Public Schools of North Carolina

State Board of Education
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Department of Public Instruction
Michael E. Ward, State Superintendent

December 20, 2000

To: Representative Eugene Rogers
Senator Howard Lee

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 1995 North Carolina Instructional Technology Plan to reflect the changes in technology and the focus on the ABCs of Public Education. In so doing, the Plan is now 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 a broad-based plan that addresses both administrative and instructional concerns. Accordingly, we have changed the name to the North Carolina Educational Technology Plan. This plan received input from a variety of focus groups across the state and was approved by both the State Board of Education and the Information Resource Management Commission.

On November 1, 2000, 109 LEAs submitted their local technology plans to align with the state plan. These plans are being reviewed by both the Information Technology Services staff and the Instructional Technology staff, changes are being suggested and submitted, and most plans will be presented to both the State Board of Education and the Information Resource Management Commission for approval in February. Plans submitted after November 1, as well as those requiring extensive revision, will go before the SBE and IRMC later in the spring. 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 can be accessed at http://tps.dpi.state.nc.us/techplan2000. Individual LEA plans can be found on school system web sites.

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NORTH CAROLINA STATE BOARD OF EDUCATION
Policy Manual

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***** Begin Policy *** (Do not tamper with this line)**

The North Carolina Educational Technology Plan

2001-2005

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

North Carolina has developed a state educational technology plan to enhance the teaching and learning processes within all its schools. As such, it has been designed to merge and reflect Governor James B. Hunt's goal of having North Carolina's schools First in America by 2010. This will be done by supporting and enhancing the North Carolina Department of Public Instruction's mission of high student achievement; safe and orderly schools; quality professionals; effective, efficient operations; and community and family support.

High Student Achievement

Technology is a tool that enables teachers and administrators to work more productively, offering solutions for time management, student monitoring and intervention, and more interesting and effective lessons and classroom activities. Technology is a tool 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. Technology is a tool that encourages student creativity and self-direction and helps students develop skills that prepare them for responsible citizenship within the nation and world. Ultimately, technology is a tool that helps every teacher and student be successful, fostering mastery of basic skills and development of critical thinking and problem-solving abilities. Technology can be a support tool to reinvent schools so that all students achieve more

and are better prepared for the workplace. Recent studies are showing that students with exposure to computers are doing better academically than their peers. (Sharp, 1999)

Safe and Orderly 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 itself. 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 while 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. As such, 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, educational research, and up-to-date curriculum resources. With statewide tools such as NC WISE, HRMS, BUD, and NC WISE OWL, teachers, administrators, and staff have desktop access to a variety of information. This information allows them 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.

Effective, Efficient Operations

Technology is an infrastructure, a seamless network of wires, cabling, equipment, and personnel that supports North Carolina's goal to be First in America. Schools realize the benefits of a technology-rich environment that enhances teaching and learning through state-driven economies of scale and individual outcomes of increased productivity and more efficient time management.

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.*"

Distance leaning, brought into the classroom via the Internet, satellite video, fiber optics, or even cable, also allows students to complete college courses, get AP credits, take classes when no certified teacher is available locally, or even complete a high school degree at home.

Through statewide resources such as NC WISE and NC WISE OWL, every educator in North Carolina has the opportunity to access a broad range of essential information and resources that affect teaching and learning. With adequate technical support within each school and school

system, teachers and administrators can focus on the important aspects of instruction, rather than on the wires and hardware.

Community and Family

Technology is the ultimate 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. 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 in a community, thus enhancing and extending teaching and learning to every individual regardless of age or socioeconomic status. Ultimately this pervasiveness creates the culture that enables North Carolina's schools to become First in America by 2010.

Instruction

Current Situation

Through the implementation of the 1995 Instructional Technology Plan, North Carolina has made an increased effort to infuse technology into instruction over the past 5 years. According to the 1999 Milken Report, 26.9% of North Carolina teachers are using student-centered, authentic, project-based learning. Many more are using the Internet and other online resources to access research and educational materials to prepare and teach lessons. 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) Over 35% of North Carolina teachers are developing individualized learning plans for students that incorporate technology and are using technology in teaching methods that address all learning styles. (Milken, 1999) Some teachers are tracking student performance and using this data to modify instruction and provide remediation. Our goal is for all teachers to be using technology in these ways by 2005.

