U.S. DEPARTMENT OF COMMERCE
National Telecommunications & Information Administration

Evaluation of the
Telecommunications and Information Infrastructure Assistance Program

Case Study Report

New York State's Electronic Learning Community: Expanding Educational Opportunity via the Information Superhighway 94012

Albany, New York

Site Visitors: Gary Silverstein and Laurie Somers

Dates of Visit: July 28-29, 1998

PREFACE

On behalf of the National Telecommunications and Information (NTIA), I am pleased to share the following report that is one of a series of case studies conducted on grants awarded by the Telecommunications and Information Infrastructure Assistance Program (TIIAP) in 1994 and 1995. The case studies are part of the program's evaluation effort designed to gain knowledge about the effects and lessons of TIIAP-funded projects. NTIA contracted Westat, a research and consulting firm, to perform an independent evaluation of the program's first two years of grants. The evaluation consisted of a mail survey of 206 grant recipient organizations and in-depth case studies of selected projects. In February, 1999, the Commerce Department released Westat's evaluation report.

The projects selected for the case studies cover a broad range of program types and sizes, planning grants as well as demonstration grants, and they show varying degrees of implementation, sustainability, and replication. Westat selected the projects to represent a cross-section of all projects funded in the program's first two years. Specific selection criteria included geographic region, target population, project application area, project category, and size of award. To conduct each case study, Westat reviewed all project files, including progress reports and the final report, and conducted site visits. The site visits consisted of project demonstrations and interviews with project staff, representatives of partner organizations, and project end users.

NTIA thanks the case study participants for their time and their willingness to share not only their successes but their difficulties, too. Most of all, we applaud their pioneering efforts to bring the benefits of advanced telecommunications and information technologies to communities in need. We are excited about the case studies and lessons they contain. It is through the dissemination of these lessons that we extend the benefits of TIIAP-funded projects nationwide.

We hope you find this case study report valuable and encourage you to read other TIIAP case studies. You may obtain additional case studies and other TIIAP publications, including the final Westat evaluation report, through the NTIA web site (www.ntia.doc.gov) or by calling the TIIAP office at (202) 482-2048. We also are interested in your feedback. If you have comments on this case study or suggestions on how TIIAP can better provide information on the results and lessons of its grants, please contact Francine E. Jefferson, Ph.D. at (202) 482-2048 or by email at fjefferson@ntia.doc.gov.

Larry Irving
Assistant Secretary for Communications and Information

TIIAP CASE STUDY

New York State's Electronic Learning Community: Expanding Educational Opportunity via the Information Superhighway

A. EXECUTIVE SUMMARY

> "*Silos were made breachable where they had not been before.*" New York Institute of Technology representative

The New York State Education Department's (NYSED) TIIAP planning grant focused on policy planning and development. NYSED wanted to establish a strategic policy framework for using technology to support learning. They began with three main areas: network infrastructure, applications for using the technology, and professional development for those using it. In general, the project defined a schematic of technology environment and the institutions impacted. Then they built a set of essential conditions for electronic learning around which the Board of Regents in New York State could focus. Project staff and partners developed documents to which people in education, telecommunications, government, and the general populace could react, and which the Regents could adopt. Several advisory groups were formed to monitor the congruence of the activities in forming an overarching vision for the electronic learning community. That overarching vision translated into a legislative package that included funding for many aspects of building and maintaining the electronic learning community. The bill did not pass in its first year, but subsequent to the grant period, many of the items in the original bill were passed and signed into law.

The TIIAP project's main strategy for achieving its vision of an electronic learning community was the development of a legislative package. The legislation, HP-12, was designed to coalesce all of the resources necessary to bring about an electronic learning community across the state:

- A long-term capital financing plan to support the infrastructure of the network,
- A definition and provision of a network connection for every institution in the state,
- Means for ensuring equity of access and special emphasis on institutions with the least ability to pay,
- Development of applications using the technology,
- A plan to provide training for all education and research professionals and administrators,
- A framework for the management of the network and its resources by all members of the education and research communities,
- A policy basis for defining the state's and private industry's responsibilities, and
- A framework for the education community to re-examine existing programs in terms of the new networked environment.

The legislation was supported by all of the other activities undertaken through the project. These include:

- Forming advisory committees,
- Holding conferences,
- Developing a network infrastructure design,
- Designing a professional development model,
- Developing applications for using the technology,
- Stimulating public-private partnerships, and
- Participating in regulatory initiatives.

Through the TIIAP grant and the required non-federal matching funds, NYSED produced a considerable number of documents. In addition, the grant leveraged a significant amount of resources for projects related to the grant activities, but not actually supported under the project or included in the total project costs. The NYSED project, then, embodied TIIAP's purpose of providing seed money that will generate other and expanded projects.

Office of Technology Policy Analyses and Development (OTPAD) staff learned a great deal about infrastructure planning and cited several benefits to the processes they used.

- Including all stakeholders in the planning process. OTPAD learned the importance of involving all stakeholders, such as education professionals, policy makers, and private industry in their planning process. Buy-in, and even understanding of the technology, was critical to the success of their plans.

- Outsourcing deliverables. Although outsourcing was to some extent a result of a lack of funds to hire in-house staff to conduct some of the tasks, OTPAD project staff found that outsourcing allowed a variety of perspectives in the process. It was also beneficial in developing implementation capacities outside of NYSED. Moreover, these capacities were not built within isolated institutions but, rather, were built for institutions and government working in concert.

