Report to the Joint Legislative Education Oversight Committee

Report on Modifications to the State School Technology Plan

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NC Department of Public Instruction

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REPRESENTATIVE FLOSSIE BOYD-McINTYRE
28TH DISTRICT

December 12, 2002

To: The HonorableWalter Dalton, Co-Chair
           The Honorable Gene Rogers, Co-Chair
            Joint Legislative Education Oversight Committee
           Members, Joint Legislative Education Oversight Committee

From: Representative Flossie Boyd-McIntyre
           Co-Chair, School Technology Commission

           Mr. Fred Bartholomew
           Co-Chair, School Technology Commission

Topic: Report on Modifications to the North Carolina Educational Technology Plan

According to G.S. 115C-102.6B, the School Technology Commission is required to present any modifications to the State Technology Plan to the Joint Legislative Education Oversight Committee and the Joint Legislative Government Operations Committee by January 1 each year. In accordance with this General Statute, the following report is being submitted.

During the past year, the Division of Instructional Technology at the Department of Public Instruction revised the 2000 North Carolina Instructional Technology Plan to reflect the changes in technology and federal and state educational priorities. In so doing, the Plan continues to be aligned with the priorities of the State Board of Education: High Student Performance; Safe, Orderly, and Caring Schools; Quality Teachers, Administrators, and Staff; Strong Family, Community, and Business Support; and Effective and Efficient Operations.

Additionally, this revision represents compliance with federal technology planning guidelines that are outlined in the *No Child Left Behind* legislation, specifically Title II, D, *Enhancing Education Through Technology*. This plan has received input from a variety of focus groups across the state and was approved by both the State Board of Education (September 2002) and the Information Resource Management Commission (August 2002).

Currently, LEAs are submitting their revisions to local technology plans, again aligning them with the state plan. These revisions are being reviewed by both the state Information Technology Services staff and the Instructional Technology staff. Approved plans qualify LEAs for state technology money, federal technology grants, and e-Rate dollars.

Both the state and local plans are subject to continual update and revision, with LEAs required to make formal revision/evaluation updates every two years. The North Carolina Educational Technology Plan may be accessed at http://tps.dpi.state.nc.us/Tech2000rev/. Individual LEA plans can be found on school system web sites.

c   Dr. Robert Bellamy, Associate Superintendent, Accountability and Technology
       Frances Bryant Bradburn, Director, Instructional Technology
       Linda Suggs, Legislative Director
       School Technology Commission Members

The North Carolina Educational Technology Plan

2001-2005

2002-2003 Revision

The Vision for Technology in North Carolina's K-12 Schools

North Carolina has been a pioneer in the implementation of technology and how it is tied to learning." Cheryl Garnette, Director of Learning Technologies Division, U.S. Department of Education at The N.C. School Technology Users Task Force II, Educational Technology in N.C.: Five Years of Progress, April 4, 2000.

As mandated by North Carolina law GS115C-102.6, North Carolina has developed a state educational technology plan to enhance teaching and learning within all its schools. In keeping with the North Carolina vision of building collaborative partners and leadership, a Media and Technology Advisory Committee provides the optimal medium for creating a system-level technology plan and for implementing a strong educational technology program. Planning is most effective when those responsible for the instructional program are involved in designing, implementing, and making decisions about administrative and educational technology. Students are more likely to be successful in achieving in-depth learning when the administrative and teaching staff and the community build a collective vision for technology that is connected to teaching and learning.

The North Carolina Educational Technology Plan has been designed to reflect North Carolina's Strategic Plan for Excellent Schools, The ABCs Plus. To achieve the state education goal of First in America by 2010, the educational technology vision and recommendations will follow the recommendations by Governor Easley's Education First Task Force for the hallmarks of excellence, the strategic use of resources, and preparing graduates of North Carolina schools. This will be done by supporting and enhancing the North Carolina Department of Public Instruction's (NCDPI) mission of high student achievement; safe and orderly schools; quality teachers, administrators and staff; strong family, community and business support; and effective and efficient operations.

High Student Performance

> Technology is a tool that enables teachers and administrators to work more productively, offering solutions for time management, student monitoring and intervention, and interesting and effective lessons and classroom activities. NC WiseOwl and Kaleidoscope, both North Carolina Department of Public Instruction initiatives, are models of well-designed instructional technology resources. NC WiseOwl is a curriculum-based reference Web resource that enables students to interact with and explore the world, bringing a wealth of information and experiences into the classroom, thus potentially overcoming geographical isolation, physical barriers, and economic hardships. Kaleidoscope is a Web portal that encourages students' creativity and self-direction, while developing twenty-first century computer and information skills. Work Force Development departments in each Local Education Agency (LEA) have a wide range of technology resources that can be used for training and for evaluating student progress. Ultimately, technology is a tool that helps every teacher and every student master basic skills and develop critical thinking and problem solving abilities. Technology can be a support tool to reinvent schools so that all students achieve at higher levels and are better prepared for the workplace. Recent studies demonstrate that students with exposure to computers are doing better academically than their peers without computers. (Sharp, 1999)

Safe, Orderly, and Caring Schools

The advent of technology into site planning and building design has increased the potential for creating a safe environment for teaching and learning. A technology infrastructure that includes integrated security and protection systems, such as telephones in every classroom, warning devices, and monitoring cameras, protects individuals and the facility. The real benefit of technology in a safe and orderly educational environment, however, is in the resources it brings into the classroom and school library media center. Because technology opens doors to the world, while simultaneously focusing students on the task at hand, student interest and motivation are heightened and discipline problems decrease. When students are motivated and successful, they tend to work harder and longer, raising the possibility of higher student achievement. This success fosters a culture in which learning is the expectation and ultimate goal.

Quality Teachers, Administrators, and Staff

Because technology increases productivity, brings worldwide experience and expertise into the classroom, and stimulates interest in learning, it is the ultimate tool in the professional educator's repertoire. It offers a variety of tools that help decrease the time spent on paperwork, thus increasing time available to spend with students. Access to the Internet offers endless opportunities for professional development and educational research, as well as access to up-to-date curriculum resources. With statewide resources such as NC WISE, HRMS, BUD, and NC WiseOwl, and N.C.Classes Online, teachers, administrators, and staff have desktop access to a variety of information resources. This information allows educators to track individual progress and mastery of skills (and the conditions that might affect that progress); develop strategies, skills, and policies that assist in that mastery; and, ultimately, create a quality, data-driven environment that affects high student achievement.

Technology promotes professional growth by providing a variety of opportunities for professional development. Telecommunications overcomes time and distance barriers that limit the resources for teachers and staff, particularly, in remote locations. Distance learning, Internet classes, and streaming video offer avenues for learning new instructional theories and developing new teaching strategies and essential skills. Through electronic collaboration with institutions of higher education, community colleges, and other public schools, local school systems are able to maximize professional development programs. NCwin's online courses and the NCDPI Star Schools distance learning series are two statewide initiatives that extend and expand professional development opportunities beyond the school.

Strong Family, Community, and Business Support

Technology is the fundamental vehicle for communication with the community and the family. E-mail, telephones in every classroom, community-access television, and school resources electronically available throughout the community allow and encourage adult participation in a child's education. Community Technology Learning Centers provide facilities where parents, teachers, students and the community can learn new skills and share resources.

The highest level of student achievement occurs when families, schools, and community organizations work together. (Dede, 1998) Parents can increase involvement as time constraints dissolve and education-related interactions occur in the comfortable, familiar context of home. With technology, the school and its values of learning and achievement can enter every home, thus enhancing and extending teaching and learning to every individual regardless of age or socioeconomic status. Eventually, this pervasiveness creates the culture that enables North Carolina's schools to become First in America by 2010.

Effective and Efficient Operation

Schools realize the benefits of a technology-rich environment through state-driven economies of scale and individual outcomes of increased productivity and more efficient time management. Online student management systems and application software allow teachers to focus more on teaching and less on clerical tasks. Online administrative and clerical resources such as Student Information Management System (SIMS), Transportation Information Management System (TIMS), Human Resource Management System (HRMS), and Budget Utilization and Development (BUD) have streamlined the reporting and information management process. Through statewide resources such as NC WISE and NC WiseOwl, every educator in North Carolina has the opportunity to access a broad range of essential information and resources that affect teaching and learning.

Telecommunications has increased the availability of lifelong learning opportunities through streaming video, distance learning courses, Web courses, and online tutorials. Distance learning, brought into the classroom via the Internet, satellite video, fiber optics, or even cable, also allows students to complete college courses, get Advanced Placement credits, take classes when no certified teacher is available locally, or even complete a high school degree at home. A study released by the American Association of School Administrators in 1999 concluded that the most effective schools in the 21st Century will be both centers of lifelong learning and "digital hubs which will be open electronically 24 hours a day, 7 days a week, 365 days a year."

Instruction

Current Situation

Since the implementation of the 1995 North Carolina Educational Technology Plan, North Carolina has made significant progress toward the integration of technology into the teaching and learning process. Over 85% of the classrooms in North Carolina have at least one computer with Internet access, enabling teachers to better implement student-centered, authentic, project-based learning. The Internet and other online resources are used daily by teachers throughout the state to access research and educational materials to prepare, teach, and deliver lessons.

Students in every school across the state have access to computers, printers, and a wide variety of educational software with which to learn computer/technology skills. Technology is available in media centers, flexibly scheduled computer labs, community technology learning centers, public libraries, and at home. Technology is becoming the norm, not the exception, in the educational environment of North Carolina schools.