Administrators continue to use technology to analyze student performance as it applies to the ABCs of Public Education, and assist teachers in identifying and remediating or accelerating students.

Regarding student use of technology in North Carolina, (*)% of North Carolina's children passed the Computer Skills Test in 1998/1999. In the 1999 Milken Report, 81% of North Carolina's students use computers in their regular classrooms, as well as their computer labs and media centers. And 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)

(*) - Information not released at this time (6/16/00).

Vision

North Carolina schools have worked hard over the past several years to make technology accessible to students and to see that teachers integrate it well into the classroom. Having come this far, it is time to become more sophisticated in how schools deploy such resources.

In a book describing how intelligence can be learned, David Perkins describes the idea of "distributed intelligence."

"The basic idea of distributed intelligence says that the resources that support intelligent behavior do not lie solely inside the mind and brain. They typically occur distributed throughout the environment and social system in which we operate. " (Perkins, p. 322)

The author goes on to say that resources that support intelligent behavior are distributed throughout our physical (paper, pencil, computers, etc.), social (teams, collaboration) and symbolic (language, vocabulary, symbol systems) environments. (Perkins, p. 322) Then he asks a powerful question: "What would it be like to recognize the perspective of distributed intelligence as such and deliberately design whole environments to support intelligent behavior systematically?" (Perkins, p. 323)

Indeed, technology resources in schools should be designed specifically to support intelligent behavior among students and teachers. Technology can be amazingly powerful in this role. The mere presence of technology, however, will not accomplish educational goals.

A thoughtfully planned technology program deriving its design from the instructional goals of the school is the best use of technology to effect high student achievement. Indeed, research supports the idea that targeted use of technology to specific instructional goals has a positive effect on student outcomes.

Elementary schools, for example, may design their technology use around a central core of goals such as those associated with reading and math instruction. This use of technology differs greatly from that of a high school, which reflects a far greater variety of technological tools as they are used in subjects from biology to consumer science. A middle school might still wish the strong focus on resources to reinforce basic skills, but also might choose to incorporate specific technologies as students transition to more detailed study. In all cases, the use of technology should reinforce intelligent behavior of students as it applies to instructional goals of the school.
The argument of "form follows function," familiar in many avenues of study other than education, also applies to technology in schools. 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 their 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 learners
- complex thinkers
- quality producers
- collaborative workers
- community contributors

Research studies note that computer-using students demonstrate greater problem-solving and critical-thinking skills when compared to students in traditional classrooms. (Pogrow, 1996; Chessler, Rockman, and Walker, 1998)

Students will learn how to select, evaluate, and use a variety of 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 the Net generation.

Statewide Recommendations

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

- All teachers will infuse technology consistent with the Standard Course of Study, with particular emphasis on the Information Skills and Technology/Computer Skills curricula.
- 100% of North Carolina students will pass the Computer Skills Test.
- Administrators will model the use of technology in the administration of their responsibilities.
- All media centers and computer labs should be flexibly scheduled so that students and teachers can access resources and services at point of need.
- LEAs will provide yearly remediation and re-testing opportunities for students who do not pass the Computer Skills Test.
- LEAs will develop methods for annually accessing student progress in the acquisition of Computer Technology Skills.
- Teachers in all academic programs shall use technology resources to analyze student data to help individualize instruction.
- Schools should participate in collaborative events that foster the distribution of technology resources throughout the community.

Grades K-8

- Relying on brain-based research and developmental needs, implement and track technology skills and processes incrementally from kindergarten through grade eight.
- Integrate technology into the total learning environment through the implementation of the Information and Computer/Technology Skills Curriculum.
- Evaluate and procure appropriate hardware and software to support the North Carolina ABCs and EOC programs.
- Use teacher-developed and student-developed rubrics to assess student work.

