. There are no aggregated or readily available data on how many schools are accessing Internet through any of these providers.

If a component school district obtains Internet access through BOCES, it is eligible for State aid, whereas non-component districts are not eligible for State aid for Internet access.[56] Some within the educational sector argue that, besides the apparent inequity of giving aid to some and not to others, accessing the Internet through BOCES simply adds another layer of cost. BOCES superintendents, however, argue that they are able to offer reduced rates to schools, and provide training and network management. Unfortunately, rate information is reported to SED in a way that cannot be easily verified. What is known is that access and pricing methods vary among BOCES, and it is difficult to assess the cost effectiveness of this service, or even the quality of any training provided.

DISTANCE LEARNING

Distance learning activities in New York State are increasing annually -- e.g. interactive high school courses, staff development and training sessions for teachers, two-way video with NASA for elementary school children. The majority of distance learning activities are in BOCES regions[57], which provide network management and technical assistance. In the 1995-96 school year, 586 buildings -- 14.4 percent of all public school buildings -- were expected to be involved in some sort of distance learning activity.[58] The BEDS definition of distance learning is very broad: "instruction that occurs at a point distant from the location of the learner with an interactive audio or visual component." As warned by the NYSERnet study, this definition could, however, "exclude a range of computer-based interactive teaching and learning activities."

Sending video over networks requires substantial bandwidth and entails higher costs than other options. Most of the distance learning networks in the State are two-way video and two-way audio. Most use dedicated fiber optic lines, some of which utilize ISDN technologies. Both have advantages and disadvantages. The advantages of ISDN are that it is cheaper and users can dial up anywhere; however, its picture is a bit distorted and slow compared to broadcast video. Dedicated lines provide sharp and accurate images; however, the schools on the network are limited to accessing only those schools with connected dedicated lines.

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[56] BOCES shared aid services, see p. 45

[57] According to The Myers Group, a private consulting firm that has been involved with the development of most distance learning networks in New York, in Fall 1995, 25 of 38 BOCES offered two-way video distance learning networks in more than 130 districts, offering more than 150 courses per day. All BOCES in the state were expected to issue a Request For Proposals to build a fiber network connecting each BOCES for the purpose of transmitting data, voice and video.

[58] 1995-96 BEDS data.

Distance learning is most often used by high schools in remote, rural, or sparsely populated areas and by other schools that lack resources, such as a qualified teacher for a low-enrollment course. Distance learning allows high schools, for example, to offer courses such as advanced calculus, Japanese, and Russian, that may not be available otherwise, and many schools use the system for delivering staff development and training to teachers and administrators.

The Living Schoolbook, which uses one of the highest speed networks in the nation, NYNET, connects five schools (four in Central New York and one in New York City) delivering interactive educational programming. Using this network, students in various schools can see and talk to each other while working on the same project.[59]

A few hundred students a week access the network through two computers in each of the schools. It's difficult to assess the program's effectiveness because it is not used in a regular classroom and is not part of the regular curriculum. Increased motivation among students is a clear outcome, according to the Dean of Syracuse University's School of Education, which is working in collaboration with the Northeast Parallel Architectures Center (NPAC), Columbia University's Teachers College, NYNEX and US Air Force Rome Laboratory. Measuring overall effectiveness and the benefit of replication or extension to additional schools should be a next step. Other regions want to hook up, like Oswego, but there is no telephone line from Syracuse to Oswego.

The Appalachian Regional Commission, which encompasses 13 states, including the Southern Tier of New York State, has an extensive distance learning system that cuts across all sectors of the community, including schools, health and social service facilities. This project is primarily federally funded.

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[59] The Living Schoolbook project, which began operation in May 1995 after 16 months of planning, training and testing, enables students to tap into vast resources of universities and research facilities. The public/private partnership project is funded in part through the New York State Science and Technology Foundation ($600,000 in 1994-95). Syracuse University and Columbia University prepared teachers to use the interactive applications in the classroom and assess student learning, while NYNEX laid down the fiber optic connections and provided technical support. Rome Laboratory is overseeing day-to-day management and maintenance, and providing technical assistance.

SCHOOL LIBRARY TECHNOLOGY RESOURCES

As noted in planning documents, the school library is typically the best point for the initial deployment of computer, multimedia and networking technology in a school. School librarians typically are already using computers and networks, and are often working with all the teachers in a school to integrate technology into the curriculum. To create an effective "beachhead" for technology in a school building, the school library should have at least five workstations, as recommended by SED. Larger schools may need more workstations.

The BEDS form asks about library media resources, such as the number of computers; whether there is a computer with a modem and telephone line; a computer with CD-ROM player; a telephone with direct access to an outside line; an automated circulation system; and an online public access catalog. SED BEDS data do not reveal whether classroom computers are connected to library services, and cannot be manipulated to determine whether these libraries exist in high or low need districts.

The vast majority of public schools have at least one computer in the school library, and over 40 percent have at least one computer with a modem and a phone line in the school library. The school library/media center is often the point of origin for a great deal of telecommunications and networking activities. CD-ROM access is available in the school library of nearly 60 percent of schools. Over 20 percent of schools have electronic circulation systems and public access card catalog systems. About 61 percent of the State's public schools have a telephone with direct access to an outside line in the school library. Although over half of schools have dial-up access in their school libraries, the percentage of schools with telephone access from the classroom is very limited.

PUBLIC K-12 SCHOOL LIBRARY RESOURCES[60]

Resource	1992-93	%	1993-94	%	1994-95	%	1995-96	%
library computer with modem	1224	31%	1390	36%	1756	45%	2155	53%
online public access to library catalog	429	11%	578	15%	771	20%	1014	25%
at least one computer in library with Internet access	NA	NA	NA	NA	NA	NA	1557	38%

[60] The data are based on BEDs statistics over the past four years.

PROPOSED RECOMMENDATIONS

The Fall 1995 BEDs form (for the 1995-96 school year) has been revised to better reveal the age and capabilities of computers, and identifies how many buildings have LANs. The form also asks for the number of classrooms with an outside telephone line. However, there are still many shortcomings to these data. They still do not indicate how technology is used, how effective it is in enhancing education, and what technical support is provided to teachers. SED's Long Range Plan and many national reports and studies all recommend knowing more about usage.

The BEDS form should be revised as follows:

- **Distinguish computers used for instructional activities from those used for administrative purposes.** Although most school districts probably infer that SED is asking for information about computers used for instructional purposes, the BEDs form (or instructions) does not differentiate between administrative and instructional computers. Most of the computers listed on the BEDS form can be used for both purposes. SED may also want to distinguish laptop computers from workstations.

- **Exclude from the technology page computers located in the school library or library media center.** These computers are already accounted for in a separate section of the BEDS form.

- **Expand the BEDS question regarding regular use of computers by students and teachers to better reflect type of use.** The BEDS results don't measure effectiveness or give any indication as to how computers are used. There is only one very general question that asks schools to enter the number of students and teachers, separately, who regularly use computer resources. Regular use is defined as direct interaction with a computer or computer terminal, as part of a planned sequence of instructional activities, either as an instructional tool or as an object of instruction. This could include basic drills.