- Developing regional capacities. By providing models for network infrastructure planning, project staff helped to develop regional capacities for applying for and implementing Technology Literacy Challenge Fund grants, rather than encouraging single institutions to apply. Meeting with representatives from other states was also beneficial in developing multi-state capacities. It provided an opportunity for sharing ideas and plans and created a human network for continuing discussion of technology implementation at the state and federal level.

- Looking at the big picture, not a specific technology. OTPAD and the partners felt they benefited from building their electronic learning community around a set of outcomes and beliefs of what was important for learners in the state. They did not focus on any specific type of technology, with the express purpose of creating a flexible and expandable system.

Early on, they made a commitment not to mandate any technology or to establish standards that were technology-specific. If anything, they encouraged the most advanced technology, high-speed digital video, knowing that it would be easier to scale back than to add new technologies later.

- Accepting uncertainty and risk. The TIIAP project was successful because of people's willingness to look at the entire educational system in the state and include traditional adversaries, such as private industry. There had to be established a relationship of trust among the different groups that they were all trying to help learners and move the system. Many of the partners went into the project not knowing what they were going to get out of it, but project staff were able to build a synergy among the players around some common goals.

- Taking advantage of smaller resources to leverage other funds. In the field of education, there is tremendous opportunity to leverage small amounts of money. In New York, federal funding is generally 5 to 10 percent of total education expenditures. These small influxes of funding, according to the project director, drive an immense effort. In the area of technology, he said, this is magnified 100-fold. The power of technology pulls people together; everyone wants to participate, and no one wants to be left behind. The TIIAP-related projects under this grant were able to leverage 10 times the resources TIIAP provided. The timing was right, and when people realized the project would be conducted at a policy level, it galvanized their attention and encouraged action.

B. OVERVIEW

Purpose and General Approach

The New York State Education Department's (NYSED) TIIAP FY-94 18-month planning grant focused on policy planning and development. NYSED wanted to establish a strategic policy framework for using technology to support learning. They began with three main areas: network infrastructure, applications for using the technology, and professional development for those using it. In general, the project defined a schematic of the existing and potential technology environment and the institutions impacted. Then they built a set of essential conditions for electronic learning around which the Board of Regents in New York State could focus. Project staff and partners developed documents to which people in education, telecommunications, government, and the general populace could react, and which the Regents could adopt. Several advisory groups were formed to monitor the congruence of the activities in forming an overarching vision for the electronic learning community. That overarching vision translated into a legislative package that included funding for many aspects of building and maintaining the electronic learning community. The bill did not pass in its first year, but subsequent to the grant period, many of the items in the bill were passed and signed into law.

Description of Grant Recipient and Project Partners

Grant Recipient. NYSED is the executive agency of the New York State Board of Regents. The Board of Regents is the policymaking body that provides leadership for all components of the education system in the state. New York is unique among all other states in that all public and private elementary, middle, and secondary schools, colleges, universities, libraries, museums, and public television and radio stations are under the charter of the Regents. Taken together, these institutions form the University of the State of New York. The Regents also have authority over registration and licensing of all professionals,

such as administering bar exams, and they oversee all professional misconduct and adjudication and other disciplinary matters.

The grant was administered by the Office of Technology Policy Analysis and Development (OTPAD), which mainly works on policy projects but also administers the Universal Service Program (the E-rate) and the Technology Literacy Challenge Fund. OTPAD is located under the Chief Information Office, along with other administrative applications, telecommunications, and information technology services (e.g., state aid, major data processing, and other information management).

While the Chief Information Office has a staff of 150, the TIIAP project was staffed primarily by two co-project directors[1] and a technology expert who continually refined infrastructure designs. Both directors worked virtually full time on the project. OTPAD had intended to hire three additional staff to create various specific projects, but as explained in Section D below, due to budget problems, they were not able to do so. However, they were able to pull staff from within (and outside) the department to help with pieces of the work. NYSED counsel assisted with the regulatory work and reviewed all hearings. State staff worked extensively on the legislation development. Because the scope of the project, and indeed NYSED as a whole, was so broad, it is difficult for any staff to estimate time on activities only relating to the TIIAP grant.

Project Partners. Each of the partners below was an original partner from the start of the grant. Because of the difficulty obtaining OTPAD, project partners created more products than intended in the original application. Project staff felt this turned out to be the great strength of the project.

The Myers Group, an independent consulting group of five full-time staff, works with the Boards of Cooperative Education Services (BOCES), districts, individual K-12 schools and higher education institutions, libraries, and NYSED to design and manage data networks. The Myers Group was brought on because they have a broad base of experience in existing networks and would bring some level of standardization to the planning project. The Myers Group facilitated and documented a conference on ensuring equitable access and designed the basic architecture of the state's infrastructure plan.

New York Institute of Technology supports 320 Teacher Resource and Computer Training Centers (the teacher centers) that focus on staff development according to the articulated needs of classroom teachers. As a bottom-up reform mechanism, the teacher centers stress the importance of technology and provide computer training that enables schools to use the technology appropriately. The teacher centers operationalized some of the language of the TIIAP project's legislative package. The director of technology-based learning systems looked at how technology could facilitate the delivery of education content to maximize the delivery of instruction in a constructivist environment.

The director of technology-based learning systems also worked on the development of the portfolio application and designed an Educational Enterprise Zone, which connects on a network organizations which provide content, intermediary organizations such as NYSED and district offices, and individual K-12 schools.

New York State Association for Computers and Technology in Education (NYSC&TE) is a grass-roots organization of educators, computer coordinators, administrators, postsecondary educators, and vendors who have interest in understanding and communicating how technology is making and can make a difference in teaching and learning. NYSC&TE developed "Learners and Technology," a

[1] Only one of the co-project directors was interviewed for this case study.

document describing how technology can improve teaching and learning in the classroom. The NYSC&TE president continues to work with OTPAD on several projects.