Grades 9-12

- Use project-based, interdisciplinary integration of technology into all curricula.

- Use appropriate technology for research, communication, publishing, and presentation of acquired knowledge into all disciplines.
- Evaluate and procure appropriate hardware and software to support the North Carolina ABCs and EOC programs.
- Use teacher-developed and student-developed rubrics to assess student work.

Staff Development

Current Situation

North Carolina has gained national recognition for its technology staff development initiatives that have affected both in-service and pre-service teachers and administrators. In the 1999 Milken Educator Survey for *Education Week*, North Carolina teachers reported an average of 21 total hours of technology staff development, while the nation averaged only 11 total hours of technology staff development. (Milken, 1999) This is a direct result of the State Board of Education's policy of requiring 3-5 CEUs of technology training every renewal cycle. The State Board of Education also mandated 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.

North Carolina has been successful in delivering staff development in a variety of formats, but barriers still exist in transferring this learning into classroom practice due to lack of resources and technical and curriculum support personnel at the building level.

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) The potential benefit that students can derive from the infusion of technology in the classroom requires that North Carolina teachers become trained and updated in technology use on a regular, timely basis. Staff development should be available to all teachers at point of need, anytime, anywhere, any place. The acquisition of knowledge and the integration of skills must be ongoing. To sustain this lifelong learning, the observation of peers in the teaching profession who integrate technology successfully in the classroom is particularly beneficial to teachers. Observation of students using educational technologies is equally beneficial. 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 with LEAs, NCDPI, IHEs, private non-profits, and business and industry partners.

Twenty-five years of research assert that the future learner must be an active learner, that is, one who plays an active role in the acquisition, analysis, and organization of knowledge and skills. To develop such learners, the classroom teacher must be the one who facilitates learning, rather than inculcates "*instruction*." Such learning must be situational, enabling students to draw meaning from their learning experiences in a context. Technology must be seamlessly infused into the classroom curriculum; therefore, teachers must be comfortable with the tools.

Beginning with pre-service training, technology must be integrated into the teacher's learning experience as a tool for teaching. Also, beginning with pre-service training, teachers must be prepared to be 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.

Attitude is just as important as skill. Teachers must believe that technology will enhance their classroom and benefit them and their students. 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. Strategies must be developed to make the time available to teachers.

Support from administrators is paramount to success in teacher training. Administrators are in a position to provide time and resources for teacher training. Administrators' beliefs that training and the subsequent use of educational technologies in the classroom will make a difference in instruction 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 change and garner resources.

Statewide Recommendations

G.S. 115C-102.6 recognizes the validity of the interrelationship between classroom use of instructional technology and the need for staff development of North Carolina teachers in this area. *"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 Instructional 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 to all LEA personnel. The transformation in the roles of staff developers has paralleled the shift from inservice 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). It is essential that any individual who is expected to utilize technology as part of their job performance be provided training on the hardware and software they will use.

The importance of professional development cannot be undervalued. The U. S. Department of Education recommends that 30% of school technology budgets go to staff training (Rosental, 1998). The following recommendations are given:

- All technology staff development should be reflective of LEA school improvement goals and individual professional growth plans.
- All LEA personnel should be surveyed continuously to ensure that professional development is meeting their instructional and administrative needs.
- Trainers should stimulate teacher suggestions for evaluation and feedback.
- 20%-30% of the technology budget should be used for staff development (This percentage may include in-kind services).
- All certified personnel must have 3-5 CEUs of technology training every renewal cycle.
- All technology staff development should be based on North Carolina Educator Technology Competencies.
- New teachers also should be assessed for technology competencies and individual growth plans should reflect this assessment.
- School systems should implement Administrator Competencies as they are developed and approved.
- School systems should develop a training plan for teacher assistants and other school-based support personnel based on identified technology competencies that are relevant to their particular job responsibilities.
- School systems should 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.
- Peer coaches should follow up initial training with visits to observe the use of technology in the classroom.
- Training plans should include peer collaboration as a strategy for follow-up support and continuous learning.
- Technology staff development training needs to model how to use technology as a tool for teaching and learning.