- **Clearly define LANs used for instructional purposes.**

- **Either through a revised form, or through another survey, SED should track or try to assess the following:**

    - **Whether existing technologies are arranged and organized in a way that is conducive to frequent and effective use by teachers and students.** Are different kinds of technologies located in a central place or in individual classrooms? Can existing equipment be made more mobile? Is there a LAN, and could it be used for more purposes than at present? Are specific kinds of technologies "reserved" for certain kinds of teachers and students, such as advanced-level science students or business education students? Is the hardware situated so that it can be used effectively for different kinds

of instruction, such as group projects, buddy learning, or individualized study or research? The kinds of support that teachers need to use the infrastructure effectively needs to be examined: integration of technology into every day teaching, the use of technologies for two-way communication, and how technologies encourage the best instructional practices.

- **Actual computer locations, whether they are in classrooms, computer laboratories, or elsewhere.** The more recent form no longer asks for the number of computer laboratories in the school building.

- **How much or in what ways teachers take advantage of existing network access.** Future studies should focus on the uses of those new media, how they affect student learning and performance of teachers.

- **Services available to integrate and utilize technology to encourage best instructional uses.**

OTHER PROPOSED RECOMMENDATIONS

- **The Department should continue its efforts to bring costs down for schools, such as its involvement in procuring funding and establishing a company in the Bronx that retrofits used, but modern, computers, and resells them to schools at a low cost.**

- **SED should continue to urge the Public Service Commission to require that telecommunications providers offer discounted rates to schools and libraries for telecommuting.**

COMPUTER AND TECHNOLOGY FUNDING

OVERVIEW

Although an exact dollar amount is difficult to ascertain, Oversight Committee staff estimates that New York State aid for K-12 public school computer and technology equipment and services, both for management and instructional purposes, was about $140 million in the 1994-95 school year. SED estimates that local revenue (property taxes) supports the bulk of overall expenditures, almost two-thirds of the total; and it is growing.[61] The remainder of funds come from Federal aid, public-private partnerships and foundations.

Many state and national studies cite two major obstacles to true integration of technology in schools: the lack of teacher training and funding. An obvious discrepancy in New York State is that schools in wealthy regions spend more per student than schools in less wealthy regions. State aid, although mostly paid in inverse proportion to property wealth, cannot make up the difference. Schools in low wealth districts tend to have less money to spend on technology for students, and fewer resources to apply for funding. These schools are usually unable to get local bond issues passed to pay for start-up costs or upgrades, or even more basic infrastructure needs. These districts need seed money, which current state aid often does not support.

Pockets of high-tech schools do exist in low-wealth districts thanks to a variety of State, Federal, private and nonprofit competitive grant programs. Many schools throughout the state benefit from these programs because they happen to have experienced grant writers. For instance, Intermediate School 252 in Queens obtained high quality computer instruction in math and science after competing for and receiving $1.6 million in Federal demonstration grants, with additional funding expected over the next five years.[62]

The State Education Department staff has developed public-private partnerships which have generated about $18 million in equipment and services in the past six years. Much of this has been targeted to low performing schools throughout the state, although not necessarily low wealth schools. An additional $10 million a year for five years will flow to schools, especially low-wealth schools, libraries and BOCES through the NYNEX diffusion fund.[63]

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[61] Estimates for local spending on technology cannot be broken down to determine how much schools are spending on the various components of computer installation and use. The Committee survey asks schools to estimate the percentage of their total budget dedicated toward management and instructional technologies and services.

[62] Brenna, Susan. "Largess Vital To Literacy In Computers In New York." The New York Times. December 20, 1995, B-1, B-14.

[63] The NYNEX Diffusion Fund will pay for telecommunications infrastructure, equipment and training in economically disadvantaged areas, especially urban and rural areas lacking sufficient telecommunications infrastructure to access electronic networks.

Also, federal aid, although generally decreasing in amount, has become more flexible in recent years, opening up money from more types of aid that can be used for the integration of computers and distance learning in curriculum. Although these funds are still not enough to equalize spending levels, school districts are using more federal aid for technology.

Oversight Committee staff attempted to determine how all of this money -- local, State, Federal, private and nonprofit revenue -- was divided among instructional, instructional support and management purposes. Due to inadequate reporting requirements and reported information, this is almost impossible to do. Based on interviews with local school, SED and BOCES officials, it appears that most of the money had been funding management applications but is increasingly being dedicated to instructional and instructional support purposes as schools expand their acquisition of computers. Committee staff could not determine how much of schools' budgets are dedicated to technology. The Committee survey asks that schools estimate the percentage of their total budgets dedicated to technology spending, broken down by several categories, e.g. hardware, software, and training.

A Regents' proposal, which the Legislature is now reviewing, would dedicate an additional $985 million over five years for the development of a statewide education telecommunications network. The proposal would fund interconnectivity, training, and many other facets of the network, with extra money targeted for low resource/high need districts and educational institutions.[64]

Before considering the Regents' proposal, it would make sense for the Legislature to determine how existing funds are spent. The State should have a better handle on how present dollars are spent, and alternative ways of funding technology in schools should be considered. If the goal remains the integration of computers and distance learning in all schools, the State must ensure that its money is effectively used. Current systems do not enable this determination to be made. This section will examine most of the major State funding streams available for technology in public schools, comment on issues of concern and finally, will assess proposals to alter how money is delivered to schools for these purposes.

STATE AID OVERVIEW

Current State aid for computer and technology equipment and services in public schools is divided into at least 12 major funding streams, most of which are earmarked for distinct purposes, such as computer hardware and software. The funds totaled about $140 million in the 1994-95 school year; however, the actual amount is difficult to determine because many State aid reporting requirements and SED databases do not segregate technology expenditures. [See chart on page 44 -- State Aid Categories.]

[64] The State of Ohio has decided to invest $495 million over two years for technology in schools; Kentucky, $570 million over six years; and, Texas $300 million over three years. Information is based on SED's compilation, March 1996.

The manner in which State education aid for computer and technology equipment and services is dispersed differs by category of aid and types of school districts. For instance, Big 5 City School District aid focuses mainly on hardware and management services, and outside the Big 5, school districts have to purchase BOCES services to tap into the bulk of aid available to them for technology services. Still, the fact remains that there is little State money available for training, staff development, curriculum integration and internal wiring, all of which are essential to true integration.

The tracking of State aid and local dollars spent on technology in schools differs by type of aid. Only aid dedicated exclusively to technology purposes, such as hardware aid, is tracked. Many types of aid are for general purposes, such as Building Aid, which can be used in part for computers. SED does not know the amount of this aid dedicated to technology. Also, aside from anecdotal information, it is impossible to verify how this money is spent or measure the effectiveness of any one of these funding streams using data currently available. The Oversight Committee survey seeks school district comment on State aid.

GENERAL STATE AID PROPOSED RECOMMENDATIONS

- **State aid should better support human resources: staff development, teacher training (pre- and in-service), curriculum development, and local planning for all schools.**

- **Consideration should be given to making training a required component of receiving State aid, as several other states have done in recent years, and adopting new federal standards so that more aid dedicated to curriculum is available for technology integration.**

- **The State should consider merging technology funding streams, allowing greater local district flexibility in spending for technology-related purposes, and ensuring that districts most in need of financial and technical support receive funding and assistance.**

- **The State should consider adopting a North Carolina strategy, which ensures effective planning and dedicated funding for schools. The state requires schools to submit long range technology plans before issuing funds. The funds accumulate and become available to the school when a plan is finally approved. [65]**

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[65] North Carolina established three dedicated funding streams for technology in schools: 1) guaranteed per-pupil base funding for all schools to be spent for whatever purposes; 2) supplemental funds for low-wealth schools; and, 3) supplemental funds for school systems which propose innovative technology initiatives that could be a model for other schools or which propose collaborative models in conjunction with other governmental agencies. Building the Foundation...Harnessing Technology for North Carolina Schools and Communities, May 1994, Public School Forum of North Carolina.