Technology has opened many educational doors to children, particularly children with disabilities. Alternative solutions from the world of technology are accommodating physical, sensory, or cognitive impairments in many ways. (Behrmann, 1998) Teachers are developing individualized learning plans that incorporate technology and are using technology in teaching methods that address all learning styles. Many teachers and administrators are tracking student performance and using this data to modify instruction and provide remediation in order to meet individual student learning goals and the ABC goals and objectives. Through continued implementation of staff development, sharing of research, identification of best practices, and modeling of effective technology use in the classroom, all teachers and students are becoming proficient in using technology as an instructional tool.

Regarding student use of technology in North Carolina, 73% of eighth grade students passed the Computer Skills Test in 1999/2000. According to the 2001 Annual Media and Technology Report (AMTR) over 85% of North Carolina's students use computers in their regular classrooms, as well as their computer labs and media centers. A variety of research studies continue to validate the use of technology in increased learning, especially as it relates to test scores. (Kulik & Kulik, 1991; Sivin & Bialo, 1996; Mann et al, 1999)

Since 1988, North Carolina students, particularly those in small rural high schools, have had access to interactive distance learning courses delivered by:

- Satellite - one-way video/two-way audio. Approximately 1100 students each year enroll in courses ranging from Marine Science to Latin to AP Psychology & to Calculus.

- North Carolina Information Highway - Approximately 3,500 high school students participate in courses from other high schools, community colleges and universities.

A growing number of students are taking on-line courses from Cumberland County's Web Academy, Apex Learning, NovaNet and the Massachusetts based Virtual High School.

Vision

North Carolina schools have made advances over the past several years to make technology accessible to students and to see that teachers integrate it well into the classroom. Research indicates the need to move beyond "integrating" competencies into the curriculum to the transparent use of appropriate technologies to stimulate higher order thinking skills. By making students active learners in control of their learning experiences, students are empowered. There is, however, no substitute for the knowledgeable teacher who guides students through this active learning process. Technology serves to enhance and facilitate this process.

A thoughtfully planned technology program deriving its design from the instructional goals of the school is the best use of technology to affect high student achievement. Research supports the idea that the targeted use of technology for specific instructional goals has a positive effect on student outcomes. The use of technology should reinforce the intelligent behavior of students as it applies to instructional goals of the school.

Schools that build their technology resources based on how technology can support their instructional goals are on the right track. Although choices about networking, productivity software, and Internet access can be generalized throughout a district, each school must make its technology support its instructional goals for all children.

In keeping with the content and philosophies of the North Carolina Standard Course of Study and the ABCs of Public Education, technology will nurture and empower the development of students to become:

- self-directed, life-long learners

- complex thinkers

- quality producers

- collaborative workers

- community contributors

Students will learn how to select, evaluate, and use a variety of technology applications and resources for their personal and academic needs. Through the acquisition of knowledge and skills, students will have the ability to participate and thrive in the American economic and political system. Principals are instructional leaders, and as such, they will continue to model the effective use of technology in the educational environment. Teachers and administrators will use technology to address more effectively the learning styles of today's students.

Research studies note that students who use computers demonstrate greater problem solving and critical thinking skills when compared to students in traditional classrooms. (Pogrow, 1996; Chessler, Rockman, and Walker, 1998) According to Ted S. Hasselbring, we must bring together the basic principles from the "science of learning" and technology use in schools to influence student achievement. Computer-based technologies hold great promise both for increasing access to knowledge and as a means of promoting learning. (2001)

Strategic Plan

Instruction is arguably the most important section of any educational technology plan and therefore should be supported by all other areas of the plan. Initiatives in the area of instruction must be factored into the Total Cost of Ownership (TCO) by school and district level planners.

Research findings indicate that technology alone does not have a significant effect on teaching and learning. When used with tested instructional practices and curriculum, technology is a tool that can be an effective catalyst for education reform. (Cradler, 1992) Research on technology's benefits for teaching is generally positive, with a shift from the traditional direct approaches to a more student-centered approach. Thus, to enhance teaching and learning through the infusion of technology into the classroom, the following action plan is presented.

Goal:

- High student achievement

Objectives:

- All NC students will pass the eighth grade computer skills test.

- Instruction will incorporate strategies for technology integration into the NC Standard Course of Study.

- All teachers will use technology consistent with the NC Standard Course of Study.

- Administrators, certified and non-certified personnel will model the use of technology in the administration of their responsibilities.

- Teachers, administrators, and support personnel will use technology to assess and individualize student instruction.

In order to achieve the statewide objectives, NCDPI will:

1. Provide direction through the development and dissemination of research-based models and strategies that enable flexible access in all media centers and computer labs.
2. Develop and maintain a variety of methods for assessing student progress in the acquisition of Computer Technology Skills, such as:

- online eighth grade practice test.

- online fifth grade Computer Skills Test item bank.

- guidelines for electronic portfolios.

- models of teacher- and student-evaluated projects.

3. Provide guidance in the implementation of school media and technology programs as outlined in IMPACT:Guidelines for Media and Technology Programs.

4. Create and/or revise position description and performance appraisal instruments for media coordinators and technology facilitators.

5. Provide reports, tools and training to LEAs to assist them in disaggregating and interpreting student performance data.

In order to achieve the statewide objectives, LEAs should:

1. Encourage and support teachers and students in the development of rubrics to assess student work.

2. Provide guidance to all educators to develop effective formative evaluation processes.

3. Assist personnel in the creation and use of project-based, interdisciplinary units that integrate technology into all curricula.

4. Schedule all media centers and computer labs flexibly so that students and teachers can access resources and services at point of need.

5. Provide yearly remediation and retesting opportunities for students who do not pass the Computer Skills Test.

6. Develop and use a variety of methods for annually assessing student progress in the acquisition of Computer Technology Skills.

7. Foster collaboration among teachers, Technology Facilitators and Media Coordinators as outlined in IMPACT: Guidelines for Media and Technology Programs.

8. Encourage the use of technology resources to analyze student data in order to individualize instruction.

Staff Development

Current Situation

North Carolina has gained national recognition for its technology staff development initiatives for both in-service and pre-service teachers and administrators. In the 1999 Milken Educator Survey for Education Week, North Carolina teachers reported that in an average year they received 21 total hours of technology staff development, while the national average during the same period was only 11 total. (Milken, 1999) This is a direct result of the State Board of Education policy that requires three to five CEUs of technology training for every five-year recertification cycle. The State Board of Education policy also includes a pre-service technology requirement for all newly licensed teachers and administrators. As the research indicates (Hunt & Bradley, 1993), the state has found that the most successful staff development programs are those that involve teachers and principals in the planning. To support the State Board policy, NCDPI has provided access to an online technology staff development resource, NCwin.

Staff development is one of the important elements of Total Cost of Ownership (TCO). LEAs spend between 20-30% of their technology budgets on staff development. Of the 20-30%, most LEAs have been putting between 8.5% and 12% of that total in solid dollars. The remaining dollar credits have been in in-kind dollars.

Vision

Never before in the history of education has there been greater recognition of the importance of professional development. Every modern proposal to reform, restructure, or transform schools emphasizes professional development as a primary vehicle in efforts to bring about needed change. (Guskey, 1994)

Lending urgency to in-service technology training is the finding that it is the single most critical factor associated with improving student achievement when using technology in instruction (CEO Forum, 2001, 9).

The potential benefit that students can derive from the infusion of technology in the classroom requires that North Carolina teachers receive high-quality staff development guided by principles developed by the U.S. Department of Education.

High-quality professional development:

- Is driven by a coherent long-term plan.

- Focuses on teachers as central to student learning, yet includes all other members of the school community.

- Focuses on individual, collegial, and organizational improvement.

- Respects and nurtures the intellectual and leadership capacity of teachers, principals, and others in the school community.

- Promotes the continuous inquiry and improvement embedded in the daily life of the schools.

- Is planned collaboratively by those who will participate in and facilitate that development.

- Requires substantial time and other resources.

- Enables teachers to develop further expertise in subject content, teaching strategies, uses of technologies, and other essential elements in teaching to high standards.

- Reflects best available research and practice in teaching, learning, and leadership.

- Is evaluated on the basis of its impact on teaching effectiveness and student learning. This assessment guides subsequent professional efforts.

The public schools will continue to build upon the strong foundation of a culture of learning that has been created in North Carolina through a variety of collaborations among LEAs, NCDPI, IHEs, private non-profits, and business and industry partners.

Support from administrators is paramount to success in teacher training. Administrators are in a position to provide time and resources for teacher training. Administrators' believe that training and the subsequent use of educational technologies in the classroom will make a difference and will carry over to the teachers. Without that belief, efforts to incorporate technology into the classroom will be limited by the individual teacher's ability to sustain the process of change and to garner resources. To aid administrators in these efforts, NCDPI has developed IMPACT for Administrators, a guide for the implementation and evaluation of building-level media and technology programs.

Beginning with pre-service training, technology must be integrated into the teacher's learning experience and used as a tool for teaching. Also, beginning with pre-service training, teachers must become lifelong learners. This is particularly pertinent to technology literacy because technology is constantly changing. Training must be relevant to the classroom setting and must suit teachers' schedules. The format of training must model the teaching behaviors that teachers are expected to exhibit. In the best cases, teachers are

equipped with a positive attitude, adequate resources, sufficient time for preparation and replication, and coaching. As a result, they find meaningful ways to incorporate technologies in the classroom.

Throughout this entire learning process, time is an essential element. Many activities compete for a teacher's time. However, teachers must have time to learn, time to practice, and time to chart their own growth and development. Teachers know their teaching styles and their own learning styles. Time to adapt new lessons learned to these teaching and learning styles is critical. Time should be allotted during the normal working hours, not only on weekends and after hours. Developing strategies to make such options feasible is needed.