Northeast Regional Technology Consortium (NetTech) is an organization that works in many states in the Northeast to align their technology plans and strategies, share resources, and leverage funds for technology. NYSED wanted to align their plans with and learn from other states, and NetTech wanted to learn from New York's experiences. NetTech sponsored a forum on universal access and several other meetings. NetTech also continues to work with OTPAD on several projects.

New York Law School Communications Media Center provided OTPAD assistance in framing the human dimension of technology issues, including copyrights, intellectual property, and other laws that might affect NYSED's policies. They sponsored the Ensuring Full and Equitable Access conference and brought in national telecommunications thinkers to help frame the issues.

Project Costs

OTPAD intended to hire staff to complete most of the tasks, create the products and documents, and design the network infrastructure. However, due to state-level budget constraints, they were not able to hire the staff as originally planned. Instead, OTPAD gave almost $275,000 as contracts to partners who worked on the various projects. The TIIAP grant paid for conferences and other meetings. Because of their inability to make their portion of the match (in-kind contributions were not affected), OTPAD returned almost $100,000 to TIIAP. The total cost of the project was $577,129, of which $112,648 was TIIAP funding, $273,921 was from NYSED, and $190,560 was in-kind funding.

C. PROJECT CONTEXT

Community Description

The New York State Education Department is large by the standards of most states in terms of breadth and purpose. With all private and public K-12 schools, 2- and 4-year postsecondary institutions, museums, libraries, and public television and radio under the aegis of the Board of Regents and managed by the New York State Education Department, the University of the State of New York is unique and powerful. The Board of Regents is separate from the governor and has no responsibilities for reporting to the governor. The Commissioner of Education serves in a chief executive officer role at the pleasure of the Regents. Both houses of New York Legislature make recommendations for the Board of Regents, who officially serve 6-year terms, but unofficially have life appointments.

Status of Telecommunications/Information Infrastructure Environment Prior to the TIIAP Project

New York State, like many states, had considered building a state-owned fiber backbone along the state transportation highways, but decided that building into others' networks would be more cost effective. As the owner of several highways running across the state and between major cities, the state allowed telecommunication companies the right of way to lay fiber along the roadways. In return for this approval, the companies gave the state a percentage of bandwidth. Thus, the state already had some access to a telecommunications infrastructure prior to the grant period.

D. PROJECT IMPLEMENTATION

Primary Activities and Milestones that Occurred Prior to the TIIAP Grant Period

In the early 1990s, NYSED worked with the Public Service Commission (PSC), the telecommunication regulatory agency in New York, on regulatory issues surrounding competition, rate caps, and profit restrictions. Through the regulatory process, NYSED started to forge partnerships with the telecommunications industry, including local providers and major companies, such as Bell Atlantic, Frontier Telephone, and the cable industry. Through this work, NYSED learned the value of good relationships with the telecommunications industry.

As technology began to be infused more and more in education and there was a strong demand for the purchase of computers for schools, the Regents and the Commissioner wanted to know what they should be considering to keep New York State at the forefront of technology and telecommunications. Coming out of the work with the PSC and telecommunication providers was an early study and recommendations paper, "The Impact of Telecommunications and Technology on Teaching, Learning, and Information Access," which said conceptually where NYSED thought they were going with technology. Sources for this early study included NYSED program offices and the field, including K-12 institutions, BOCES, colleges and universities, teacher unions, and anyone who had leadership responsibilities for telecommunications. Created in 1993 by the eventual project directors for the TIIAP grant, it set the stage for the structure of the TIIAP proposal.

The project director had a good working knowledge of agencies in Washington, DC, and came across TIIAP after an early search of federal agencies with telecommunications information. The other main staff member had background in economic development and had worked with the Department of Commerce. The two submitted a proposal without firm idea of where they were going, except the notion that many things related to telecommunications and networking could impact the use of technology for teaching and learning.

Activities/Milestones that Occurred During the TIIAP Grant Period

OTPAD conducted eight major types of planning activities under the TIIAP planning grant.

Legislation Development. The TIIAP project's main strategy for achieving its vision of the electronic learning community was the development of a legislative package. The legislation, HP-12, was designed to coalesce all of the resources necessary to bring about the electronic learning community across the state:

- A long-term capital financing plan to support the infrastructure of the network,
- A definition of what counts as a network connection and a provision of that connection for every institution in the state,
- Means for ensuring equity of access and special emphasis on institutions with the least ability to pay,
- Development of applications using the technology,
- A plan to provide training for all education and research professionals and administrators,

- A framework for the management of the network and its resources by all members of the education and research communities,

- A policy basis for defining the state's and private industry's responsibilities, and

- A framework for the education community to re-examine existing programs in terms of the new networked environment.

Most of the activities conducted under the grant, and many conducted through funds leveraged by the TIIAP grant money, had direct implications for the legislation, by informing what should go into HP-12, setting the stage for how it would work in practice, or helping to educate the executive and legislative branches of the need for this legislation. Unlike the legislation with similar purposes in most other states project staff consulted, HP-12 was unidimensional in that it was not attached to other legislation and that it put all the pieces together. Other states, project staff learned, were more fractionalized in their legislative development.

Advisory Committees. OTPAD established three advisory committees to guide its work. The Regents Policy Council on Telecommunications and Information Technologies was composed of high level business, industry, financial, education, and government leaders, who were charged with advising the Regents on policy issues critical to telecommunications in educational institutions. They provided policy recommendations leading to the legislative initiative (described below). The group met twice. The Policy Council ceased to exist at the end of the grant period, although a number of subcommittees are still meeting to work on their more focused areas.