ESTIMATED STATE EDUCATIONAL/ADMINISTRATIVE COMPUTER AND TECHNOLOGY FUNDING

FUNDING SOURCE	DISTRIBUTION	HOW FUNDS CAN BE USED	1993-1994	1994-1995	1995-1996
Instructional Computer Hardware & Technology Equipment Aid **All public schools**	Formula-driven -- attendance No matching funds required	Instructional computer hardware and equipment; including up to 20 percent for repairs, training, staff development	$10,680,000	$10,680,000	$10,680,000
Instructional Computer Software Aid **All public school districts (required to loan software to private schools)**	Formula-driven -- enrollment No matching funds required	Instructional computer software	$9,530,000	$9,530,000	$9,530,000
BOCES Shared Services Aid **All public schools except the Big 5**	Formula-driven -- district wealth	BOCES management/instructional computer and technology services	NA	$51,000,000†	$65,000,000†
Comprehensive Instructional Management Systems (CIMS) **50% Big 5; 50% other schools**	Competitive grants	A portion of funds used for technology for the development/use of materials/reports/training to improve instruction, tracking student progress.	$5,500,000	$5,500,000	$5,500,000
Special Services Aid for Large City Schools **Big 5 city school districts**	Formula-driven -- attendance No matching funds required	Computer administrative aid for management purposes, funds everything from hardware to software to training to repair.	$31,080,000	$31,080,000	$31,080,000
Student Information Services (SIS) **Big 5 city school districts**	Formula driven	Planning, developing, and installing an on-line computerized records management system	$9,000,000	$9,000,000	$9,000,000
Teacher Resource and Computer Training Centers **School districts, BOCES, and consortiums of both**	Per center, funds can not exceed $2 million ($6 million for NYC) and can not be less than $20,000.	Demonstration/training sites where teachers are trained in the use of computers as teaching aids, the criteria for school acquisition and use of computer equipment and software, and the evaluation of computer-related materials.	$17,000,000	$9,500,000	$15,739,000
Learning Technology Grants **Public, private schools, BOCES,**	Competitive grants	Varied -- innovative, educational computer and technology curriculum projects	$0	$0	$3,500,000
School Building Aid **All public schools**	Formula-driven - wealth	A small portion of funds can be used for purchase/installation of hardware, conduit, wiring, powering in computer classrooms; and LANs and in-building elements of other WANs.	$10,000,000•	$10,000,000•	$10,000,000•

† Committee staff estimates based on SED data.

• Estimated amount provided by SED State Aid officials, representing 1 to 3 percent of Building Aid used by schools for technology.

STATE AID AND GRANT DESCRIPTIONS/COMMENTS

BOCES SHARED SERVICES AID

Shared services aid represents a large portion of all state education aid for computer and technology equipment and services, and is given only to school districts outside the Big 5 City School Districts to subsidize the costs of services purchased through Boards of Cooperative Education Services (BOCES). The 38 BOCES in New York provide an increasingly wide range of instructional and management services, including computer and technology services, such as Internet access, computer management applications, local area network installation and maintenance, and distance learning.

Shared Services Aid – Services	1992-93	1993-94	1994-95	1995-96
Management	$28,000,000	$34,000,000	NA	NA
Instructional	$21,000,000	$20,000,000	NA	NA
Other	$ 2,300,000	$11,181,672	NA	NA
Total	$51,300,000	$65,181,672	NA	NA

The intention of BOCES is to coordinate and provide shared services among schools in established regions, which enables schools to get many services they might not otherwise be able to afford or maintain individually. While not all school districts use BOCES for these services, some rely completely on BOCES for computer/technology services.

Shared services aid is only given to schools that purchase BOCES services. This automatically excludes the Big 5 City School Districts which, by law, cannot receive shared services aid. Even if school districts such as Buffalo do purchase BOCES services, they still do not qualify for this aid category. It also excludes schools outside the Big 5 City School Districts who do not purchase their services from BOCES.

BOCES charge participating school districts per service, for which schools receive aid. The ratio of aid a district receives is based entirely on its taxable property wealth per student, with higher aid ratios (higher reimbursement rates) for low wealth districts. For example, if a low-wealth district with an aid ratio of 80 percent purchases computer management services costing $100,000, they may get up to $80,000 in reimbursement. The operating aid ratios range from a low of 36 percent to a high of 90 percent, with the average being 49 percent. Some districts have a zero aid ratio because their property wealth is considered too high.

BOCES computer and technology related expenditures are increasing annually, much more so than any other state aid for computer/technology services. Since 1987-88, BOCES aid for computer/technology services has more than doubled. Meanwhile, other education aid for

computers/technology services has remained relatively static or increased in much smaller amounts. This situation is exacerbated by the tremendous student enrollment growths in New York City.

BOCES SHARED SERVICES AID COMMENTS

Shared services aid both supports and conflicts with the State's goals for integration of technology in schools. Through this funding stream and the structure of BOCES, many schools have been able to introduce an array of services, such as a Russian language or an advanced calculus class through distance learning that they would otherwise be unable to independently afford or maintain. On that count, this funding stream works well to support the State's goals.

However, many within the State's educational system criticize this aid category because it is not available to all schools, it limits schools' choice of providers and the quality of BOCES services is inconsistent throughout the State. There have also been many complaints about BOCES lack of accountability, which have been addressed in part through 1993 and 1994 legislative reforms.[66] It is still too early to determine the effectiveness of these reforms. Furthermore, the 1996-97 Executive budget proposes altering this funding stream in a profound way.[67]

It is difficult to determine the quality and cost-effectiveness of BOCES technology services other than through anecdotal testimony. Oversight Committee staff have heard strong praise, complacent satisfaction and harsh criticisms of services and have attempted to verify these comments in a comprehensive fashion. Because of inconsistent service descriptions and costs among BOCES, as well as inadequate reporting requirements and SED databases, however, it has not been possible to determine cost effectiveness and school satisfaction on a statewide basis. Also, BOCES regional computer plans, which are required to include school surveys of existing services, are too inconsistent to determine schools' satisfaction statewide.

Some criticisms of BOCES technology services were substantial enough for schools, some with high aid ratios, to forsake aid and hire their own staff, purchase services from private consultants or vendors and/or work with other school districts. While school officials often stress the need for BOCES, they also cite reasons why they have opted not to purchase BOCES technology services, such as: technology is outdated; does not meet needs; and, is not cost-effective. Some complain that certain BOCES services are overpriced and that it is the state aid subsidy that biases their decision to use BOCES services.

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[66] Chapter 602 of the Laws of 1994: The intention of this legislation was to strengthen BOCES budgeting practices, improve accountability and promote responsiveness to school district needs. Delays in implementation have not tested whether the law has achieved its goals. Chapter 295 of the Laws of 1993 were designed to improve accountability and control administrative spending.

[67] The Governor's proposed budget includes reductions in BOCES Shared Services Aid and reforms to allow school districts to receive aid without purchasing services through BOCES, but by purchasing services cooperatively.

PROPOSED RECOMMENDATIONS

- **All school districts should be supported in the goal of integrating technology in the classroom and administrative offices -- regardless of the entity that provides assistance.** Technology integration is a goal for all schools. This goal makes sense both educationally and fiscally. Yet, only schools purchasing BOCES services outside the Big 5 City School Districts can get aid for planning computer/technology integration in education, the Model Schools Program, accessing the Internet or distance learning. State aid should support this goal for all schools, not just those eligible to receive BOCES aid, and those who choose to purchase it from BOCES.