Strategic Plan

GS 115C-102.6 recognizes the validity of this interrelationship between classroom use of instructional technology and the need for staff development for North Carolina teachers. "The single most important factor affecting the successful incorporation of technology into the classroom is teacher staff development." (Chalmers, p.48) During the development of the first State Educational Technology Plan, the findings of the external consultant (CELT) re-emphasized the significance of this relationship with data from North Carolina teachers and other educators suggesting that staff development and training were as important to them as the technological tools themselves. Such staff development requires small group collaboration in classroom settings. Here, teachers build upon existing knowledge about curriculum and practice and have opportunities to experiment and reflect upon new experiences. Settings such as this provide ongoing support for change and implementation. State and national conferences offer staff development opportunities that encourage sharing and collaboration across system, state, and national boundaries.

Staff development is not only for teachers, but also is very beneficial for all LEA personnel. It is essential that any individuals who are expected to utilize technology as part of their job performance be provided training on the hardware and software they will use.

The transformation in the roles of staff developers has paralleled the shift from in-service education focused primarily on individual teacher change to a more comprehensive, systemic focus on the entire organization and the individuals who comprise it. (Henkelman, 1991; Killian and Harrison, 1991,1992). The professional development plan and focus should address the entire LEA staff.

The importance of professional development cannot be undervalued. Despite the demonstrable need, the latest indication is that nationally only 8 percent of technology expenditures are directed toward professional staff development (*Topics in Education Group, 2001, May*). Since 1995, NCDPI has recommended that 20-30% of the total technology budget be used for technology staff development. The U. S. Department of Education recommends that 30% of school technology budgets go to staff training (Rosental, 1998).

Goal:

- Quality teachers, administrators, and staff

Objectives:

- All administrators, certified and non-certified personnel will have access to relevant, high quality technology staff development opportunities.

- All certified personnel will earn technology continuing education units (CEUs) during their license renewal cycle based on State Board of Education policy.

- All administrators, certified and non-certified personnel will receive ongoing technology staff development based on identified technology competencies relevant to job responsibilities.

In order to achieve the statewide objectives, NCDPI will:

1. Provide initial staff development for all new agency resources.
2. Provide Technology Consultation Services to LEAs.
3. Develop support materials for staff development initiatives provided by NCDPI.
4. Provide staff development opportunities for LEAs, IHEs, Community Colleges and non-profit organizations.
5. Update North Carolina Educator Technology Competencies to align with North Carolina pre-service standards.
6. Provide statewide cost and access to online technology staff development through NCwin.
7. Evaluate staff development resources.
8. Research and identify best practices for delivering high-quality technology staff development.

In order to achieve the statewide objectives, LEAs should:

1. Allocate 20-30% of the technology budget for staff development (This may include in-kind services).
2. Base technology staff development programs on student learning outcomes.
3. Offer high-quality training opportunities.
4. Make staff development available through a variety of delivery systems including online opportunities.
5. Reflect school improvement goals and individual professional growth plans in all technology staff development.
6. Continuously assess personnel to ensure that staff development is meeting their instructional and administrative needs.
7. Ensure that trainers solicit teacher suggestions for evaluation and feedback.
8. Base technology staff development on North Carolina Educator Technology Competencies.
9. Assess new teachers for technology competency and reflect the assessment in individual growth plans.
10. Implement the ISTE Technology Standards for School Administrators.
11. Develop a training plan for teacher assistants and other building level support personnel based on identified technology competencies that are relevant to their particular job responsibilities.
12. Offer a variety of staff development options that include state and national conferences, on-line courses, IHE/graduate level courses, one-on-one instruction, and system-level training opportunities.
13. Follow up initial training with visits from peer coaches to observe the use of technology in the classroom.
14. Include peer collaboration in training plans as a strategy for follow-up support and continuous learning.
15. Model the appropriate use of technology as a tool for teaching and learning during staff development.
16. Include strategies for planning effective and appropriate integration of technology into classroom instruction.
17. Provide comprehensive training for all work related technology applications.
18. Establish a policy for selection of online staff development based on state guidelines.
19. Make plans for training and implementation of NCWISE.

IN-KIND Staff Development Appendix.

Infrastructure / Connectivity

Current Situation

Currently, NCDPI maintains statewide low speed System Network Architecture (SNA) connectivity for mainframe and midrange systems to support the financial services, human resource systems, and bus garage applications. The LEA financial systems are housed on the AS/400, and the bus garage systems are housed on the Office of Information Technology Services mainframe. Workstation connectivity to the midrange and mainframe systems varies from LEA to LEA. Most LEAs are moving toward IP connectivity between the workstation and the midrange and mainframe systems. In addition, connectivity between the state midrange systems and mainframe systems and the LEAs is primarily SNA. LEAs are moving toward an integrated IP network for all instructional and administrative connectivity. NCDPI is working currently with the Office of Information Technology Services to provide LEAs with Wide Area Network Connectivity.

Most LEAs that have Local Area Networks (LANs) use Novell for directory, file, and print services. The Office of Information Technology Services maintains the Novell Tree for the State Network. School systems have the ability to insert into the state tree, but most LEAs have not chosen to do this. Windows NT is also a prevalent network operating system, but is primarily used as an applications server and database server. Unix/Linux is also beginning to be used to deploy various application and web servers.The RISC AS/400 is the primary platform for Human Resource and Financial Systems.

LEAs have chosen a variety of server platforms to deploy various applications. Intel is the primary hardware platform for most servers for instruction. The RISC AS/400 is the primary platform for Human Resource and Financial Systems.

While the actual data in NCWISE is protected via SSL the piloting of both NCWISE and HRMS has shown that there is a shortage of skills in many LEAs with regards to firewall implementation and management. A common firewall structure would not only simplify the opening of needed ports for new applications. More importantly it would also simplify, and thereby, speed up, the deployment of new security patches, as vulnerabilities are discovered.

The NC WISE pilot has shown that many LEAs are currently operating at near maximum bandwidth capacity in support of their existing applications. Any programs that DPI makes available will need additional bandwidth. Many LEAs have also expressed that if more bandwidth was available to them, it would allow them to more fully integrate the video resources already available at DPI, into their curriculum. Whatever solution is proposed must be demonstrated as easily expandable, not a "rip and replace" strategy, to quickly meet a customer's bandwidth needs. Upcoming standards should also be supported when they become available, i.e., IPv6.

Currently DPI has various video resources available both in streaming format as well as in the live format (video field trips etc). Video requires large amounts of bandwidth per session, which many schools do not have. There are also content providers which require that customers have very large pipes into the schools (i.e., DS3). If one wishes to join Internet 2 (Abilene) which functions at an entry level of 1.5Mbps and can go as high as 2.5 Gbps, there must be complementary bandwidth between the school and Internet 2 (Abilene) to prevent bottlenecks. Currently N.C. schools have access to Internet 2 (Abilene) courtesy of funding through the University system. Therefore this opportunity should be exploited to benefit K-12 education.

Most streaming applications, in order to run effectively, must run at a minimum speed of 80 to 90 Kbps per concurrent user, and assumes that the average school would have a maximum of 4 concurrent users. The network should have the ability to handle IP multicasting of both broadcast events and stored content. QoS availability at the school level would allow schools to prioritize their traffic.

Vision

High speed Internet IP connectivity is the backbone on which most educational technology services will be delivered in the next 5 years. Most new applications and resources that the state and industry deploy will run over this high-speed type of infrastructure. Without this high-speed access, school systems will fall behind both instructionally and administratively. A new statewide WAN is a necessity for NC WISE, the state's student information management system, to operate at its optimal capacity. A statewide education network will also improve equitable high-speed, reliable Internet access for instructional purposes.

NCDPI is working with relevant state agencies and representatives from the LEAs to develop and implement statewide baseline IP connectivity. The final solution that will provide connectivity to the LEAs must include the following:

- high-speed access with high reliability

- lower statewide Total Cost of Ownership (TCO)

- reduction in inequalities by providing a baseline level of service statewide

- adequate school network security with a full complement of security components, including firewalls, intrusion detection, and vulnerability assessment

- support for statewide instructional and administrative applications

- maximized local decision-making

- access to Internet 2

Connectivity to the school building is only the initial link to the world. It also must extend to the classroom. This connectivity, better know as a Local Area Network, allows instructional and administrative computers to access remote databases and applications, both within the building and to the outside world. According to the 1999 Milken Survey of Technology in the Schools Report, 81% of North Carolina students use technology in their learning, thereby making classroom connectivity of utmost importance.

Infrastructure is one of the important elements of the Total Cost of Ownership (TCO) process. Once LEAs have their basic infrastructure in place, LEAs should designate 7-10% of their technology budget to cover the ongoing yearly cost of maintaining the system.

Strategic Plan

NCDPI and the Office of Information Technology Services (ITS) have developed a series of technical standards, recommendations, statements of direction, and other aids to assist schools and districts in implementing a wide range of instructional and administrative technology. The purpose of these recommendations is to provide a blueprint of what the minimum level of infrastructure should be in each LEA throughout North Carolina. The following recommendations provide a sound framework of interoperability from which voice, video and data can flow smoothly throughout any LEA. These recommendations also will ensure that students, teachers, and administrators have access to the vast array of resources available online and that vital statistics and other data needed by NCDPI move seamlessly between the district and the state. (See Appendix A)

Goal: Effective and Efficient Operations

Objectives:

- All sites should have IP WAN connectivity at T-1 (DS-1 or 1.54 Mbps) connection or better, which is suitable for simultaneous instructional and administrative applications, with connections to the Internet for all sites.