The second group, the Advisory Council on Telecommunications, was composed of education professionals and technology users. They were considered the implementers. The main charge to the group was to identify uses of technology and approaches to implementing the Regents Policy Council's policy directions. This group met formally twice, but also met more frequently in smaller groups. The Advisory Council stopped meeting at the end of the grant period but was reconstituted in the fall of 1997 and continues to work on these issues.

One of the smaller groups was the Regulatory Issues Workgroup, which held bimonthly meetings on private sector issues. They worked with the Public Service Commission's Competition II (described below) and other Federal Communications Commission work. This group still exists.

Conferences. The first conference, held in June 1995, was the Community and Regional Networks of New York conference. Developed by the Myers Group, it concentrated on what the network infrastructure should look like. It encouraged local school districts and other networks to work off a common infrastructure, rather than building their own. It also defined what capacities individual schools would need, but focused more on the need for a community-based infrastructure. The major outcome of the conference was a statewide network architecture map, which included digital switches and ATM technologies that could provide high-speed connectivity for data, voice, and video transmission. Various regional networks presented the kinds of work they were doing and how they could work together.

The second conference, Assuring Full and Equitable Access to Telecommunications Networks and Technology for Education and Research, held in February 1996, was sponsored with New York Law School's Communications Media Center. The conferences was designed to engage the Regents in the process of planning an electronic learning community, unpack the issues for them, and report out to them with findings. A technology consultant provided several context papers on how technology impacts the learning environment. Project staff were able to involve the Regents, educators, government officials,

FCC staff, congressional staff, other New York State stakeholders, representatives from other states, and leaders in technology policy from around the country. Planners were pleased that the structure of the forum produced consensus on many issues and brought diverse groups together in a very positive way. The forum touched on the basic technology issues at a high level and did not discuss technical information about the network. The TIIAP project director kept much of the discussion with the policy that is behind the issues, rather than just the technology and what it could do. Most attendees were astounded that the Regents were taking on these issues and seemed to understand that merely putting computers in each classroom was not the answer. Rather, there should be a network to which the computers could be connected and teachers should learn how to infuse technology into their curricula to advance learning in their classrooms. The forum set the structure of how the new Commissioner of Education and NYSED viewed implementation of infrastructure.

A third conference, held in March 1996, was the Northeast Telecommunications Consortium on Universal Access and Interconnectivity for Education, co-sponsored by and organized with the assistance of the Northeast Regional Technology Consortium (NetTech). The conference brought together other states in the Northeast to unpack the issues and open a dialogue. The main outcome of the conference was the framework for the legislation, including what should be included and strategies for writing it. Other states provided confirmation for the major elements of legislation and where major areas of investment should be. OTPAD was concerned that if their design was divergent from other states, they would not be able to dovetail with other federal and local investments. At the conference, an attorney for New York Law School spoke to the group to help them understand some of the legal issues surrounding universal access. The group of state representatives gained not only an interpretation from those who knew, but also a support system of others working on the same issues. These relationships have continued without NetTech's involvement.

Finally, OTPAD produced and broadcast a teleconference to a statewide audience in March 1996. Education professionals and the public were given an opportunity to learn about the electronic learning community being developed. The Commissioner of Education participated in a live demonstration of instructional technology and held an open dialogue with the viewing audience.

Network Infrastructure. In designing the electronic learning community, OTPAD staff and consultants had to conceptualize the architecture of a network that could serve the entire state. This process had to support (1) the local area networks of individual schools, libraries, colleges, and, museums; (2) the community and regional networks around the state; and (3) statewide and national networks. They established four principles to guide the design:

1. The infrastructure would have to be based on current and emerging technological capacities of all commercial network providers, rather than creating a separate public sector network.

2. The infrastructure would have to support data, sound, image, and video information with a reliable and robust broadband system.

3. The capacity of the system would have to be able to expand to increasingly sophisticated applications and a greater number of users.

4. The applications and resources would have to be usable in a wide range of hardware and software environments based on open, nonproprietary standards.

Other work in designing the infrastructure included:

- The creation of schematic diagrams for various levels of infrastructure by project staff and partners from the Myers Group. Over time the ATM-switching design has become the de facto strategy for the networks around the state.

- The amendment of statutory authority of the Dormitory Authority of the State of New York, a construction corporation formed by the state to finance and build facilities for nonprofit institutions such as colleges and hospitals, to include libraries and schools. This amendment was designed to address the deteriorating buildings unable to support advanced telecommunications, by including libraries and schools under the jurisdiction of the Dormitory Authority.

- A study conducted by the New York State Empire Development Corporation and the New York State Education and Research Network (NYSERNet) called Network Access Use and Costs in K-12 Schools and Libraries, which looked at the existing capacity in 6,000 schools and 1,000 public libraries.

Professional Development. A major focus for OTPAD's policy work was to ensure that members of the electronic learning community would be able to use the technology in effective ways. Accordingly, staff developed the NTIA Staff Development Model: The New York State Teacher Resource and Computer Training Centers Model, to discuss critical components for enabling teachers to use electronic learning resources. The new design was a "sawtooth" approach for training, where trainers escalate trainees' skills, expect decay in those skills, and then provide new training, etc. They developed a plan for "just in time" training, which is localized at the moment of need of teachers. Partly a result of this work, all teacher centers are now connected and have a video-conferencing network for this training. Bell Atlantic provided the multiple conferencing technology for free, with the only cost to the centers being the connection at only $1.20 more an hour than regular telephone charges. The staff development component also focuses heavily on reflective practice. On the video conferencing, they found that people are more willing to reflect outside their own community, and feel less exposed than in their own community in regular inservice sessions.