Infrastructure / Connectivity

Current Situation

Although NCDPI and North Carolina school systems have created a patchwork of WANs, LANs, and Internet Service Providers to support administrative and instructional technology applications, currently one high speed statewide WAN that can be used for instruction as well as administration is not in place. While a new statewide WAN is a necessity for NC WISE, the state's student information management system, it also will improve equitable high speed, reliable Internet access for instructional purposes.

Currently, NCDPI maintains statewide low speed 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 State ITS 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 connectivity, instructional and administrative. NCDPI has worked with ITS to provide several options to LEAs for WAN connectivity.

Most LEAs that have Local Area Networks use Novell for directory, file, and print. The Office of Information and 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.

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.

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 will deploy will run over this type of infrastructure. Unfortunately, connectivity is becoming the next digital divide. Without this high-speed access, school systems will fall behind both instructionally and administratively.

The NCDPI is working with State ITS and representatives from the LEAs to develop and implement a Statewide Education Network based on 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
- Reduction in inequalities by providing a baseline level of service statewide
- Adequate security
- Support for statewide instructional and administrative applications
- Maximized local decision making

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 used technology in their learning; therefore, this classroom connectivity is of utmost importance. (Milken, 1999)

Statewide Recommendations

The Department of Public Instruction (DPI), and the State 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 video and data can flow smoothly throughout any LEA. These recommendations also will insure that students, teachers, and administrators have

access to the vast array of resources available on-line and that vital statistics and other data needed by DPI move seamlessly between the district and the state. (See Appendix A)

- WAN connectivity at T-1 (DS-1 or 1.54 Mbps) connection or better, that 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 video, speech, and data transmission.
- When building new schools, or in major renovations, an important part of the planning and design process with the architect should include a network diagram. The plans should include adequate square footage and infrastructure to support the media and technology programs. The plans should also include well-ventilated, easily accessible wiring closet areas (minimum 6' by 8').

Minimum connectivity should include:

- 2 blocks of 4 data ports per classroom *(Please note: 2 to 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 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.

PLEASE REMEMBER: Each LEA must submit for verification or approval, the plan or diagram for their system's current or future WAN. This includes the LANs for each of the LEA's schools.

(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 they support their technical infrastructure at a ratio of one technical support person to 50 computers. (Gartner Group, 1999) North Carolina schools, on the other hand, support their technical infrastructure, on average, at a ratio of one technical support person to 800 computers. (Technology Focus Group, June, 1999) The

result of this inadequate support is significant down time, lost productivity, and inefficient use of resources.

This dearth of technical support extends to the classroom. Only 16% of North Carolina schools have an instructional technology facilitator to assist teachers in the infusion of technology in teaching and learning. (AMTR, November 1999) In order to use technology in the classroom to its fullest potential, building-level instructional technology support is a necessity.

Currently, no statewide funding for technical support personnel exists. 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 technical support is in place to ensure reliability and a sound knowledge base. The effective implementation of the **North Carolina Educational Technology Plan** will be impossible without the availability of trained professional and technical support staff. These individuals should represent a variety of career paths: 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 to add technology facilitators to every school, while lobbying the legislature for classified technology support positions.

Statewide Recommendations

Computers, networks, students, teachers, administrators, and other support personnel in the public schools of North Carolina are becoming more interconnected and interdependent than ever before. The rewards of technology integration are worth our investments because our students, teachers, administrators, and other LEA support personnel are more technically inclined than ever before. 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. Technology directors, coordinators, and technical support staff representing some thirty LEAs across the state, in collaboration with DPI Technology Planning and Support staff, coordinated the effort to develop class specifications and job descriptions for technology support which could be used consistently across all school districts. These focus groups prioritized the need to establish standards and classifications for technology support personnel that could be used by all LEAs. The Technology Assistant classification (instructional position) was adopted in 1996 by the State Board of Education and the remaining non-certified technical class specifications for technology support personnel were approved by the State Board in 1999.