- All platforms should facilitate adoption of any other emerging technology that is suitable and supports voice, video, and data transmission.

In order to achieve the statewide objectives, **NCDPI** will:

1. Communicate to the LEA a migration plan for moving each LEA from its existing service to the new service, before the migration begins.

2. Plan jointly with ITS for the migration plan.

3. Notify the LEA if predetermined milestones are met, or if delayed, the reason for the delay.

4. Helpdesk support will also be available 24x7.

5. Address incident tracking, change control and response times in the negotiated SLA between DPI and ITS.

In order to achieve the statewide objectives, **LEAs should**:

1. Migrate to TCP/IP protocol, if not already in place. Provide encapsulation for legacy applications.

2. Put in place network traffic monitoring software in order to ensure that existing connectivity is adequate for concurrent use of multiple applications.

3. Have a connectivity plan in place that is scalable, leads towards T1 connectivity, as a minimum, to every school, and employs Quality of Service (QoS).

4. Meet or exceed state security requirements, by installing:

- a high speed, robust firewall solution, with a common set of rules and policies;

- a DMZ for web services to users;

- intrusion detection;

- vulnerability assessment.

5. Implement CIPA requirements in order to be in compliance with federal E-rate regulations

6. Install virus protection to keep networks from being flooded by viral attacks.

7. Develop a business recovery plan for critical administrative and instructional applications.

8. Maintain up-to-date network diagrams, both WAN and LAN. Note: Each LEA must submit for verification or approval the plan or diagram for its system's current or future WAN. Includes the LANs for each of the LEA's schools. New schools should follow the North Carolina School Technology Technological Standards and Recommendations, Appendix A. See sample network diagrams and justification at http://tps.dpi.state.nc.us.

(Note: New schools must follow the North Carolina School Technology Technological Standards and Recommendations, Appendix A)

Network Diagrams and Justification

Personnel

Current Situation

Business and industry have recognized the importance of technical support. Currently, industry provides a technical support ratio of one technical support person to 50 computers. (Gartner Group, 1999) North Carolina schools have made progress by providing a support ratio of one technical support person for every 560 computers in 2001 (up from 1 technical support person to every 800 computers in 1999) (Annual Media and Technology Report (AMTR), July, 2001) The results, while improved, are still higher than the recommended ratio of one technical support person to every 400 computers. The result of inadequate support is significant down time, lost productivity, and inefficient use of resources.

One of the most important members of the instructional technology support team is the technology facilitator. This is a school level position designated to assist teachers in the infusion of technology in teaching and learning. This individual teams with the media coordinator at their school in seeing that the technology resources are in place and that teachers understand the value of those resources for improving student achievement. Approximately 20% of North Carolina schools have an instructional technology facilitator. (AMTR, July 2001) In order to use technology in the classroom to its fullest potential, building-level instructional technology support is a necessity.

LEAs are doing a much better job of providing technical services for technology resources within their districts. Of the minimum numbers for technical support needed to support current technology use in an LEA, North Carolina's LEAs have 60% of the positions employed. The cost of maintaining and upgrading hardware and software, and the price paid to individuals who perform those duties, are a piece of the Total Cost of Ownership (TCO) process.

There has been a statewide effort to bring all technology support positions under a recognized set of job titles. The State Board of Education (SBE) has approved a set of job descriptions and classifications for technology support personnel. Where applicable, suggested pay grades have been addressed. The hope is that by moving in the direction, of calling technology personnel by similar titles based on their job description, a Technician I, II, or III, or a Technology Facilitator will mean the same thing statewide. It is also hoped that the rate of pay for these similar positions will vary only by the amount of supplement an LEA pays its employees.

Currently, no statewide funding for technology support personnel exists. Only 22.9% of the recommended instructional technology positions are in place in North Carolina's schools. (AMTR, 2001) Most classified technical support positions in individual LEAs have been funded by local dollars. This results in inconsistent and inequitable technology support across the state. The certified technology facilitator position currently can be created from ADM teaching positions allocated as part of the State Public School fund. A few LEAs have created these positions and have seen dramatic results. The State Board of Education continues to provide flexibility to LEAs in most program areas, and other LEAs are moving in this direction.

Vision

Research has shown that teachers will infuse technology into teaching and learning more readily and enthusiastically if they have real-time, point of need instructional and technical support. The effective implementation of the North Carolina Educational Technology Plan will be impossible without the availability of trained instructional and technical support staff. These individuals represent a variety of career paths. The personnel that comprise a fully staffed media and technology department include school-level media coordinators, system-level media supervisors, instructional technology specialists, instructional technology facilitators, media and technology assistants, LAN and WAN engineers, SIMS/NC WISE data managers, and technicians.

LEAs should continue to use the flexibility provided by the State Board of Education (SBE) to add technology facilitators to every school, while lobbying the legislature for classified technology support positions.

LEAs should move towards seeing that the job titles addressed by NCDPI and approved by the SBE are followed in their school district.

Strategic Plan

Computers, networks, students, teachers, administrators, and other support personnel in the public schools of North Carolina are becoming more interconnected and interdependent. The rewards of technology integration are worth our investments because our students, teachers, administrators, and other LEA support personnel are more technically inclined than in the past. Additionally, they have a higher dependence on new and emerging instructional technology resources and support. As the infrastructure to support the instructional needs and administrative demands is built, the technical and networking support requirements increase accordingly.

Goal:

- Effective and Efficient Operations

- High Student Achievement

Objective:

LEAs will strive to employ technology support personnel for the proper implementation of their overall technology program.

Listed below are the technology support personnel that are recommended for each LEA to employ. These personnel support the growing demands that increased access and utilization of technology create (see Appendix B for a copy of each of the class specifications and job descriptions).

- One technology director/CTO who will oversee the administrative and educational programs

- One certified media supervisor who will oversee school library media programs

- One technology coordinator/10 schools

- One to two instructional technology facilitator(s)/school (school must have at least 50 networked computers) (see charts in Appendix C)

- One to two technology assistant(s)/school. (see charts in Appendix C)

- One Technician I, II, or III/400 computers, with at least one Technician III position/LEA

- One LAN engineer/LEA if no WAN is present

- One WAN engineer/LEA if WAN is present

- One LAN engineer for each 50 schools

- One SIMS/NC WISE coordinator/ LEA

- One SIMS/NC WISE data manager/school

- One to two certified school library media coordinator(s)/school (see charts in Appendix C)

- One to two school library media assistant/(s)school (see charts in Appendix C)

Resources

Current Situation

There appears to be a trend toward a system-level purchase of software, and accessing more resources online. While 85% of the classrooms in North Carolina are connected to the Internet, high-speed connectivity across the state is an issue. (AMTR, 2001) Lower speed Internet access increases search time and decreases productivity for teaching and learning.

In 1999, NCDPI introduced NC WiseOwl a Web site of free and subscription resources for students, teachers, and parents. In 2001, 74% of North Carolina schools reported that this is their only online resource. (AMTR, 2001) NC WiseOwl has had a major impact on equity of access to quality online resources for North Carolina's K-12 public education community, and has lowered the Total Cost of Ownership (TCO) for the state and LEAs. Although many more substantial resources are needed, NC WiseOwl has provided a baseline of evaluated, developmentally appropriate and curriculum related resources for the state.

A variety of research studies indicate that funding for school library media center resources has direct impact upon student learning, especially upon reading and writing test scores. (Lance, 1992/1999/2001) The economic value of well-equipped, flexibly accessed school library media centers has been validated by The Places Rated Almanac (1998) and School Match (NPR, 1992). Resources Evaluation Services, part of NCDPI's Instructional Technology Division, provides a variety of services to assist school library media coordinators and teachers in selecting curriculum-related, developmentally appropriate print and electronic resources. Their services and recommendations potentially save the state millions of dollars in unwise resource purchases.

All areas of technology impact student achievement, NCDPI also provides several administrative resources to LEAs (e.g. HRMS, BUD, and ABCs Tools). Administrative resources are an important part of the overall technology program within a school system. Supporting this overall vision.

Vision

Today's educational environment fosters the need for global connectivity that enriches the learning environment by allowing teachers and students to access foremost libraries, peruse remote information sources (databases), converse with experts in a variety of fields, and complete research using primary sources. The vision for North Carolina's K-12 educational community is that access be provided to technology resources at the point of need, whether it is in the media center, the classroom, the principal's office, or the home. Through community partnerships, the vision is that LEAs explore avenues for students to have access to resources beyond the school day. There are currently 33 Community Technology Learning Centers located in schools throughout North Carolina. These centers serve as models for future development.

On December 20, 2001 connections became active to the K-12/K-20 communities to access Internet2. Through Internet2's Sponsored Education Group Participants (SEGP) program, the state's elementary, middle, and high schools as well as independent and community colleges, and museums can connect to the Abilene Internet2 backbone network. Sponsored participants may connect to Abilene through the North Carolina Research and Education Network (NCREN) and the NC gigaPop at speeds of up to 2.4 gigabits per second.

The goal of the SEGP program is to bring Internet2 member institutions, primary and secondary schools, colleges and universities, libraries, and museums together to collaborate on new technologies for advancing education&emdash;networking tools, applications, middleware, and content&emdash;and to provide these technologies to innovators, across all educational sectors in the United States, as quickly and as "connectedly" as possible. (Research Triangle Park, NC - January 09, 2002)

In this environment, teachers will have access to technology resources that will link them to many other avenues for instruction. These resources will enable teachers to access a wealth of media and resources tailored to individual student proficiency levels, learning styles, and interests. Technology will unite classroom teachers with other educators, school counselors, community service agencies, professional development information and opportunities, and various learning networks. Teachers will have many sources of support to inspire, motivate, and help them become knowledgeable and skilled professionals.