TIIAP funds were also used to help develop another document, "Technology and Training for Libraries in Transition: A Report to the New York State Education Department Office of Technology Policy Analysis and Development," by the New York State Library Association. It discusses components of professional development for librarians and library professionals, especially as it relates to libraries' emerging role of providing access to technology and electronic information.

Application and Network Development. TIIAP project activities included a variety of application and network development activities. Although many of the activities described below were provided largely as in-kind donations by the partner organizations, TIIAP funds supported at least a portion of each activity.

OTPAD used TIIAP funds to support an art teacher nominated by NYSC&TE to develop a digital art portfolio on a CD-ROM, with the assistance of the New York Institute of Technology. Teachers wanted assessment methodologies that were aligned with the technologies they were giving students. The project looked at portfolio assessment as a means of instruction and assessment. The project demonstrated how higher education and teacher centers could work with a local school to support curriculum activities. The art teacher was able to utilize off-peak resources of the college, which made available advanced media capacity. The teacher center provided her training in pure technology, software, storage capacity,

and appropriate use of multimedia. The teacher brought more pedagogical concepts, such as assessment, portfolio assessment, components of portfolios, choice of product of what goes in a portfolio. The work was conducted in an open-dialogue, mentoring system between the teacher center director, the teacher, and her students.

TIIAP funds were also used to help NYSC&TE research and write "Learners and Technology: A Study of the Essential Elements of a Transformed Learning Environment." The paper outlined ways that technology can change teaching and learning in the classroom and described uses of technology that substantively change the way students learn, as compared to using technology to teach in the same ways. The paper informed the provisions in the legislative initiative dealing with adequate funding for developing innovative applications of the technology.

When the TIIAP project started, OTPAD staff looked for local telecommunications projects that they could assist with further development and then replicate elsewhere. OTPAD assisted organizations in Rochester, NY, in developing the Rochester Area Interactive Telecommunications Network (RAITN), a high-speed, fiber, digital network linking schools, Boards of Cooperative Educational Services (BOCES), colleges, and libraries. The project was viewed as a case study for learning about policies that must be in place at the state level to create a state network.

Another regional network activity that received TIIAP support was the Long Island ISDN Ubiquitous Access Project, later called the Educational Enterprise Zone. Designed by the New York Institute of Technology, the education enterprise zone was also a case study type of activity for a project to develop applications using ISDN technology and fiber optic networks. OTPAD organized a planning group of K-12 school representatives, as well as college and university and library staff. The outgrowth of the activity was a design of a gateway system that allows communication between the various groups, public access, and different technologies interfacing. Additional funding assistance was provided by Bell Atlantic.

Public/Private Partnerships. From their prior regulatory experiences, OTPAD project staff knew the extreme value of working with the telecommunications industry. NYSED continues to advocate for the use of private sector network providers, rather than building a state backbone. Because it is such a large market, the University of the State of New York's aggregate purchasing power has a strong impact on market pricing. OTPAD developed a position paper, "Public/Private Partnerships to Enhance Learning," that was adopted by the Regents to guide NYSED's relationships with industry.

The New York State Telephone Association conducted a study for the TIIAP project. The creation of "Transforming the Public Sector for the Information Age: The Role of the Local Phone Companies" was seen as an artifact of the collaboration between the telecommunications industry and the education systems. The study contributed to the design of the network and lent strength to the legislative package.

Regulatory Initiatives. The OTPAD project worked with a variety of regulatory issues related to the development of the electronic learning community, the legislative package, and the public/private partnerships. The Regulatory Issues Workgroup (described above) formulated recommendations and positions on the state and federal telecommunications issues. Participation in each of these provided an opportunity for a direct dialogue between the PSC commissioners and the Regents.

OTPAD project staff participated in several proceedings of the New York State Public Service Commission (PSC), from which they learned of the vast impacts of telecommunications regulation on the networking environment for education. The first was the NYNEX Incentive Regulation, which resolved a number of issues between New York, the state's largest local exchange carrier, and the PSC. The second proceeding, Competition II, was to design a new regulatory framework to support competition in the local

exchange market. Competition II was designed to create rules for telecommunication providers to operate under rules of competition rather than a regulatory structure.

Project staff also participated in the Diffusion Program Committee, which worked with rate settlement issues for distributing Bell Atlantic and Frontier Telephone funds to educational institutions. These NYNEX partners made commitments to provide funding to schools and other educational and non-profit institutions after they were found to be making too much money. This highly politicized work greatly informed the development of the project's legislative package.

NYSED, through the OTPAD and the Regulatory Issues Workgroup, also worked closely with the Federal Communications Commission on provisions of the Telecommunications Act of 1996, which created the Universal Service Fund and the E-rate. These provide for discounted rates on telecommunications services for schools and libraries. OTPAD staff represented the educational interests of the state, as well as coordinated a coalition of 10 northeast and mid-Atlantic states in formulating regional strategies.

Steps Taken to Sustain Project Activities Beyond the TIIAP Grant Period

The main means of continuing project activities was through the HP-12 legislation (described above). According to the project director, the legislation continues to be the driver for many of the new increases in aid for technology for schools. However, the human networks and working relationships developed through the planning processes provided for continued interactions towards the goals of the electronic learning community.