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 instructional technology facilitator/school (school must have at least 50 networked computers).(see charts in Appendix C)
- One technology assistant/school + One technology assistant/1000 additional students.(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

Currently, a majority of electronic resources are purchased at the individual school level, with most of them available only through the school library media center, not individual classrooms. Since 81% of the state's students access online resources for research and personal information needs (Milken,1999), this lack of classroom access is significant. Additionally, high-speed connectivity across the state is an issue. Lower speed Internet access increases search time and decreases productivity for teaching and learning.

In 1999, NCDPI introduced NC WISE OWL, an online Web site of free and subscription resources for students, teachers, and parents. This resource has had a major impact on equity of access to quality online resources for North Carolina's K-12 public education community, while lowering the total cost of ownership for the state and LEAs. Although many more substantial resources are needed, NCWISE OWL has provided a baseline of evaluated child-appropriate 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) 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) Educational Resources Evaluation Services, part of NCDPI's Educational Technologies Division, has maintained a variety of services that assist school library media coordinators and teachers in selecting curriculum-related, developmentally-appropriate print and electronic resources. These services potentially save the state millions of dollars in unwise resource purchases, while continuing to offer a wide variety for site-based decision making.

Vision

Today's educational environment fosters the need for global connectivity that enriches the learning environment by allowing teachers and students to access leading libraries, peruse remote information sources (databases), converse with experts in a variety of fields, and complete research using primary sources. The vision of technology resources for North Carolina's K-12 educational community is access to these resources at the point of need, whether it be the media center, the classroom, the principal's office, or the home.

In this environment, teachers will have access to technology resources that will link them to many other avenues for instruction. These resources, especially NC WISE OWL, will enable them 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. They will, on a daily basis, be developing and using higher-level thinking and communication skills and engaging in problem-solving activities that model real-life situations. 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, accessing and benefiting from resources beyond the school walls, and experiencing the satisfaction of tracking their own progress.

The ideal method for creating this vision is through statewide purchasing of baseline resources. Equity of access and significant economies of scale result from this practice, while still allowing site-based purchases of specialized materials. Resource procurement is particularly responsive to purchasing in volume. The more materials that can be bought statewide, the lower the TCO of these resources. Delivering these resources via the Internet or IP lowers the total support costs for LEAs. Web-delivered resources also lower the cost of training because of the decreased learning curve.

Statewide Recommendations

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 result in 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.

These recommendations address the growing problem of disparity among varying income levels, races, and educational attainments created by inequitable access to computers and telecommunications, "*the digital divide.*"

- All resources should be subject to the LEA selection policy, curriculum guidelines, and technical capabilities.
- All classrooms and administrative facilities should have access to Internet resources including the World Wide Web and ftp (for properly trained staff).

- All classrooms should have access in each school to the school's library media collection via an online public access catalog (OPAC).
- All classrooms should have access to NC WISE.
- All classrooms should have access to NC WISE OWL.
- All classrooms should have access to basic application software.
- All staff should have access to e-mail accounts.
- All students should have access to simulation software.
- All staff and students should have access to online and/or CD-ROM resources for research.
- Each LEA, and each individual school, should have an up-to-date web site.

Hardware Recommendations

Current Situation

In the 1998-99 Annual Media and Technology Report, the ratio of students to multimedia computers is 1 to 9, while the ratio of students to all computers is 1 to 5.3. Fifty-six percent (56%) of North Carolina's classrooms have Internet access, while seventy-three percent (73%) of the LEAs have a Wide Area Network. Seventy-nine percent (79%) of the school systems have e-mail accounts for certified staff; seventy percent (70%) have e-mail accounts for non-certified staff. (AMTR, 1999)

In June 1999, seventy-three percent (73%) of the schools in North Carolina had a LAN in which most of the machines in the school are connected. (AMTR, 1999) However, North Carolina's schools are using a variety of workstation and server hardware, from the very old to the very new. The diversity of hardware presents major problems for access to the latest information via the Internet and machine-based electronic resources. This is an economic reality due in large part to the lack of consistent funding methods for technology.