Likewise, students will be provided a technology-rich environment conducive to improving academic achievement in all areas. On a daily basis, they will develop and use higher-level thinking and communication skills and engage in real world problem solving activities.

These technology resources will enable students to work individually or in groups at an appropriate level of challenge or interest. They will allow students to grasp simple and complex knowledge and skills more quickly by accessing resources beyond the school walls.

The ideal method for creating this vision is through statewide development, collaboration and purchasing of baseline resources to achieve equity of access and significant economies of scale, while still allowing site-based purchases of specialized materials. The more materials, bandwidth and services that can be procured statewide, the lower the Total Cost of Ownership (TCO) of these resources. Delivering these resources via the Internet or IP lowers the total support costs for LEAs.

Strategic Plan

Technology will play a vital role in providing equitable access to a variety of resources for the students of North Carolina. Access to these resources will support the infusion of technology into all curriculum areas as required in the North Carolina Standard Course of Study. Outcomes of this infusion will be students who are self-directed lifelong learners, complex thinkers, quality producers, collaborative workers, and community contributors.

This action plan addresses the growing problem of disparity among varying income levels, races, and educational attainments created by inequitable access to computers and telecommunications known as "the digital divide."

Goal: High Student Achievement

Objective:

- Instructional resources will be available to students and instructional staff to enhance all curricular areas.

To meet the statewide objective, NCDPI will:

1. Continue to develop and maintain:

- NC WiseOwl.

- Kaleidoscope.

- Technology Planning and Support Web site.

- Infotech: The Advisory List

- EvaluTech

- North Carolina Educational Resources Web sites.

- Video Web site, with streamed and archived resources.

- School Television Program - K-8 video based instructional resources, correlated to the North Carolina Standard Course of Study.

- Distance Learning by Satellite - providing interactive high school courses to students at predominately small, rural high schools.

2. Assess the need for new technology-based educational resources and manage their development.

To meet the statewide objective, LEAs should:

1. Follow the materials selection policy as mandated by GS115C-98, in the selection of resources to meet curriculum guidelines and technical requirements.
2. Select resources based on assessment of student needs.
3. Use assessment data to match resources to individual student needs.
4. Ensure that all classrooms and administrative facilities have access to Internet resources.
5. Provide access to the school's library media collection via an online public access catalog (OPAC) in every classroom.
6. Provide access to NCWiseOwl in every classroom.
7. Provide basic applications software in every classroom.
8. Provide each staff member with an e-mail account.
9. Provide access to simulation software to all students.
10. Provide access to online and/or CD-ROM resources for research.
11. Maintain an up-to-date Web site for the district, each school and each instructional staff member.
12. Provide student access to instructional resources beyond the regular school day.

Goal: Effective and Efficient Operations

Objectives:

- Administrative resources will be available to all personnel.

In order the meet the statewide objective, NCDPI will:

1. Continue to develop and maintain NCWISE.
2. Continue to develop and maintain administrative applications.

To meet the statewide objective, LEAs should:

1. Provide access to NCWISE in all classrooms
2. Provide tools for necessary administrative applications (e.g. HRMS, BUD and ABC tools).

Hardware Recommendations

Current Situation

According to the 2000-2001 Annual Media and Technology Report,

- The ratio of students to multimedia computers is 5.3 to 1.

- The ratio of students to all computers is 4.4 to 1.

- 85.6% of North Carolina's classrooms have Internet access.

- 94.9% of the LEAs have a Wide Area Network.

- 90% of the school systems provide e-mail accounts for certified staff.

- 75% have e-mail accounts for non-certified staff.

- 98.3% of the schools in North Carolina had a school-wide LAN.

North Carolina's schools use a variety of workstation and server hardware, from the very old to the very new. This is an economic reality due in large part to the lack of consistent funding methods for technology. The diversity of hardware presents major problems for access to the latest information via the Internet and machine-based electronic resources.

Currently, public schools in North Carolina purchase technology hardware through the state's Office of Information Technology Services managed microcomputer contract, thus leveraging certain economies of scale. In the past, most hardware purchases have been considered one-time, capital expenditures, with no replacement policy or budget defined. School systems are beginning to realize the need for replacement schedules for hardware. LEAs are beginning to move these purchases to the operational/recurring budgets. This has been facilitated through legislation that allow schools to lease microcomputer equipment.

Vision

One of the most important concepts in technology planning should be that the business determines the equipment and software purchases. Thus, curriculum and instruction decisions must be the driving force behind the selection and purchase of educational software and hardware solutions. All areas of the LEA should share a common infrastructure. While most educational decisions reside appropriately with the individual school, technology-related decisions must be guided by a centralized decision-making process to facilitate the technical and instructional support of technology.

The classroom is the focal point for teaching and learning. As teaching changes from teacher-directed to project-based learning, the need for technology in the classroom will change. One computer in the classroom would no longer be adequate or appropriate. Research indicates that a ratio of one computer to every four to five students is necessary if technology is to help students make significant gains in student achievement and support the teaching/learning process. (Valdez et al, 1999)

The classroom should include numerous, multimedia, networked computers so students can work on projects, access online resources, and use remediation and basic application software. The teacher workstation would facilitate classroom administrative functions such as taking attendance, developing Individual Education Plans (IEPs), communicating with parents, processing grades, analyzing student performance data, and collaborating with other professionals. A variety of electronic resources should be available for student and teacher use, such as digital and video cameras, scanners, and assistive/adaptive devices for children with special needs. Classrooms should also have a telephone with voice mail capabilities so that teachers and parents can communicate without interrupting instructional time.

The school library media center should be an extension of the classroom, where teachers, technology facilitators and media coordinators collaborate to bring information resources to teaching and learning. Computers in the media center will become windows to the world, serving every student and teacher in the school. A variety of different activities will take place here: students doing research, preparing multimedia presentations, searching onsite and remote databases, checking out materials, and learning to evaluate resources. These activities should take place throughout the media center:

- Reference areas should house myriad print and electronic resources for ready access to information, with a high-speed laser printer available so information can be used at home for further learning.

- Circulation areas should include two computers, one for student checkout and one for media coordinator access.

- OPACs should be available throughout the media center for ready access to a variety of resources.

- Pods of computers should be available for small groups of students to collaborate on classroom projects.

- Portable laptop computers should be available for checkout to students for home use.

Even with computers in both the classroom and the media center, a computer lab would still be necessary. In order for this lab to be used effectively, it would be a flexibly accessed space with a one-to-one computer to student ratio. This lab would be used for whole-class instruction and would be a place where the classroom teacher, media coordinator, and instructional technology facilitator will work in collaboration to teach large groups of students specific skills and concepts.

Some schools and LEAs may decide that mobile wireless labs are more appropriate to their curriculum needs than stationary computer labs. These mobile labs can provide whole class experiences or small group activities within a school. These mobile labs can plug into existing Ethernet ports and then use a wireless antenna to transmit a networked signal to wireless laptops. Additional access points placed in appropriate locations throughout a school can remove the necessity of having the mobile cart nearby.

In office areas, each administrative space would be equipped with a computer that has access to workgroup printers. Administrative stations should have access to all appropriate student information databases, other pertinent administrative databases (e.g., Human and Financial Resources Systems), e-mail, and voice mail. These workstations should be configured so that they can access all midrange and mainframe systems via IP where appropriate.

Connectivity is quickly becoming a major issue that affects the varieties of hardware that an LEA purchases. Wireless connectivity is rapidly becoming a viable option that can remove the necessity for the hardware to be stationary in a four-walled environment. This ability to access information from anywhere at the school site will be beneficial to students and teachers. Planning is required to see that the technology is in place to support this new learning environment. When possible, administrators should have access to hand-held devices to assist in assessing teachers and to help perform their daily duties.

Hardware is an important element of the Total Cost of Ownership (TCO) process. LEAs should plan on spending 40-45% of their technology dollars on initial hardware purchases. Once all hardware expectations

are met, approximately 20% of an LEA's technology budget should be used to support ongoing hardware purchases.

Minimum connectivity should include:

- 2 blocks of 4 data ports per classroom (Please note: 2-8 data ports should be run to areas such as science labs, fine arts areas, multipurpose rooms, auditoriums, cafeterias, or any other area that may be used in the future for educational purposes such as science fairs, PTO meetings, etc.); 2/administrative space; 14/media center (minimum)

- Telephone and Internet access in every classroom and administrative space

- Local Area Network with switched 10/100 Mbps data connectivity to each classroom and administrative space.

- IP connectivity to all midrange or mainframe systems

- Video capability to each classroom

- Emergency data retrieval tools and plan that includes regularly scheduled backup of all data. Current data backups should be stored off-site

- A firewall or other suitable means of security in place to protect against unwarranted intrusion into system data.

The following provides detail.

Classrooms

- One teacher workstation + 4 multimedia computers/classroom (may require hub/switch depending on number of data ports or wireless hardware)

- Hand-held devices

- Assistive/adaptive peripherals to meet student/teacher needs

- One 200-volt UPS on every teacher workstation

- One surge-protector/computer (student workstations)

- One networkable printer/classroom, inkjet or better

- One projection device/classroom

- One TV/monitor/classroom

- One telephone/classroom

- One multimedia center for each 5 classrooms (includes digital camera, scanner, multimedia computer)

- One video camera/500 students

- Ergonomically correct furniture and peripherals

- Appropriate technology for course content (e.g., manipulatives, probeware, midis, CADware, etc.