- **The State should enforce its mandate that BOCES provide training, staff development and support services to obtain aid.** Aside from quality of services, some school officials have complained that BOCES services are not worth purchasing because they include services, such as staff development, that the district does not want. This complaint is difficult to address because it runs counter to the LRP goals. The State should be ensuring that BOCES remain a service delivery vehicle, and that whatever purchases are made through BOCES come with proper training and support, especially if State aid is utilized.

- SED is considering changing the way BOCES technology services are approved. A formal revision has not been introduced yet. Whatever revisions are ultimately considered, **SED should set a goal of ensuring that BOCES technology services not only enhance education and school management, but are cost-effective and efficient, and that BOCES technology services are consistent with technological trends.**

- BOCES accountability remains an issue -- it is virtually impossible to figure out costs for services or State aid expenditures using SED's data. **SED should carefully examine and refine BOCES reporting requirements and how the Department uses the information it collects from BOCES.**

OTHER PROPOSED CHANGES

The proposed 1996-97 Executive Budget recommends reducing BOCES aid and allowing schools, who share services, to receive aid without purchasing the service through BOCES. This would only be applicable to the schools currently considered BOCES component schools. Specifically, the proposed budget includes the following recommendations:

- Cut BOCES shared services aid by 25 percent from what existing formulas would generate, capping each BOCES at 87.95 percent of this year's aid level.

- Allow schools, for the first time, to opt out of BOCES, and therefore not be responsible for BOCES administrative budgets.

- Allow schools (excluding the Big 5 City School Districts) to become eligible for shared services aid without purchasing services through BOCES, but by sharing services with other school districts.

While the Governor's proposal to allow aid for schools regardless of where they purchase the service is in line with the recommendations above, it still excludes the Big 5 City School Districts. This proposal has also been considered in the past by the Division of the Budget, but was rejected because it could have the effect of increasing costs and weakening services for districts with the least resources.[58] Whatever legislative action is ultimately taken must ensure that districts are not hurt, either fiscally or programmatically.

SPECIAL SERVICES AID FOR FIVE LARGE CITY SCHOOL DISTRICTS

This aid category -- which represents the second largest single funding stream for technology in schools -- is intended to parallel BOCES shared services aid for the Big 5 City School Districts (New York City, Buffalo, Rochester, Syracuse and Yonkers). It off-sets costs for vocational education and management technology. The computer administration aid portion, which has remained relatively static at $31 million for the past few years, allows funding for everything from hardware to software, from training to repair.

The aid formula stipulates distribution to the Big 5 City School Districts based on enrollment ($57.20 times K-12 enrollment), and does not require matching funds. There are no reporting requirements attached to this aid, except that it be reported on an annual school revenue and expenditure form. The aid is deposited into the cities' general operating budgets.

CONCERN

- The aid is deposited into the cities' general operating budgets. There is no system in place to track how this money is spent and whether it is used as intended.

PROPOSED RECOMMENDATION

- **The aid language should be changed to include instructional computer services as well as management services, and a system should be developed for tracking funding.**

[58] New York State. Division of the Budget. Management and Intergovernmental Systems Unit. Boards of Cooperative Educational Services Budgeting and Expenditure Report. New York: Dec. 1993.

INSTRUCTIONAL COMPUTER HARDWARE AND TECHNOLOGY EQUIPMENT AID

Most public school districts in New York are eligible to receive aid for instructional computer hardware, equipment and repair. The aid is a steady source of funding for initial purchase and maintenance of computers. The aid formula is entirely based on attendance. School districts that have a zero BOCES aid ratio get no hardware aid.

Hardware aid can also be used for the purchase or lease of micro and/or minicomputer equipment or terminals for instructional purposes and technology equipment used for instructional purposes with a useful life used with or in support of educational programs, including video, solar energy, robotics, satellite, laser and other such equipment. Up to 20 percent can be used for repair of instructional computer hardware and technical equipment or for staff training and development.

COMMENTS

- Hardware aid is not significant for most school districts. This funding stream has not increased much in the past five years, and the Executive budget proposal for the 1996-97 school year is static. A typical microcomputer costs about $1,200, not much less than what many school districts get annually.

- The aid is equally distributed based on attendance with no recognition of variations in pupil needs or local ability to pay for technology, therefore schools with greater need or lower wealth do not receive more money.

- Schools are required to submit a "plan" to SED that lists equipment purchases; however, there is little assurance that money is spent for instructional applications, or is part of a larger plan, as stipulated in law.[59] State aid form SA-100/19 B, schedules E1-7, requires school districts to list the number of units, descriptions, cost for computers, peripherals, telecommunications hardware, hardware boards, cables and audio-visual interface, other hardware, and repair and staff development. School districts certify that purchases are for instructional purposes, and SED staff attempts to verify this by the type of machine described. Many of these computers can be used for both educational and administrative purposes.

INSTRUCTIONAL COMPUTER SOFTWARE AID

Software aid is to be used for computer programs which students use as learning aids in a particular class. The aid formula is derived by multiplying the number of students enrolled in public and nonpublic schools within a district by $3.50. SED reimburses the school district

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[59] McKinney's Consolidated Laws of New York. State Education Law. Section 3602, Subd. 26.a. West Publishing Company, 1996.

for the amount of the software purchase, but in no case more than $3.50 a student.

Public schools are required to loan software to private schools upon request, at no cost. SED encourages public schools to consult with nonpublic schools regarding software (as well as textbook and library) aid.

PROPOSED RECOMMENDATION

- **The State should (once again) consider merging software aid with Textbook Aid, ($110.42 million in the 1995-96 fiscal year) allowing schools to choose how they deliver content to students. Or Textbook Aid language could be changed to allow schools to purchase software with this money, still requiring that software be shared with private schools.** While fulfilling a real educational need, software aid doesn't amount to much money, especially if a school has only old equipment. Although most schools have at least some new computers, some do not.

- **The State should explore ways to ensure that parochial schools are not negatively affected by any changes.**

- **The State should consider including with the definition of software, online access services charges.**

BUILDING AID

Public schools are allowed to use a small portion of Building Aid funds, which are primarily for new school construction and acquisition, for computer/technology related purposes. These "incidental costs," such as desks, chairs, microcomputers, wiring, architectural fees, site acquisition and preparation can represent 20 percent for K-6 school buildings, and 25 percent for 7-12th grade school buildings. SED does not track the portion of these funds spent on technology, but State aid officials (roughly) estimate that one to three percent of Building Aid is spent on technology-related purposes. Using that percentage, Committee staff estimate that $10,000,000 a year is spent on these purposes.

Building Aid is distributed to school districts for SED approved construction and rehabilitation plans on a formula basis that takes into account average daily attendance and local property wealth.

CONCERNS

- SED officials complain that schools often use this money inappropriately. Building Aid funds are obtained through issuance of bonds and are therefore repaid over 10 to 20 years. This financing mechanism is inappropriate for the purchase of computers, which have an average life

span of about five years.

- Others claim that using the average daily attendance, rather than enrollment figures to determine aid is unfair, especially in New York City, which has a lower than average attendance rate.

- Some argue that the incidental cost cap is unfair to New York City. Cost allowances are unfair because there are no regional cost adjustments. Incidental cost caps for such things as site acquisition and preparation creates problems in urban areas because, unlike suburban and rural schools, which usually have large campuses, cities usually have to buy new property and demolish whatever building is standing. Doing this can eat up much of their Building Aid appropriation.