Activities/Milestones that Occurred Following the TIIAP Grant Period

HP-12 did not pass in the 1995-96 legislative session. According to the TIIAP project director, the failure to pass the legislation was largely due to its billion dollar price tag. For the 1996-97 session, the bill was renamed the Omnibus Technology in Education Act and broken into pieces. Pieces that were passed included approximately $500 million in funding for:

- Providing for a new supplemental aid category for the acquisition of technology, including telecommunications equipment for wiring for instruction, research, and information access for all public K-12 schools;

- Expanding the current building aid provisions to support the purchase of computers and related equipment for use in any classroom in the school;

- Amending current Public Authority Law to allow the Dormitory Authority to finance telecommunications infrastructures for library systems, public libraries, and museums chartered by the Regents and the Legislature; and

- Establishing a new state program to fund preservice and inservice training in the use of telecommunications and related information technologies for teachers, librarians, and other education professionals.

The following were not funded by the bill:

- Providing funds to K-12 schools, colleges, universities, and museums for connection to the information superhighway;

- Providing special building aid for technology for low-wealth districts, library systems, and public libraries; and

- Establishing the authority to create a statewide buying cooperative for acquiring licenses for selected network instructional and information resources.

Issues

Project Planning and Organization. Much of the original plan and timeline in the TIIAP proposal was not possible due to the state's budget troubles. OTPAD was not able to hire someone to manage the processes of a research grant style. This changed the strategy outlined in the grant application. As a result, the first several conferences were organizing forums that were used to identify major areas of inquiry and to set the policy tone. Beyond that, project staff knew generally where they needed to take the planning and found partners who could help them.

Involving New York City in Project Activities. An issue that often arises in New York is the dichotomy between New York City and the rest of the state. The New York City Board of Education operates somewhat separately from NYSED, largely because it has a vastly different set of needs than the rest of the state. The city's strategic technology plan was narrower than NYSED's and focused on the use of technology for administrative tasks rather than for learning. Consequently, the system was driven by a different kind of decision-making process for connections and the size of channels to classrooms. The TIIAP project director continues to work with the New York City Board of Education to encourage priority for distance learning and other applications of technology in the classroom. This has created a greater need to upgrade facilities and wiring in city schools, which has brought in more players. One such player is the city's Department of Information Technology and Telecommunications, which has authority for K-12 schools, but not the New York Public Library, which is separate from the school system, unlike the greater NYSED organization. These issues have created complicated political interactions for NYSED in New York City that have yet to be overcome.

Role of Teachers and Teacher Unions. Initially, the teachers and teacher unions in New York State were concerned that technologies and telecommunications and the applications NYSED was suggesting could replace teachers. They were very vocal in telling the Regents of these concerns. Project staff knew early on that the decision making and planning they envisioned required the full participation of teachers. NYSED and OTPAD staff have been effective in describing how the technologies and networks would not replace teachers but, rather, would create fundamental improvements in pedagogy. The NYSC&TE document and others were useful in describing how these changes in pedagogy would enhance teachers' capacity to infuse technology into their classroom practices. Moreover, a bill was passed into education law and signed by the Commissioner that defined regulations for teacher training, and in particular for technology training, which gave teachers the responsibility for what they learn. This brought tremendous buy-in from teachers, and now the unions are among the strongest supporters of developing the infrastructure.

Emerging Technologies. Because the grant was a policy study, the project was largely insulated from advances in technology. Early on, they made a commitment that the state would not mandate a

particular technology or establish standards that were technology-specific. They were sensitive to the issue of changing technologies and stated that they wanted access to voice, data, and video, but without specifying a way to get there. At the various conferences and in position papers, staff and consultants tried to keep participants at the forefront of technology, and especially pushed the envelope for the Regents.

Problems

As mentioned previously, the TIIAP project had staffing problems due to budget deficits for NYSED. In general, they proposed to hire people to do very specific activities and create specific products, such as the network design and standards development and applied uses of networks especially at the K-12 level. They were planning to hire three people to carry forward the establishment of a new office. However, the state would not release its matching funds to hire the staff, and the department was releasing other staff at the time. This precipitated a 6-month delay in the activities.

The use of in-kind resources had always been in the plans, but as time went on, the project relied on external staff resources to a greater extent that originally planned. These organizations were both partners and contractors. This did not change what the project did as much as it changed *how* it was done and *who* did it. In fact, the project director felt that the budget problems actually benefited the project by generating buy-in for the project from a variety of organizations in different sectors. He was more comfortable with not creating a large staffing structure and has an aversion to institutionalizing activities because they tend to become inflexible.

E. PROJECT ACCOMPLISHMENTS AND IMPACT

> *"Range of influence on a policy grant is somewhat defined, but the fact that they could work in so many ways was great strength."* NetTech representative

An important project accomplishment was its ability to turn a little over $100,000 in funding from TIIAP into an almost $600,000 project. Moreover, the project director estimated that the TIIAP funds leveraged 10 times the amount in activities related to, but not supported by the grant or the non-federal match or in-kind services. Other accomplishments are described below.

Technology-Related Accomplishments

Because the TIIAP grant was for a policy planning project, there were no actual technology accomplishments, such as putting in place actual computer systems or wiring. However, out of the project grew a network architecture for New York State to which all subsequent network activity has adhered.

The most concrete example of a technology accomplishment is the Education Enterprise Zone that grew out of the Long Island ISDN Ubiquitous Access Project. It has electronically linked three communities:

- Learners in formal and informal settings, from pre-K to senior citizens;
- The organizing units than enable learning, such as local school boards, NYSED, library systems, and the teachers centers; and

- Content providers, such as libraries, businesses, colleges, museums, cultural institutions, research sites, international resources, hospitals, and community and government organizations.