Media Center

- One OPAC station/150 students

- One research station/100 students

- Assistive/adaptive peripherals to meet student/teacher needs

- Two circulation stations/media center

- One circulation printer/media center

- One networkable printer /10 computers/media center, inkjet or better

- One presentation station (includes multimedia computer, scanner, and projector/LCD panel)

- One 200-volt UPS on presentation and circulation workstations

- One surge-protector/computer (OPAC and research workstations)

- Two TV/Monitors for media center use

- Ergonomically correct furniture and peripherals

Computer Lab

- 25-30 Internet-accessible computers depending on largest class size

- One networkable printer, inkjet or better

- Assistive/adaptive devices as needed

- One teacher presentation/workstation (includes multimedia computer, scanner, and projector/LCD panel)

- One TV/monitor

- One 200-volt UPS on every teacher workstation

- One surge-protector/computer (student workstations)

- Ergonomically correct furniture and peripherals

Mobile Labs

- 15-30 laptop computers, depending on budget or class size. If you require network access you can use a wireless solution or use Network Interface Card (NIC) for hard wire connectivity

- One networkable printer, inkjet or better

- One mobile lab cart complete with battery charging capabilities and wireless access point

- One 200-volt UPS on every mobile lab cart

- Extra batteries for each wireless laptop

Administrative Spaces

These spaces include media coordinator, media assistants, nurses, counselors, etc.

- One computer/each administrative/clerical personnel. (administrators should consider laptops over desktop computers)

- Hand-held devices

- Assistive/adaptive devices as needed

- One telephone

- One scanner/each administrative area

- One networkable printer/each administrative area, inkjet or better

- One 200-volt UPS on every administrative/clerical computer

- One surge-protector/computer (non-administrative workstations)

- Access to TV/monitor

- Ergonomically correct furniture and peripherals

Strategic Plan

In order to effectively implement the **North Carolina Educational Technology Plan** the following actions are presented.

Goal: Effective and Efficient Operations

Objective:

- All students and personnel will have access to sufficient hardware to support high-quality educational technology.

To achieve the statewide objective, NCDPI will:

1. Provide an online Annual Media and Technology Report to gather information from each LEA.
2. Make all inventory information available to LEAs via the most effective and efficient means possible and utilize the data to address statewide needs.
3. Provide statewide comparative data for LEAs to use to enhance their programs based on the collected data.
4. Collaborate with ITS in developing and updating standards for acquiring hardware and related peripherals.

To achieve the statewide objective, LEAs should:

1. Plan for and acquire hardware in accordance with the guidelines stated above.
2. Maintain an updated inventory process.
3. Complete and verify the AMTR by the date established by NCDPI.
4. Use the latest research to insure that the hardware decisions are sound.
5. Follow local purchasing procedures and appropriate state guidelines when obtaining hardware and related peripherals.

Policy

Current Situation

Establishing appropriate policies, procedures, and guidelines is fundamental to developing an instructional technology environment that provides equitable and efficient access to all members of the learning community. Policy issues associated with educational technology infrastructure and resources are made complex by rapid changes in technologies. Further complexity is added by the abundance of agencies and processes that regulate and coordinate technology and education. Policy issues basic to an instructional technology program include the following: equitable access, standards, finance, coordination of programs and resources, and appropriate application of technology.

NCDPI has provided leadership in assisting school systems in identifying policies that enhance teaching and learning while simultaneously protecting community standards and academic freedom. Some of the guidelines provided by NCDPI include:

- IMPACT: Guidelines for Media and Technology Programs, in which a variety of sample policies are available for school- and system-level use.

- IMPACT for Administrators

- North Carolina Technology Competencies for Educators

- North Carolina Standard Course of Study

- Technological Recommendations and Standards from Information and Technology Services

A few of NCDPIs initiatives that help ensure equitable and appropriate use of resources for educators and students of North Carolina are:

- The NCDPI InfoWeb, the Agency Web site disseminating information

- EvaluTech, a keyword searchable database of reviewed print and electronic resources

- NC WiseOwl, a Web site of free and subscription resources for students, teachers, and parents

- Kaleidoscope, a Web resource for students, teachers

- Instructional Resources Evaluation Services, where print and technology resources can be previewed by educators and the public.

Vision

North Carolina Public Schools are challenged with implementing technology programs based on community standards and sound educational theory. In order to ensure that the selection of instructional materials and the use of technology resources is based on these premises, each LEA must establish a series of policies, guidelines, and procedures that reflect academic mores, protects academic freedom, and assist personnel in making equitable, sound education decisions.

Strategic Plan

A course of structured action or protocol for handling personnel situations, requesting assistance, reporting problems, or managing work productivity should be outlined in formal, written documentation. Formal documentation supports compliance to a uniform set of standards and equitable adherence to those standards. Documentation can be divided into three categories: policy, procedures, and guidelines. Certain protocols may have documentation in two or more of these categories. Except where a policy is required by law each school district determines the most appropriate form of documentation. In determining the best form of documentation follow these definitions:

Policies can be defined as a code prescribing strict adherence to correct etiquette, precedence and law. Certain policies are required by state and federal law. Policies are board approved to enforce strict adherence when necessary.

Procedures can be defined as an established series of instructions to be followed routinely for the performance of designated operations.

Guidelines can be defined as a set of conventions for accomplishing certain tasks.

The recommended policies, guidelines and procedures support the state's vision for technology and the desired results for student learning. To assure that the quality teaching and learning environment in North Carolina communities is reflected in the selection and procurement of instructional materials, the following actions are presented:

Goal:

- Effective and Efficient Operations

Objectives:

- All students will have equitable access to educational opportunities and resources.

- All personnel will have equitable access to educational resources.

- Components of the education system are effectively aligned to achieve high performance.

In order to achieve the statewide objectives, NCDPI will:

- Communicate and facilitate the implementation of General Statutes 115C-102.1 through 115C - 102.4.

- Work with the School Technology Commission to identify instructional goals that can be met through the use of technology and make recommendations on standards, policy, legislation and statewide activities.

- Advocate for legislation that supports and promotes educational technology.

In order to achieve the statewide objectives, LEAs should:

1. Develop and approve policies as follows:

  - A Materials Selection Policy as mandated by North Carolina Law GS115C-98

  - A Hardware and Software Procurement Policy that follows IRMC technology standards

  - A Copyright Policy as outlined in Public Law. 94-553, 90 Stat. 2541

- An Acceptable Use Policy or Internet Safety Policy as mandated by Public Law 106-554 to receive federal funding under Library Services and Technology Act, Title III of the Elementary and Secondary Education Act, and on the Universal Service discount program

- As part of the Acceptable Use Policy an

  o Access to Information Policy that, if filtering systems are used, ensures adequate data retrieval capabilities for both students and staff.

- An Access to Services Policy as outlined in Public Law 101-336, the Americans with Disabilities Act, that prohibits discrimination and ensures equal opportunity for persons with disabilities in employment, State and local government services, public accommodations, commercial facilities, and transportation

- A Data Privacy Policy as outlined in the Family Educational Rights and Privacy Act of 1974 (The Buckley Amendment), 20 U.S.C. § 1232g; 34 CFR Part 99 and recommended by North Carolina State Board of Education Policy EE0-C-017, The Use of Education Data in North Carolina

- An Inventory Control Policy as mandated by North Carolina Law GS 115C-102.6A

- An eEquipment/Materials Donation Policy

- A Replacement of Obsolete Equipment Policy

- A Network Security Policy that includes regularly scheduled security audits

- An Advertising and Commercialism Policy

- A Discipline Policy that includes consequences for inappropriate use of computer/Internet resources

2. Develop and communicate procedures as follows:

- Hardware and software deployment

- Equipment maintenance and repair

- Outdated resources and equipment replacement

- Disaster recovery of data and hardware

- Administration of online courses

3. Develop and communicate guidelines as follows:

- A plan for translating all student/parent-related policies into the predominant languages of the community

- Web site development

- Instructional use of videos

- Development of online resources such as instructional and teacher Web pages

Budget

Current Situation

According to the 1999 Milken Survey of Technology in the Schools Report, North Carolina spends an average of $5,509 per student, while the national average is $6,237 per student. (Milken, 1999) North Carolina public schools currently receive dedicated funds for technology. The PRC15 State Technology Trust Fund, is an interest-bearing, non-reverting account that is allocated by the General Assembly and distributed by average daily membership to the LEAs. To access these funds, LEAs must have an approved technology plan on file with NCDPI. Most of the funds that NCDPI distributes to LEAs have budget codes that allow technology purchases.

LEAs do not have a unified approach to planning technology expenditures and budgets that span across all program areas. This lack of unified budget planning increases the Total Cost of Ownership (TCO) of technology for the school system. Most LEAs do not use operational budgets for hardware and software replacement, thus causing unreliable technology systems.

Purchasing a computer is not a one-time expense. The Consortium for School Networking estimates that the Total Cost of Ownership (TCO) for educational technology is approximately $500 per pupil or about $2500 per computer for a desktop connected to the Internet (COSN, 1998). The TCO of a piece of equipment includes the following: maintenance and repair, electricity and HVAC, telecommunications charges, staff development (20-30%), downtime, virus protection, furniture, and upgrades. Most LEAs do not take the TCO into account when budgeting for technology. This is demonstrated by the lack of technology support personnel and significant downtime of workstations and networks.