PROPOSED RECOMMENDATIONS

- **SED should require that wiring/cabling, or just conduits, be installed with new construction and substantial rehabilitation.** Although most newly built schools are being wired for computers, some with fiber optics, Building Aid language should stipulate this. Also, Building Aid should be allowed to be used for wiring within existing classrooms.

- **The Department should track the portion of Building Aid spent on technology-related purposes.** Committee staff was unable to determine how much of this aid is used on technology-related purposes because SED does not track these expenses.

- **The State should consider implementing regional cost differences for Building Aid.**

- **K-12 schools should be allowed to use this aid for the purchase of networking equipment for all classrooms, school library media centers and other facilities, without any restriction to computer laboratory configuration.**

OTHER PROPOSED CHANGES

- The Governor's proposed 1996-97 budget, while increasing the total amount of Building Aid by $74.4 million, creates a new "fixed pool" approach, which caps New York City projects at $500 million and those outside New York City at $850 million. The budget also proposes providing school districts with access to financing, construction management and other services available through the State Dormitory Authority.

- SED's proposed legislation (The Omnibus Technology in Education Act of 1996) to connect all educational institutions in New York to the Internet, includes some recommendations for altering Building Aid language, including opening up Building Aid to libraries and other cultural institutions, and allowing access to Dormitory Authority Funding.

TEACHER RESOURCE AND COMPUTER TRAINING CENTERS GRANTS

This competitive grant program funds teacher centers throughout the state. These centers are used for many purposes, including computer demonstration and training for teachers. Depending on the center, teachers are trained to use computers, software, and to evaluate computer-related materials.

Grants, which cannot exceed $2 million per site ($6 million for New York City), and can not be less than $20,000, are awarded to school boards and BOCES and administered by independent boards, which include teachers. In the 1995-96 school year, centers across the State were awarded $15,739,000.

SED requires that centers submit a plan for approval and then a final expenditure report at the end of the year. Because the plans are not specific enough to capture this level of detail, it is impossible to determine what portion of funds are spent on computer-related activities.

PROPOSED RECOMMENDATIONS

- **Continue to fund Teachers' Centers.** The Governor's proposed 1996-97 budget proposes eliminating funding for centers in the 1996-97 school year budget. SED Commissioner Mills has asked for $12.4 million for teachers centers on a school year basis, and New York City Chancellor of Education Crew is "deeply concerned" about elimination of funds. Crew credits the teacher centers with getting 11 Schools Under Registration Review (SURR) off the list. Furthermore, Teacher Centers are the only consistent source of teacher computer training in New York City, and are used by school districts throughout the state to develop curriculum and learn teaching skills.

- **SED should establish some means of accounting for this funding, and ensuring Teachers' Centers are used for optimal purposes throughout the State. At the very least, Teachers Centers should share their needs assessment surveys of teachers with SED and BOCES.**

STUDENT INFORMATION SYSTEMS GRANTS (SIS)

The SIS is available to the Big 5 City School Districts for developing and maintaining student information systems. Funds can be used for planning, developing, and installing an on-line computerized records management system. New York City funds are to be used to hire an

independent consulting firm to monitor implementation of the SIS. In Buffalo, Rochester, Syracuse and Yonkers grants can be used to install, implement, and maintain a core system like the one developed by New York City, and to enhance a core system by adding data elements and functions. This program was created to track students moving from one school to another to prevent re-testing and to track student performance.

CONCERNS

- The Governor's proposed 1996-97 budget eliminates this funding stream. New York City relies on SIS grants to maintain and expand its ATS computer management system for schools. It is through the ATS network that the City hopes to expand instructional computer services for schools. New York City Board of Education Deputy Chancellor for Operations Lewis Spence has stated that eliminating this funding would be a "desperately tragic, penny-wise, pound-foolish move." As the City downsizes every year, the need for automation to improve efficiency of administration increases.

PROPOSED RECOMMENDATION

- **Continue funding SIS.**

COMPREHENSIVE INSTRUCTIONAL MANAGEMENT SYSTEMS (CIMS)

These competitive grants are split 50-50 among the Big 5 City School Districts and BOCES component school districts. Although a majority of these funds are spent on staffing, curriculum development and training, a portion is used for technology related purposes, e.g. development and use of curriculum materials, training and tracking student progress. There is no breakdown available.

CONCERN

- The Governor's proposed 1996-97 budget eliminates this funding stream. SED Commissioner Mills is requesting restoration of funds, as well as an additional $2.5 million for CIMS. At a legislative budget hearing in January 1996, SED Commissioner Mills said, "You can't drive change if you don't invest in change."

LEARNING TECHNOLOGY GRANTS

In the 1995-96 school year, 71 projects received $3.5 million in grants (up to $50,000 each) in a competitive process. Selection was based upon the "vision of the future" roles of learning technology and networking outlined in the Long Range Plan and the major aspects of

the federal Goals 2000: Education America Act, a national blueprint for educational reform. Public schools and BOCES were invited to submit applications outlining activities to implement new reforms in curriculum, instruction, assessment and restructuring through the use of technology in the classroom. The criteria required that nonpublic schools be substantially and equitably involved in the development of the project. SED received 448 applications with requests exceeding $20 million.

Successful applicants focused initiatives on use of classroom technology for restructuring teaching and learning; building technological capacity of SURRS; encouraging networking among Compact Partnership Schools; and collaborating with other educational institutions. Many businesses, communication links, libraries, community organizations, and museums were included in applications to support schools and BOCES with planning, staff development and networking.

PROPOSED RECOMMENDATIONS

- **The State should continue to offer these grants.** The Governor's budget proposal does not include funding for the 1996-97 school year. This money has provided many schools with the necessary seed money to begin the integration of computers and other technologies into classrooms. It seems imprudent not to support this cost-effective initiative.

- **If re-funded, grant awards should be larger for New York City, Long Island and other urban areas.** Small grant size discouraged applicants in these areas from applying for funds.

OTHER STATE GRANT PROGRAMS

- **Efficiency Study Grants** -- Schools are using these SED grants to fund distance learning initiative.

- **Special Legislative Grants** -- Each year districts throughout the state receive these targeted education grants. Those related to educational technology are reviewed by SED instructional technology staff to ensure they are driven by educational goals and aim to integrate technology within the curriculum.

- **Consolidation Grants** -- School districts that consolidate to achieve cost-efficiency, have used some of this incentive money for integrating technology/telecommunications systems.

- **NYS Science and Technology Foundation grants** -- The Foundation supports several isolated telecommunications and technology-related projects for K-12 schools throughout the State.

PUBLIC-PRIVATE PARTNERSHIPS

Since 1990, the State Education Department has actively encouraged collaboration with the nation's leading technology industries, which has generated almost $18 million in hardware, software, training, technical assistance and other technology related services. Over 100 school districts have benefitted from these partnerships, including schools under registration review (SURRS). Most of the partnership dollars were contributed in the early 1990's. Since then individual company contributions have been smaller. However, SED solicited widespread support from over 50 companies in 1994-95. Most of the partnership programs include representation of SED, BOCES, industry partners and school districts.

LOCAL EXPENDITURES

It is difficult, to determine how much school districts, using local dollars, spend on technology resources and services. The annual financial reports prescribed by the State Comptroller's Office do not require technology-specific breakdowns, and do not include special bond issues that provide funding for computer system upgrades or installations.