Currently, North Carolina public schools make hardware purchases through this state's Purchase and Contract (PandC) 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 allowing schools to lease microcomputer equipment.

Vision

One of the most important concepts in technology planning is 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, while administrative business requirements determine those hardware and software decisions. Both areas of the organization 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 has changed from teacher-directed to project-based learning, the need for technology in the classroom has changed. One computer in the classroom is no longer 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, connected computers so that students can work on projects, access online resources, and use remediation and basic application software. The teacher workstation facilitates classroom administrative functions such as taking attendance, developing 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 is an extension of the classroom where teachers and media coordinators collaborate to bring information resources to teaching and learning. Computers in the media center are windows to the world, serving every student and teacher in the school. A variety of different activities take place here: students do research, prepare multimedia presentations, search on-site and remote databases, check out materials, and learn to evaluate resources. These activities take place throughout the center:

- the reference area should house myriad print and electronic resources for ready access to information, with a high-speed laser printer available so that printed information can be used at home for further learning;
- the circulation desk should include two computers, one for student checkout and one for media coordinator access;
- OPACs should be scattered throughout the center for student and teacher use and so that the media coordinator can help teachers and students find a variety of materials for personal use and can help teachers find resources to complete lesson plans;
- Pods of computers should be available across the center for small groups of students to collaborate on classroom projects;
- Portable laptop computers should be available for checkout for children who do not have computers at home.

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

In office areas, each administrative space is 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 such as 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.

Statewide Recommendations

Progress toward these goals will be evaluated through AMTR reports, Milken Surveys, and Local Technology Plan evaluation instruments. In order to effectively implement the **North Carolina Educational Technology Plan** the following recommendations are presented. Please note that ergonomic issues are included in these recommendations. "It is mandatory that schools begin to address ergonomic concerns for both their employees and students" (New York Times, 1996).

These recommendations are based on target data in the STaR Chart, and guidelines provided in Title III: Technology for Education, *The Educational Excellence for All Children Act of 1999.*

Classrooms

- One teacher workstation + 4 multimedia computers/classroom (may require hub/switch depending on number of data ports).
- 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: digital camera, scanner, and multimedia computer.
- One video camera/500 students.
- Ergonomically correct furniture and peripherals.
- Appropriate technology for course content (i.e. 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.

Administrative Spaces

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

- One computer/each administrative/clerical personnel.
- 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.

Policy

Current Situation

NCDPI has provided leadership in assisting school systems in identifying policies that enhance teaching and learning while simultaneously protecting community standards and academic freedom. A few of the Department's initiatives that help ensure the appropriateness of resources for educators and children of North Carolina are:

- The DPI InfoWeb, the Agency Web site disseminating Department information;
- EvaluTech, a keyword searchable database of reviewed print and electronic resources;
- NC WISE OWL, an online Web site of free and subscription resources for students, teachers, and parents;
- Evaluation Services, where textbooks and other print and electronic resources can be previewed by parents and teachers; and
- *Learning Connections, Guidelines for School Library Media Programs*, in which a variety of sample policies are available for school and system-level use.

Currently 98% of LEAs have an Internet Acceptable Use Policy in place, as well as other policies and procedures that assist teachers and administrators in providing developmentally appropriate resources to the state's children. (AMTR, 1999)

Vision

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

Statewide Recommendations

The recommended policies 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 recommendations for policy are made:

Every school system should have:

- A Materials Selection Policy as mandated by GS115C-102.6.
- A hardware and software procurement policy that follows IRM technology standards.
- A Copyright Policy.
- Deployment Procedures.
- An Acceptable Use Policy.
- A policy for equipment/materials donation.
- Guidelines for Web site development.
- A policy for equipment maintenance and repair.
- A policy for replacement of obsolete equipment.
- A network security policy that includes regularly scheduled security audits.
- A plan to cover the disposal of outdated resources and equipment.
- A comprehensive policy for inventory control.
- A data privacy policy that addresses FERPA and state legislation.
- An Access to Information Policy that, if filtering systems are used, ensures adequate data retrieval capabilities for both students and staff.
- A plan for translating all student/parent-related policies into the predominant languages of the community.
- A policy for disaster recovery of data and hardware.
- A policy that addresses advertising and commercialism on school resources and equipment.