The per-pupil cost for placing technology into an LEA and for maintaining the program on an on-going basis is difficult to pinpoint in North Carolina. Each LEA is at a different level of technology implementation. Each has a technology plan, which sets the levels of technology deployment, training, maintenance, and allowed software resources and peripherals throughout the school district. LEAs have unique technology requirements and budget needs, based on their current level of technology implementation and technology plan.

With this said, we can provide an average range of cost for technology implementation using data collected from the 2001 AMTR and other state agencies. The TCO for the one time purchase of all resources needed to support the technology requirements in an average school district in North Carolina is between $432 and $450 per pupil. The on-going yearly TCO figures range from $113 to $136 per pupil. It must be remembered that the high-end numbers are based on the cost required to maintain a program as indicated in the North Carolina Educational Technology Plan at the minimum level needed to support instructional technology throughout the school district.

On-going per-pupil cost ratio for smaller LEAs and Charter Schools will be almost twice as high as that for a large school district. Due to the fact that fewer students will require many of the same services and resources.

The attached Excel-formatted templates should assist each LEA in determining its budget needs and TCO.

Vision

Budgeting for technology should cross all program areas of a school system. This unified approach will lower the TCO for LEAs. It also will ensure that every LEA program adhers to technical standards, and that the hardware and software being purchased can be supported by the technology personnel and infrastructure. While technology purchases are ultimately a site-based decision, state- and system-level standards must be developed and followed so that repair, maintenance, and replacement are facilitated.

Technology can also assist in the practice LEAs use to generate requisitions and issue purchase orders. This process should become paperless and all functions should be moved to an Intranet Web/IP environment. School administrators should have real-time access to their budget information and be able to make decisions that can rapidly be reviewed and implemented by the LEA's financial department. This same technology can be used to establish secure online databases where inventory and personnel information can also be readily available to the proper school administrators.

Effective and efficient use of technology can enhance the budgetary practices of an LEA and assure that the proper tools are purchased for the tasks at hand. This use of technology can also play a large role in the decisions made by an LEA as they weigh the effects each purchase will have on the TCO to the LEA.

Past experience has shown that the most effective implementation of learning and instructional management technologies occurs when the funding is continuous, over a multiyear period. Continuous funding facilitates the development of high-quality, long-range local plans and allows for the deployment of resources to be coordinated with staff development and infrastructure improvements.

It also is imperative that schools work together at local, regional, and state levels in order to achieve a critical mass that will empower them to drive the technology market and procure equipment and services at dramatically reduced rates. Funding strategies and acquisition activities must be well-planned, organized, and coordinated. This unified effort may have many partners, including local education agencies, NCDPI, universities, community colleges, private colleges, regional consortia, local governments, businesses, or other appropriate organizations.

The effective use of state-supplied technology funds and the prospects of a continuous funding program from the state legislature will be enhanced to the extent that the following action plan is presented.

Strategic Plan

To assure that North Carolina's schools utilize the most effective and efficient budgetary practices in the selection and procurement of technology related items, the following actions are presented.

Goal: Effective and Efficient Operation

Objective:

- LEAs will make sound educationally based decisions on technology related purchases

- LEAs will maintain a system for tracking and reporting technology related expenditures

- LEAs will develop technology budgets that reflect Total Cost of Ownership methodology

In order to meet the statewide objectives, **NCDPI** will:

1. Provide templates to assist LEAs to organize, analyze, and report technology expenditures.
2. Make all budgetary information available via the most effective and efficient means possible.
3. Gather and compile budgetary information from LEAs and utilize the data to address statewide needs.

4. Provide statewide comparative data for use at the LEA level to enable LEAs to justify request for adequate funding for technology initiatives.

5. Work with ITS in assuring the purchasing process is accessible and easy to use.

In order to meet the statewide objectives, **LEAs** should:

1. Include all personnel who advocate for funding for technology resources and programs in the technology budget planning process, in order for all funding sources to develop a cohesive plan for purchasing, staff development, and TCO for the entire system.

2. Develop a plan that migrates ongoing technology expenditures to the system's operational budget.

3. Develop annual program implementation milestones that are reportable and accountable each October in the report to the State Legislature.

4. Solicit visible support and participation by major local business partners, possibly through the establishment of an advisory panel to the Local Technology Planning Committee.

5. Follow uniform state accounting procedures when purchasing all technology resources.

6. Develop a secure paperless environment for all budget and data transfer and access over the LEA's Intranet.

7. Submit, as a part of the state technology plan process, a long range budget plan that extends from July 1, 2003 to June 30, 2007, with a more detailed plan for the following periods: July 1, 2003 through June 30, 2004; and, July 1, 2004 through June 30, 2005.

The attached Excel-formatted templates should assist each LEA in determining its budget needs and TCO.

Communication and Collaboration

Current Situation

Through a variety of documents and events NCDPI has had success in marketing its technology plan and vision to media and technology personnel throughout the state. The agency's educational technology agenda to the state community has been publicized through:

- Evaluation pre-conferences

- School Technology Commission

- Statewide supervisor's meetings

- NC WISE Symposium

- Distance Learning Star Schools series

- eLearning Summit

- New evaluation instruments

- IMPACT for Administrators

- Publication of the AMTR data

- Legislative School Technology Day

Other state, IHE, and private organizations have had success in marketing their services to the LEAs. ExplorNet, LEARN NC., Principals Executive Program (PEP), Principals as Technology Leaders (PATL), the Teacher Academy, North Carolina Center for the Advancement of Teaching (NCCAT), and other

creative technology initiatives have helped create an exciting statewide synergy for technology staff development in the public schools. Most often based upon the standards and policies that the North Carolina Department of Public Instruction has researched and developed, collaborations which allow LEAs to leverage the academic and business community's financial and skill-based resources for the benefit of teaching and learning.

In the 2000-2001 school year, NCDPI awarded grant monies for the creation of eight Community Technology Learning Centers (CTLC), and the program was expanded the following year. There are currently 33 CTLC projects in existence. These centers demonstrate the power of collaboration with business, local government and other community-based organizations.

A major achievement was the development of each LEA's technology plan and the ongoing revision process. Interfacing with the North Carolina Educational Technology Plan, each system's technology plan is created by a group of community stakeholders, as well as educational personnel. Business leaders, parents, and educators join together to create a vision of the impact of technology on teaching and learning--and the strategies for reaching this goal.

Vision

Technology is a tool that greatly increases our opportunities to communicate effectively and efficiently. Advances in telephony and Internet teleconferencing enable educators and students to communicate with peers beyond their local areas. As a result, opportunities for new collaborations exist. Communication and collaboration are interdependent factors in the success of any educational technology plan. Effective communications strategies are necessary for building and maintaining successful collaborations. Collaboration involves the communication of one's vision in such a way as to generate support for one's program. Parties within the collaboration must be able to communicate with each other as well as their constituents.

NCDPI and the LEAs should strengthen their current partnerships with business, industry, IHEs, nonprofit organizations, and the community, as well as seek out new opportunities for collaboration. Both should continue to build on current successes, making sure that taxpayers and legislators are aware of the impact of media and technology programs on teaching and learning. The more specific information parents and decision makers have, the less likely they are to be concerned the next time the local media questions the role of technology in schools.

LEAs should develop communications plans that support the dissemination of information to students, parents and community members. Each LEA should leverage its technology resources by using several media to convey their message. Equally important is the LEAs ability to receive input from students, parents and community members in a variety of formats.

Strategic Plan

Educators must do a better job of selling our programs to the public. Without public support, technology initiatives are much more difficult to begin and to maintain. The organization that projects its' needs and accomplishments most effectively, usually receives the most support.

Goal:

- Strong Family, Community and Business Support

Objectives:

- North Carolina educators will use technology to cultivate, communicate and build relationships with community members.

- North Carolina educators will use technology to keep parents informed of student progress and activities.

In order to meet the statewide objectives, NCDPI will:

1. Provide parents with access to student information via NCWISE.
2. Provide opportunities for LEAs to showcase what is happening in North Carolina schools.
3. Publish agency information via the World Wide Web.
4. Conduct presentations on pertinent topics in educational technology at statewide conferences.
5. Keep constituents informed with weekly e-mail updates.
6. Continue to publish Infotech, a review of instructional resources.

In order to meet the statewide objectives, LEAs should:

1. Create a communications plan that focuses on students, parents, and the general public.
2. Involve local businesses, community groups, and major employers in the development and evaluation of local technology initiatives.
3. Form a Media and Technology Advisory Committee that includes parents and representatives from the community, the school system, IHEs, and local government agencies for the development, updating, and evaluation of the local technology plan.
4. Whenever and wherever possible in each LEA, expand the hours of the media center and computer lab of at least one school to provide students, parents and community members access to information and communication resources. Expanded hours are to be scheduled before and/or after regular school hours.
5. Establish relationships with other state entities, such as ExplorNet, LearnNC, PEP, NCCAT, Teacher Academy, etc., as deemed necessary in achieving school improvement plan objectives.

Goal:

- Effective and Efficient Operations

Objective:

- North Carolina educators will deploy technology-based communications methods to increase and improve communications among students, staff, parents and members of the community.

In order the meet the statewide objective, NCDPI will:

1. Publicize the impact of media and technology programs on teaching and learning based on research aggregated from NCDPI and other LEAs.
2. Maintain an up-to-date Web site.

In order to achieve the statewide objective, LEAs should:

1. Provide messaging services (voice mail, e-mail) that allow parents, guardians, and community members to contact teachers and school officials as needed, and allow teachers and staff members to respond at their earliest opportunity.
2. Provide an e-mail account for every certified employee.
3. Support the creation and maintenance of an informational Web site for each LEA, school, and teacher.
4. Provide summary data for the NCDPI Annual Media and Technology Report, Education Week survey, and the U.S. Department of Education.
5. Report school and district activities to local media outlets (newspaper, television, radio, etc.)