The museums have been the most active, and, in fact, staff have been overwhelmed with the number of museums that are interested in making connections. Moreover, there are many content providers already connected that are geographically located far outside of New York State. The system has worked such that schools express a content area they would like to see on the system, and the administrator finds locations of that content, in or out of the state. As project staff found, the key is content providers knowing that there is something and someone to whom to deliver their information. An example was provided of a conversation 12 middle school students had with a reporter traveling with Vice President Gore investigating the status of the Chernobyl nuclear disaster site.

As was the original intention in the TIIAP grant, this model for linking information sources with schools is being replicated elsewhere in the state. It is being bid by several BOCES as Technology Literacy Challenge Fund grant projects.

Impact of the Project on Direct End Users

As a policy planning grant, the project had no true end users. All respondents felt that the project has definitely moved the electronic learning community forward, and ultimately, where it has not already, it will improve the education system in New York State.

Impact of the Project on Other Beneficiaries and/or the Overall Community

The grant created enough visibility to the issues to bring other resources to the task. The following two examples illustrate this point. Early on, as telecommunications came to be viewed as essential to the education community, the governor of New York initially wanted to put a computer on every student's desk. Receipt of the TIIAP grant enabled OTPAD to gather evidence that a computer itself is not enough. It urged a strong emphasis on professional development for teachers to be able to use the technology effectively. As a result, funds for technology-based professional development were included in the legislation that was eventually passed.

Early on in the TIIAP project, the Senate education chair wanted a computer in every classroom and believed that more computers mean the state is doing a better job of education. OTPAD project staff worked extensively with his office and showed him that network-based resources are what schools need, and that a computer is not enough. This fomented a major change in the Senate, according to the project director. The project director reported that the Senate members now have a better understanding of the dynamics and needs of the electronic learning community.

The project also broadened the thinking of private telecommunications companies about the needs of educational communities. Initially, OTPAD intended to interact with private companies on an advisory capacity and in consultation, but to use in-house experts to do the work. When this did not occur, the project director helped the companies understand what they could do and how to meet needs of their customers. When the telecommunication companies could not see what schools were going to do with high-bandwidth connections, he helped them understand how the Internet went beyond the utility of just research universities. As a result, there are plans to provide a high-speed T-1 connection for all 1,200 New York City schools, whereas initially the companies planned only a 28.8 kb connection.

Impact of the Project on Grant Recipient and Project Partners

The planning project brought a focus to all things related to information technology policy and brought about the advent of networks for learning. Prior to the study, nobody was really thinking about technology use in terms of networks. But with the involvement of a variety of organizations, the project built capacity outside of NYSED by decentralizing development and planning activities to private industry and various associations.

The decision to outsource many of the grant tasks expanded the scope of who was involved in the project. The project director noted that he was not concerned with the quality of any of the documents as much as how they could draw the need and expertise into the decision-making process. The organizations felt much more bought in to process, especially with the NYSC&TE document, which got into minds of 2,500 teachers. Even though the issues were there prior to the project, the NYSC&TE president said, the TIIAP project put in place a mechanism to write the document. Similarly, the Teacher Resource Computer Training Centers, which looked at professional development policies and informed the process, easily reached more than half of the teachers involved with the teacher centers. Two of the partner organizations, NYSC&TE and NetTech, did not have previous relationships with NYSED, but now have close relationships on many projects and consult each other on their work and policies.

The TIIAP project led to a restructuring of how the Teacher Resource and Computer Training Centers conduct business. Prior to the project, there were individualized activities organized at each teacher center; they treated their mission literally and provided training according to teachers' articulated needs exactly as they were stated in needs assessment surveys. Teachers never got to see outside the box and received the same training on the same old things. Even with no overarching and unifying theme, the training was somewhat useful, but not in light of the statewide movement for standards and other reforms. The TIIAP project revealed the problem but did not solve it. It did, however, provide an opportunity for the technology committee to think about the needs that had surfaced and to separate overarching needs and needs idiosyncratic to a few teachers. In order to develop new models, the project looked at the current methodologies of delivery and found they were typically one-shot, make-and-take sessions with little or no followup. They looked at the strategies and their efficacy with different populations, such as experienced teachers and new teachers, and changed them accordingly.

Many of the partners reported that they really learned about technology policy and the technologies themselves through the project. The NetTech representative said her work on the project helped crystallize the issues, processes, players, and how to negotiate within the different arenas. She had always been interested in policy work and had worked on other grants, but she knew that teachers could not do what the policies said teachers should do; the grant activities helped her to understand what could be done about it. She also reported the feeling among all of the NetTech participants that interpreting the laws was a critical learning activity for them. The grant motivated NetTech to find out what other states were thinking, what resources they were using, and how they dealt with time, money, and equipment. The states had a willingness to share. Collaboration, she said, always sounded nice, but actually sharing resources was crucial. This was especially helpful once the federal program offices expected NetTech to be responsive to states because they had people in those states who already knew what was going on with these issues.

Outsourcing tasks also led to many other projects. For example, the New York State Telephone Association liked the idea of the TIIAP project so much that they fashioned a study on loop-to-loop technology. They saw the process as help them understand how to meet the needs of their customers. Otherwise, they likely would have thought about and designed a system themselves without consulting

with other organizations. Forcing OTPAD to go outside the department brought the industry into contact with the support and collaboration they needed.