School districts are required to annually complete the ST-3 Annual Financial Report, which encompasses all district revenues and expenditures. The form is completed by school districts after June 30 of each year, and fiscal data are reported electronically to SED on September 1 of each year. The ST-3 collects expenditures by function codes within a range of major fund groups that include a general fund category and special fund groups. Since reporting through the ST-3 is a legal requirement for districts, and since the form is designed to capture all expenditures (including those for technology), it gives the only statewide local expenditure data available. The problems with these data, however, are that technology-related expenditures are not clearly categorized and schools use different categories to report the same expenses.

PROPOSED RECOMMENDATION

- **Consider ways to revise the ST-3 to better reflect current and future computer and technology application expenditures.** The ST-3's descriptor for technology is computer-assisted instruction, which is an outdated term and may not include all technology expenditures. As noted in a 1994 SED report, "Ideally, the ST-3 categories used for reporting should be expanded to include telecommunications costs, as well as capital improvements for technology."[60]

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[60] New York State. Department of Education. Office of Instruction and Program Development. Technology Expenditures in New York State Schools. New York: December 1994.

FEDERAL FUNDS

The scope of federal funds that can be used for technology related purposes has increased in the past two years, and according to SED, New York State schools are taking advantage of that. Federal grant money is administered by the Department, which must ensure that no more than a small percentage is spent on hardware; the focus is on training, staff and curriculum development. There is a wide variety of federal funds that allow for technology-related expenditures, including:

U.S. EDUCATION DEPARTMENT FUNDS

- Goals 2000 -- professional development
- Title I -- remedial math -- staff development
- Title II -- math and science -- staff development
- Title VI -- innovative -- training and staff development
- Idea -- special education -- adaptive hardware
- VATEA -- vocational

Other Federal grants are available through Environmental Protection Agency Funds, for training on how to incorporate technology within science classes, and the Department of Commerce and Agriculture, for distance learning.

FOUNDATION GRANTS

Over 12,000 different foundation grant programs award money to schools for educational purposes, and many of these can be used for technology-related purposes.

"Each school or district has its own unique needs, opportunities, and challenges; no one blueprint could possibly address them all. Accordingly, successfully deploying the infrastructure will require an approach flexible enough not just to allow individual schools to set their own pace and priorities, but actively to encourage local experimentation and innovation." McKinsey report.

APPENDIX A

The New York State Assembly
Committee on Oversight, Analysis and Investigation
Empire State Plaza
Agency Building 4, 12th Floor
Albany, New York 12248
Contact: Kathleen Fazio
Telephone: (518) 455-3039
Fax: (518) 455-4175

SCHOOL DISTRICT COMPUTER TECHNOLOGY QUESTIONNAIRE

The New York State Assembly Oversight, Analysis and Investigation Committee has developed the following questionnaire for all school districts throughout the state to complete. This questionnaire has several purposes: 1) to examine local spending for computer use; 2) to examine conditions that promote or prohibit technology use in schools; 3) to determine local technology planning levels and needs; and, 4) to help the Legislature evaluate school district needs and assessments of current State funding schemes. Please have the appropriate people respond to those parts which they can best answer. For example, technology planning coordinators may be most able to answer questions about planning. Please complete this form by July 1, 1996, and return to the above address.

OFFICIAL COMPLETING SURVEY

Name:_____

Address:_____

Title:_____

Telephone: ( )_____ Fax: ( )_____

SCHOOL DISTRICT
IDENTIFICATION/DESCRIPTION

ANNUAL COMPUTER/TECHNOLOGY REVENUES AND EXPENDITURES

1. Please provide, by revenue source, your district's technology expenditures for the 1994-95 school year. If you cannot provide such detail, but can account for total costs, simply fill in the last column. Print **0** in a box if you do not use that funding for a given technology component; Print **NA** if you have included expenditures for a certain technology component within another component's costs, e.g. online usage fees may be within software.

SCHOOL DISTRICT ANNUAL TECHNOLOGY EXPENDITURES -- 1994-95 SCHOOL YEAR					
Technology Expenditure	**Amount Spent From:**				**Total Amount Spent for Each Component**
Components	**Federal Aid & Grants**	**State Aid & Grants**	**Local Tax Dollars**	**Other Gifts & Grants**	
Hardware (including servers, computers, printers, etc.)	$	$	$	$	$
Software	$	$	$	$	$
Maintenance/Repair	$	$	$	$	$
Technical Assistance	$	$	$	$	$
Staff Development/Teacher Training	$	$	$	$	$
Telecommuting Costs	$	$	$	$	$
Computer Management Services (if not within another category)	$	$	$	$	$
Instructional Computer Services (if not within another category)	$	$	$	$	$
On-Line Usage Service Fees (if not within another category)	$	$	$	$	$
All Other Costs (list, e.g. wiring, technology staff)	$	$	$	$	$
TOTAL AMOUNT SPENT FROM EACH REVENUE SOURCE	$	$	$	$	$

2.a. Did you spend at least five percent more or less on technology items in 1994-95 than in other recent years?

- ☐ More
- ☐ Less
- ☐ About the same

2.b. If more or less, please indicate the reason(s) by checking the appropriate boxes:

If More		If Less	
☐	Upgraded computer equipment	☐	Completed initial system deployment
☐	Upgraded electrical capacity	☐	Received donated equipment
☐	Installed LAN	☐	Received donated services
☐	Installed WAN	☐	Finished training staff
☐	Upgraded Internet access	☐	Switched service providers
☐	Obtained Internet access	☐	School district budget cuts
☐	Hired computer/technology staff	☐	Cut computer/technology staff
☐	Obtained new educational software	☐	State aid reductions
☐	Conducted training	☐	Consolidated with another district
☐	Unexpected telecommuting costs	☐	Consolidated computer systems

☐ Other: _____

_____

3.a. Has your district passed a local bond issue within the past few years dedicating all or some money to technology?

☐ Yes ☐ No

3.b. If yes, please specify the amount dedicated to technology as a result of this bond, the time period for spending from the bond issues, and the general purpose(s) for such investment in technology:

$ _____ from 19_____ to 19_____.
(fill in dollar amount) (fill in years)

Purpose(s): Check each purpose that applies.

Instructional	☐
Distance learning	☐
Library	☐
Management	☐

4. Different State aid categories support the technology equipment and service expenditures identified in question 1. Please indicate and assess the particular State funds which did or did not support your technology services in the 1994-95 school year, even if the aid was available but not used. Check appropriate boxes.

AID CATEGORIES	AVAILABILITY AND USE OF STATE AID			USEFULNESS OF STATE AID			FLEXIBILITY OF STATE AID		
	Not Available	Available		Useful	Somewhat Useful	Not Useful	Flexible	Somewhat Flexible	Not Flexible
		Used	Not Used						
BOCES Shared Services Aid									
Special Services Aid									
Instructional Computer Hardware Aid									
Instructional Computer Software Aid									
Student Information System (SIS) funding									
CIMS grants									
Building Aid									
Learning Technology Grants									
Efficiency Study Grants									
Special Legislative Grants									
Teacher Resource and Computer Training Center Grants									
Other (list specific aid/grant categories)									

PLANNING

5. Does your school district participate in a regional technology planning committee?

☐ Yes ☐ No

6. Does your school district have a district-level technology planning committee?

☐ Yes ☐ No

7. How many of your school buildings have building-level technology planning committees?

☐ None ☐ Most
☐ Some ☐ All
☐ Half

8. If you answered yes to questions 5, 6, or 7, do any or all of the technology committees include teachers? Check those that apply.