Evaluation

Current Situation

North Carolina has created an online Annual Media and Technology Report that tracks the amount of equipment and connectivity available for use in each public school in the state. It has also identified a variety of instruments to evaluate various aspects of technology use. Assessment tools designed by SERVE, NCREL, SEDL, and other regional educational laboratories have been evaluated and shared with district and school-level personnel. The Technology Counts/Education Week survey that NCDPI completes allows North Carolina to be compared with other states across the nation in technology acquisition and use. Regularly updated LEA profiles provide NCDPI with additional information to develop reports requested by the legislature, State Board of Education, School Technology Commission, agency personnel, and for national reporting purposes.

One of the weakest areas of evaluation in both the state and nation is the impact that technology has on teaching, learning, and achievement. Past research has made it clear that technologies by themselves have little scalable or sustained impact on learning in schools. To be effective, innovative and robust technological resources must be used to support systemic changes. Since technology is changing classroom dynamics, but has affected the testing environment very little, the true impact of technology on student learning may be realized further in the future than immediate end-of-year tests reveal. Yet we must find ways to measure the impact of technology on student achievement in order to justify the investment that state, local, and federal governments are making in equipment, connectivity, resources, and training.

Vision

North Carolina will assess students, staff, and programs using a variety of formal and informal instruments, in order to evaluate the impact of media and technology programs on teaching and learning. Ideally, this assessment will be planned during the design phase of any lesson plan, unit, or project, taking into consideration student/staff prior experiences and knowledge and the goals and educational objectives of the lesson plan, unit, or project. As the project moves through its various stages, formal and informal assessment will be merged seamlessly into the teaching/learning process in order to determine how effectively the objectives are being accomplished and whether or not the goal itself is realistic and achievable.

While planning up-front for the evaluation of any project or lesson is educational best practice, educators will be faced with the occasional situation in which evaluation must be planned after implementation has begun. While mid-stream assessment poses definite problems, it is possible and preferable to no evaluation at all. Although valid baseline data will be difficult to determine, formal and informal teacher observation, survey results, peer assessment, and test scores/project grades will offer insight into the strengths and weaknesses of the project.

Once a lesson, unit, or project is completed, and formative and summative evaluation has taken place, an analysis of success is necessary. All good educators can informally discuss what worked and did not work for a particular lesson, unit, or project, easily outlining components to add, change, or omit entirely. Now we must formally analyze a project's success or failure and aggregate the data in a form that other educators and the public will find helpful. Not only is this an assessment of the value of media and technology to the teaching and learning process, it is an evaluation of our effectiveness as leaders of schools, school systems, and the state.

Evaluating the Impact of Media and Technology Programs on Student Achievement

Most educators perceive that high-stakes, standardized tests do not effectively measure the true impact of media and technology programs and resources. Media and technology programs and resources help students develop problem solving abilities and higher order thinking skills (Statham and Torell, 1996), thus expanding a student's abilities to think and cope within a fast-paced, technologically sophisticated world. Standardized tests, on the other hand, often measure baseline knowledge, focusing on lower order skills that are more easily tested. (CEO Forum Reports, 2001)

In order to meet the expectations of a test-minded society, we must do our best to show that media and technology programs and resources are worth their expense and upkeep. In 2002, it is probably impossible to gather baseline data on any student who has not had the advantage of some technology in an educational setting. BUT we can begin today, implementing an evaluation/assessment component in every unit or project that will allow us to track specific teaching strategies and their effectiveness. Focusing assessment on carefully identified learning situations or projects will allow us to analyze what really has had an impact on test score improvement.

Having acknowledged the reality of high-stakes, standardized tests in the evaluation process, it is important to point out that "Accountability should not rely solely on the results of high-stakes tests, particularly outdated tests that do not measure all the skills deemed most critical. Accountability should examine progress against educational objectives by examining multiple indicators across the education system." (CEO Forum Reports, 2001) In order to do this, we must move to include an analysis of such important education bellwethers as drop-out rates, attendance, school safety designations, discipline logs, and even student self-concept and motivation indicators. While some will view this information skeptically, true educators will understand that when students are present, enthusiastic, focused, and motivated to learn, educating them just became a delight!

Media and technology integration automatically assumes a less traditional classroom with more real-world, authentic assignments. Assessing these assignments, their products, and the ultimate learning that takes place requires an authentic assessment approach. Rubrics are an excellent source of authentic evaluation, but additional community involvement in the evaluation process via senior projects, governmental/environmental studies, newspaper articles and letters, and Web site creation offer additional authentic means of assessing student comprehension and skills.

Evaluating the Impact of Media and Technology Programs on Teacher Performance

The first challenge in evaluating teacher use of technology is actually assessing what educators already know. This evaluation allows us to determine the staff development options teachers need to use technology effectively both for their own personal needs and with their students. While this involves needs assessments and pre-tests, it also includes attitudinal surveys and teacher self-assessment of technology ability and use. Media and technology personnel will be able to spot improvement trends, teacher satisfaction, teacher comfort level with technology, and technology classroom use. This will allow them to determine teacher staff development needs more effectively both in staff development offerings and teacher personal and classroom use.

Research conducted by **Apple Computers** in the 1980s produced a powerful model representing teachers' use of technology and acceptance of change. Based on observations of teacher behavior in technology intensive classrooms, discrete stages of technology use were identified. NCDPI has created an **assessment tool** based on these stages. This tool can be used by administrators and other education professionals to assess the classroom teacher's current level of technology use. For each stage identified, suggestions are given to assist the teacher in moving on to the next stage of technology integration. This assessment tool may be used during pretesting, formative assessment, and/or summative assessment.

Ultimately, the effectiveness of a teacher's use of technology is the achievement of his or her students. While the most obvious indicator is student scores on high-stakes, standardized tests, the other factors mentioned in the student assessment section are equally important indicators of success.

Evaluating the Media and Technology Program

Just as each district's media and technology program consists of many components, it is important to consider that no one measure can adequately indicate the effectiveness of the program. Therefore, any evaluation of media and technology programs must consist of many components. The thorough evaluation will include assessment of student achievement and teacher performance, as well as those indicators that reflect the program as a whole.

In the **diagram linked here**, we see that student achievement and teacher performance impact the overall program effectiveness directly. In addition, we must recognize that high student achievement is an indicator of successful teacher performance. These factors must be recorded, analyzed and appraised in any discussion of program effectiveness.

When evaluating a media and technology program, it is important to begin with a research base. We must ask what does the research say is an educational best practice? How can we replicate or extend this best practice to a particular classroom, group of students, or school? It is upon this research that we formulate and build a project.

As the project is planned, it is important to plan simultaneously for its evaluation. The evaluation method includes the collection of baseline data, the data collection tools, and the benchmarks for success. The essence of this planning process focuses on the goals and objectives for the program or project to answer three basic questions:

1. What are we trying to accomplish?

2. What do we think will happen?

3. What will the results be?

These questions should remain foremost in our minds and answered at regular intervals throughout the life of the project. They will evolve into:

1. What is really happening?

2. Why are we getting the results that we are getting?

3. If the results are different than expected, Why

4. What changes do we need to make in this project?

Strategic Plan

Goal:

- Effective and Efficient Operations, High Student Achievement

Objectives:

- Using a variety of evaluation/assessment tools that are provided by NCDPI or developed by the LEA, North Carolina educators will collect, aggregate, analyze, and report the impact of media and technology programs.

- NCDPI, administrators, teachers and support personnel will use technology to gather, compile, publish and analyze performance data.

- NCDPI, administrators, teachers and support personnel will make sound decisions based on results of assessments.

- Complying with federal mandates, North Carolina educators will collect, aggregate, analyze and report the impact of educational technology programs on student achievement.

To meet these objectives, NCDPI will:

1. Identify goals of the North Carolina State Educational Technology Plan.
2. Collect, compile and publish the Annual Media and Technology Report.
3. Conduct formative and summative evaluations on the progress of the state technology plan.
4. Continue research in assessment and evaluation techniques.
5. Communicate the results of evaluation to LEAs, NC State Board of Education and US Department of Education.
6. Monitor and report statewide achievement data as it relates to educational technology initiatives to the US Department of Education in accordance with mandates of No Child Left Behind/Enhancing Education Through Technology legislation.
7. Provide instruction and guidance in data-driven assessment and evaluation.
8. Supply assessment information to Milken Foundation and Education Week for the Technology Counts annual report, as well as other national survey organizations.
9. Provide data concerning media and technology to the NC General Assembly as requested.
10. Provide tools and training for data collection and analysis

In order to meet the state objectives, LEAs should:

1. Identify goals of district and school lever educational technology plans and continuously assess progress towards those goals.
2. Collect baseline data at the start of every media and technology initiative.
3. Use quantitative and qualitative methods of assessment.
4. Perform multiple assessments whenever possible.
5. Support the creation and use of student and teacher created rubrics to evaluate students' media and technology projects.
6. Make course corrections to media/technology projects and/or technology plan as needed, based on formative assessment.
7. Consider alternate assessment forms and implement when appropriate.
8. Involve teachers in efforts to develop assessment practices that satisfy local needs, align with state frameworks, and track student progress over time.
9. Provide data on media and technology to NCDPI as needed.
10. Monitor and report statewide achievement data as it relates to educational technology initiatives to the US Department of Education in accordance with mandates of No Child Left Behind/Enhancing Education Through Technology legislation.

Bibliography

To be updated