The New York Public Service Commission was brought to the table to help them understand the needs of education as they develop new regulatory structures. Representatives from the New York Law School Communications Media Center were particularly adamant that how the PSC creates the regulatory structure must meet the education needs of those most in need in the education community. These are areas generally not represented in business models when rate caps are removed. As a function of the TIIAP grant, the Regents met with the PSC commissioners and forged an agreement that is still in effect. The Regents have open door to certain proceedings of the PSC, and the PSC must respond to the Regents' petitions. The TIIAP project director was pleased that the PSC really "carried [their] flag, especially with the E-rate." This close relationship continues, and the project director continues to be involved with many of the PSC proceedings.

Project Goals Not Met

The project had originally planned to create a database of projects using instructional technology. The database would include local, regional, and state-level projects that were developing and using technology to enhance pedagogy and learning. It was to provide information and new ideas about how technology was being used and what outcomes were observed. Due to the staffing issues, this aspect of the project was not completed.

Second, NYSED and OTPAD did not get legislation passed during the period covered by the TIIAP grant. As discussed earlier, some of the items contained in the original bill were included in legislation passed later.

The project director was also disappointed that a long-term strategic plan for New York State's telecommunication infrastructure was not written by the end of the grant period. This strategic plan was to have been a blueprint document against which all funding and program development activities are developed at state, regional, and local levels. Part of the plan was to be a formal statement of what had already happened with the electronic learning community. Another part was to lay out practices that should be adopted in the future, such as requiring instructional technology experts, rather than technicians, to operate networks in the BOCES. The project director is currently working on the plan and anticipates it will be completed by January 1999.

F. EVALUATION AND DISSEMINATION

Evaluation

No evaluation was conducted under the TIIAP planning grant. Because of the nature of the grant, it does not appear that any kind of evaluation would have informed the design or implementation of any project-related activities.

Dissemination

Under the project, many position papers were created that have been widely distributed across the state at meetings and other events and through BOCES. These continue to be updated and distributed. These documents have also been shared with technology staff in other states.

G. LESSONS LEARNED

OTPAD staff learned a great deal about infrastructure planning and cited several benefits to the processes they used.

Including All Stakeholders in the Planning Process. OTPAD learned the importance of involving all stakeholders, such as education professionals, policymakers, and private industry in their planning process. Buy-in, and even understanding of the technology, was critical to the success of their plans.

Outsourcing Deliverables. Although outsourcing was to some extent a result of a lack of funds to hire in-house staff to conduct some of the tasks, OTPAD project staff found that outsourcing allowed a variety of perspectives in the process. It was also beneficial in developing implementation capacities outside of NYSED. Moreover, these capacities were not built within isolated institutions, but rather, were built for institutions and government working in concert.

Developing Regional Capacities. By providing models for network infrastructure planning, project staff helped to develop regional capacities for applying for and implementing Technology Literacy Challenge Fund grants, rather encouraging single institutions to apply. Meeting with representatives from other states was also beneficial in developing multi-state capacities. It provided an opportunity for sharing ideas and plans and created a human network for continuing discussion of technology implementation at the state and federal level.

Looking at the Big Picture, not a Specific Technology. OTPAD and the partners felt they benefited from building their electronic learning community around a set of outcomes and beliefs of what was important for learners in the state. They did not focus on any specific type of technology, with the express purpose of creating a flexible and expandable system. Early on, they made a commitment not to mandate any technology or to establish standards that were technology-specific. If anything, they encouraged the most advanced technology, high-speed digital video, knowing that it would be easier to scale back than to add new technologies later.

Accepting Uncertainty and Risk. The TIIAP project was successful because of people's willingness to look at the entire educational system in the state and include traditional adversaries, such as private industry. There had to be established a relationship of trust among the different groups that they were all trying to help learners and move the system. Many of the partners went into the project not knowing what they were going to get out of it, but project staff were able to build a synergy among the players around some common goals.

Taking Advantage of Smaller Resources to Leverage Other Funds. In the field of education, there is tremendous opportunity to leverage small amounts of money. In New York, federal funding is generally 5 to 10 percent of total education expenditures. These small influxes of funding, according to the project director, drive a immense effort. In the area of technology, he said, this is magnified 100-fold. The power of technology pulls people together; everyone wants to participate, and no one wants to be left behind. The TIIAP-related projects under this grant were able to leverage ten times the resources TIIAP provided. The timing was right, and when people realized the project would be conducted at a policy level, it galvanized their attention and encouraged action.

H. FUTURE PLANS

The TIIAP project director continues to work with all of the partners to implement the electronic learning community.

OTPAD has recently been working with Governor's office on a new strategy for state telecommunication infrastructure. Material from the TIIAP project is being used as the background information for these activities. A long-range technology plan for New York State is now the first priority. The strategic plan will be a blueprint document against which all funding and program development activities are developed at state, regional, and local level. Much of this plan will be a formal statement of what is already happening with the electronic learning community, but it will also provide some rules of the road that need to change. One major change will be requiring instructional technology experts, rather than technicians, to operate networks in the BOCES.

The TIIAP grant set the expectation that that infrastructure development activities in New York State always should address the networking capacity of the infrastructure. With the Technology Literacy Challenge Fund, the state is developing regional capacities, rather than institutional capacities. According to the project director, New York State is different from other states by using the TLCF for large consortia. They are also pushing staff development more than other states, requiring at least 25 percent of TLCF funds to be used for professional development in each TLCF-funded project. The professional development requirement is quite unique but is supported by the U.S. Department of Education and the TLCF program. The wild card, the TIIAP project director said, is the virtual absence of funding for networking because of delays in the implementation of the Universal Service Fund and E-rate. The applications they developed are highly dependent on access to networks.