☐ Regional Technology Committee
☐ District-Level Technology Committee
☐ Building-Level Technology Committee(s)
☐ None

9.a. Do you have an existing written plan for district-level technology implementation? If no, move on to question 9.d.

☐ Yes ☐ No

9.b. If yes to question 9.a., please indicate the year the plan was:

- Prepared: _____
- Updated: _____

9.c. If yes to question 9.a., are you in the process of implementing that plan? If yes, move on to question 10.

☐ Yes ☐ No

9.d. If no to questions 9.a. or 9.c., please indicate why you do not have a plan or you are not implementing the plan? Check those that apply.

☐ In the process of updating it
☐ The plan is too old
☐ Lack of funding
☐ Lack of community support
☐ Lack of staff support
☐ Wiring/cabling costs prohibitive

☐ Other: _____

_____

10. Which of the following factors support the implementation of district technology plans and/or efforts? Check those that apply.

- ☐ Passed local bond act
- ☐ High state aid ratio
- ☐ Awarded state grant(s)
- ☐ Technology public-private partnership program
- ☐ Local technology expertise
- ☐ Strong community support
- ☐ Strong staff support
- ☐ Effective planning
- ☐ Effective training
- ☐ Effective staff development
- ☐ Support/direction from SED
- ☐ Support/direction from Central Board
- ☐ BOCES services meet needs
- ☐ BOCES services are cost efficient
- ☐ BOCES services/product selection varied

☐ Other: _____

_____

_____

11. Which of the following factors inhibit or impede implementation of district technology plans and/or efforts? Check those that apply.

- ☐ Lack of local funding
- ☐ Low state aid ratio
- ☐ Poor planning
- ☐ Lack of local technology expertise
- ☐ Lack of community support
- ☐ Lack of staff support
- ☐ Lack of training
- ☐ Ineffective training
- ☐ Dependent district status/lack of control
- ☐ Lack of support/direction from SED
- ☐ Lack of support from Central Board
- ☐ BOCES services do not meet needs
- ☐ BOCES services are not cost efficient
- ☐ BOCES services/product selection too restrictive
- ☐ Asbestos related problems
- ☐ Inadequate infrastructure, e.g. wiring/cabling problems

☐ Other: _____

_____

_____

12. Did you receive assistance in the development of your district technology plan and/or efforts from any of the listed sources? Check those that apply.

- ☐ BOCES
- ☐ BOCES -- TPIS (Technology Planning for Improving Schools)
- ☐ TPIS guide book -- school district implementation service
- ☐ Private consultant
- ☐ Board of Education - Central Administration
- ☐ Another school district's technology plan
- ☐ Local/regional technology committee
- ☐ State Education Department

- ☐ Other: _____

_____

_____

13. What, if any, of the following topics does your technology plan and/or efforts include? Check those that apply.

- ☐ A statement of beliefs or values about education and technology for guiding the planning process.
- ☐ A mission identifying the major purposes for technology integration of the district or school
- ☐ Summary of critical needs to be addressed based upon prior assessment
- ☐ List of priorities and directions
- ☐ Goals for technology integration in various subjects/grade levels
- ☐ Benchmarks and timelines for implementation
- ☐ Assessment processes for various stages of implementation
- ☐ Long-term funding strategies
- ☐ Ongoing staff development and training, e.g. basic skills training programs
- ☐ Ongoing technical assistance
- ☐ Ongoing assessment procedures
- ☐ Procedures for maintenance, technical assistance, obsolescence and upgrading of equipment and software applications
- ☐ Specifications for installing and testing the system
- ☐ Policies and procedures regarding access
- ☐ Plan for giving teachers, school librarians, and media specialists access to technology as soon as possible.
- ☐ Incentives for teachers, e.g. credentialing and pay scales
- ☐ Plan for allowing teachers, school libraries and media specialists time to share their experiences and provide some in-class support to one another
- ☐ Goals for moving the entire population of teachers across several levels of training

14. Which three from the following list would your district consider the highest priority in regard to computer/technology implementation? Check three boxes that apply.

- ☐ Purchasing/upgrading computers used for instructional purposes
- ☐ Installing local area networks within school buildings
- ☐ Installing wide area networks within school buildings
- ☐ Providing students with Internet access
- ☐ Upgrading electrical capacity
- ☐ Installing phone lines in classrooms
- ☐ Providing staff development/teacher training
- ☐ Connecting instructional and administrative computers
- ☐ Equipping libraries with computers
- ☐ Networking library computers
- ☐ Expanding educational software inventory
- ☐ Hiring a technology coordinator(s)
- ☐ Distance learning for instructional purposes

☐ Other: _____

_____

_____

15. Are your district's computer management applications integrated with instructional or instructional support computer applications?

☐ Yes ☐ No

TRAINING

16.a. Please estimate as best you can the proportion of teachers in your district who received any type of computer/technology training in the 1995-96 school year.

☐ All ☐ Some
☐ Most ☐ None
☐ Half

16.b. Of those teachers, please check the boxes indicating the estimated proportion of teachers who received the types of computer/technology training listed. If this type of training was not available to teachers in your district during the 1995-96 school year, please indicate by checking the "Not Available" column.

TYPES OF COMPUTER & TECHNOLOGY TRAINING	Not Available	ESTIMATED PROPORTION OF TEACHERS WHO RECEIVED TRAINING				
		All	Most	Half	Some	None
Basic computer skills						
Using software for curriculum activities						
How to plan for instructional applications in technology						
Using technology to support new assessment procedures						
How to access Internet information resources						
How to use online networks for communications/sharing resources						
Assistive technology						
Curriculum and instruction management						
Distance Learning						

16.c. Of those teachers, please check the boxes indicating the sources of training and the estimated proportion of teachers who obtained training from those sources. If this source for training was not available to your district during the 1995-96 school year, please indicate by checking the "Not Available" column.

SOURCE OF TRAINING	Not Available	ESTIMATED PROPORTION OF TEACHERS WHO RECEIVED TRAINING				
		All	Most	Half	Some	None
In-district program						
BOCES						
New York City Public Schools Central Office						
Hardware/software vendor						
Post-secondary institution						
Professional association						
New York State Department of Education						
Teacher Resource and Computer Training Center						
Model Schools Program -- through Teacher Centers						
Model Schools Program -- through BOCES						
Other						

17. Please indicate whether the 1995-96 school year was a typical year for teacher computer/technology training in your district. Check the box that applies.

☐ About the same level of training
☐ More
☐ Less

If more or less, please explain why:_____

_____

_____

18.a. Does your district employ a (part-time or full-time) computer/technology coordinator?

☐ Yes ☐ No

18.b. If yes, what activities does the coordinator perform? Check those that apply.

- ☐ Helping teachers integrate technology within the curriculum
- ☐ Coordinating teacher in-service training
- ☐ Coordinating staff training (including librarians, administrators)
- ☐ Providing staff training (including librarians, administrators)
- ☐ Providing technical assistance
- ☐ Conducting technology planning or plan implementation progress
- ☐ Conducting purchasing
- ☐ Scheduling of computer/multi-media rooms

☐ Other: _____

_____

COMMENTS

We invite any comments, opinions and/or suggestions you have about any issue related to computer technology in schools, including any comments you may have on issues raised in the Committee report.

_____

_____

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APPENDIX B

SCHOOL DISTRICT RESOURCES

Throughout the course of this review, Committee staff read many reports which may be helpful to schools. The following list is not a complete reference guide, but includes a number of reports and sources of information.

SCHOOL DISTRICT TECHNOLOGY PLANNING INFORMATION AND SUPPORT

Technology Planning For Improving Schools, Ideas and Resources for Educators in New York State. New York State Department of Education, 1991. This report provides guidance and direction for schools starting or in the midst of planning for acquisition and implementation of computers in schools. Available through The New York State Education Department.

Technology in Instructional Support Services. New York State Department of Education, 1991. This report discusses ways for schools to provide teachers and other school staff with instructional support using technology. Available through The New York State Education Department.

Expanding Distance Learning in New York State ... A K-12 Perspective. New York State Department of Education, 1993. The report discusses how schools should plan for distance learning and provides examples of implementation. Available through The New York State Education Department.

New York State Education Department's Technology Partnership Programs for New York State Schools. This report is a composite of public-private partnerships, in which projects are profiled. This listing may spark some ideas for possible partnerships. Available through The New York State Education Department.

Connecting K-12 Schools to the Information Superhighway. McKinsey & Company, Inc., 1996, New York. This report is an informative guide for those planning for acquisition and implementation of computers in schools. It provides clear and explicit information on what schools need, in regard to finances, infrastructure, equipment and human resources.

Technology Applications Quarterly. This quarterly, published by the Office of Instruction and Program Development, highlights model technology programs, lists grants and discusses local technology planning. This publication also includes Internet and WWW sites, and descriptions and order forms for instructional and staff development video programs available through SED's Media Distribution Network. New York State Education Department, Innovative Programs and Learning Technologies, Room 967, EBA, Albany, New York 12234. (518) 474-1280. AArdell@vm1.NYSED.gov

Teachers and Technology: Making the Connection. United States. Congress. Office of Technology and Assessment. Washington, D.C., 1995. This report offers a lot of information on technology, its role in the classroom and what teachers need to integrate its use.

Preparing Students for the 21st Century. American Association of School Administrators, 1996. This report discusses what a council of 55 educators, businesspeople, sociologists and futurists believe students must know and schools can do to succeed in the 21st Century.

Network Access Use and Costs in K-12 Schools and Libraries. NYSERNET, Inc. The NYSERNet study was conducted under contract by the New York State Science and Technology Foundation. NYSERNet's report, discusses study findings on the level of network access, use and costs for New York State K-12 schools and libraries. It also includes some model cost structures.

Guide to Developing Educational Partnerships. Tushnet, Naida (1993) U.S. Government Printing Office, Superintendent of Documents, Mail Stop: SSOP, Washington, D.C. 20402-9238, (202) 783-3238.

Bring Business and Community Resources Into Your Classroom. Otterbourg, Susan (1992) National Education Association, 1201 16th Street NW, Washington, D.C. 20036, (202) 822-7783.

Directory of Building and Equipment Grants. Research Grant Guides, Department 3A, P.O. Box 4970, Margate, Florida 33063. (305) 753-1754.

Educational Resources Information Center (ERIC) and ASKERIC. ERIC Clearinghouse on Information and Technology. Center for Science and Technology, Syracuse University, Syracuse, New York 13244-4100, (315) 443-3640, askeric@ericir.syr.edu

The Center for Children and Technology. Issues many reports on technology in education, focusing on various aspects of integration. Bank Street College of Education. 610 West 112th Street, New York, New York 10025.

The Regional Laboratory for Educational Improvement of the Northeast & Islands, Inc. Provides services for teachers. They have published a Mentoring: A Resource and Training Guide for Educators, a how-to guide for starting and maintaining mentoring programs for teachers. 300 Brickstone Square, Suite 950, Andover, MA 01810, (508) 470-0098; Fax (508) 475-9220.

INTERNET CONNECTIONS

New York State Education Department World Wide Web Page: http:\www.nysed.gov

TEC_PART. A listserv, moderated by SED, which supports the new New York State curriculum frameworks, technology planning, public and private technolgoy partnerships, and technology staff development at pre-service and in-service levels. listserv@vm1.NYSED.gov -- In the body of the message, type: SUBscribe TEC_PART your name. Once subscribed, e-mail to TEC_PART@vm1.nysed.gov

ArtsEdNet. A free on-line service from the Getty Center for Education in the Arts designed for arts educators and general classroom teachers in grades K-12 to communicate and collaborate.
E-mail: artsednet@getty.edu
Web site: http://www.artsednet.getty.edu

The Electronic School. A publication for all K-12 educators. http://www.access.digex.net/nsbamags/e-school.html

Global Network Academy. Home page of the Global Network Academy which includes links to the Virtual Online University, Ta-Ming Virtual University, and the Global Electronic Multimedia University. http://uu_gna.mit.edu:8001/uu-gna/index.html

JASON Foundation for Education. Sponsors science expeditions all over the world with student telecommunications participation. http://seavifs.gsfc.nasa.gov/Jason.html

Jones Multimedia Encyclopedia. An update on the history of the computer from the abacus to the microprocessor. http://digitalcentury.com/encyclo/update

Learning Oasis. Educational resources for K-12 classrooms. http://ww.pierian.com

Library of Congress Archives. http://www.loc.gov

List of Education Opportunities. Such as a home page on African Americans in the sciences. http://web66.coled.umn.edu

National Museum of American Art. http://www.mtn.org/MIA/mia_intro.html

Search for Extra Terrestrial Intelligence (SETI). Contains a life-in-the-universe curriculum. http://www.metrolink.com/SETI

Smithsonian. Access to its museums. http://www.si.sgi.com/sgistart.htm

Yahoo. Directory of WWW sites. http://www.yahoo.com

LOW COST SOLUTIONS/OPTIONS

LINCT (Learning and Information Networks for Computer Telecomputing). The Coalition's singular purpose is to help communities to develop locally-run, cooperative telecommunications networks, committed to achieving community-wide, equitable access to computer technology, training, information and life-long learning. The Hamlet Green, Suite 3, 103-3 West Montauk Highway, Hampton Bays, New York 11946. (516) 728-9100, e-mail: komoski@bnlarm.bnl.gov.

Per Scholas. A company, located in New York State, that retrofits used computers and sells them to schools at low cost. Their inventory includes all levels of computers, including those that can be used for multi-media applications.

New York State bulk purchasing. A new electronic purchasing system designed to allow State and local governments to shop for computers and drive down prices. New York allows local governments to join the State in bulk purchases of goods and services. The new system, which went on-line in May 1996, gives government officials easy access to information about different computer merchandise available, with enough details to design a purchase precisely for their needs.

New York Learns. A series of programs on educational issues broadcast on New York's public television stations. The series, which featured model examples of education reform and staff development, was produced by the Office of Educational Television and Public Broadcasting and broadcast on all nine public television stations in New York State. Form information: (518) 474-5862. TDunn2@mail.Nysed.gov

OTHER REPORTS

Newman, Denis, et al. *The Ralph Bunche Minischool: A Design for Individual and Community Work* (Technical Report no. 29). New York: Center for Technology in Education, 1993.

Quality Education Data, Inc. *Educational Technology Trends: QED's 13th Annual Sample Survey of Technology Use and Purchase Plans in U.S. Public Schools*. Denver: Quality Education Data, Inc., 1994.

New York. The University of the State of New York and The State Education Department, Office of Instruction and Program Development. Exploring the Internet. Volume 1, 1994

New York. The University of the State of New York and The State Education Department, Office of Instruction and Program Development. Technology Support For Compact Activities. Volume 2, 1994.

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