Budget

Current Situation

According to the 1999 Milken Survey of Technology in the Schools, North Carolina spends an average of $5,509/student, while the national average is $6,237/student. (Milken, 1999) North Carolina public schools currently receive dedicated funds from the state as a part of the PRC15 State Technology Trust

Fund. This 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, the LEA must have an approved technology plan on file with the Department of Public Instruction. Most of the funds that the Department of Public Instruction distributes to LEAs have budget codes that allow technology purchases.

LEAs do not have a unified approach to planning technology expenditures and budget that span across all program areas. This lack of unified budget planning increases the total cost of ownership of technology for the school system. Most LEAs do not use operational budgets for hardware and software replacement, resulting in 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: maintenance and repair, electricity and HVAC, telecommunications charges, staff development (20%-30%), downtime, virus protection, furniture, and upgrades. Most LEAs do not take the total cost of ownership into account when budgeting for technology. This is demonstrated by the lack of technology support personnel and significant downtime of workstations and networks.

Vision

Budgeting for technology should cross all program areas of a school system. This unified approach will lower the TCO for the LEA. It also will insure that every program in the LEA is adhering to technical standards, and that the hardware and software being purchased can be supported by the technical and personnel 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.

Statewide Recommendations

Past experience has shown that the most effective implementation of learning and instructional management technologies occurs when the funding program 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, the Department of Public Instruction, 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 recommendations are presented:

- The LEA technology budget planning process should include all areas/personnel that leverage funding for technology resources and programs, in order for all funding sources to have a cohesive plan for purchasing, staff development, and TCO for the entire system.

- LEAs should develop a plan that migrates ongoing technology expenditures to the system's operational budget.
- LEAs should develop annual program implementation milestones that are reportable and accountable each October in the report to the Legislature.
- LEAs should provide visible support and participation by major employers, possibly through the establishment of an advisory panel to the Local Technology Planning Commission.
- LEAs should follow uniform state accounting procedures when purchasing all technology resources.
- As a part of the state technology plan process, LEAs must submit a long range budget plan that extends from July 1, 2000 to June 30, 2005, with a more detailed plan for the following periods: July 1, 2000 through June 30, 2002; and, July 1, 2002 through June 30, 2004.

Communication and Collaboration

Current Situation

North Carolina has a nationwide reputation for its media and technology planning and implementation processes, but does not appear to have the same credibility within the state itself. While some LEAs have wide community support based on the system's sound program marketing principles, others have little recognition for their innovative work in technology. NCDPI has had much the same success in marketing its technology plan and vision. While media and technology personnel throughout the state recognize the Agency's work, the larger state community seems to know little about the Agency's educational technology agenda.

Other state, IHE, and private organizations have had success in marketing their services to the LEAs. ExplorNet, LEARNNC, PEP, PATL, the Teacher Academy, 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 such as these allow LEAs to leverage the academic and business community's financial and skill-based resources for the benefit of teaching and learning.

One of the public schools' major successes is the development of each LEA's technology plan. 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 must join together to create a vision of the impact of technology on teaching and learning--and the strategies for reaching this goal.

Vision

NCDPI and the LEAs should strengthen their current partnerships with business, industry, IHEs, nonprofit organizations, and the community, as well as search 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.

Statewide Recommendations

We as educators must do a better job of selling our programs to the public. Without public support, initiatives are much more difficult to begin and to maintain. It has been proven time and time again that the organization that projects its needs and accomplishments the most effectively usually receives the most support. Collaboration, like communication, is essential in today's world. Working with other organizations to promote a common goal has a greater chance of success. Collaboration involves the communication of one's vision in such a way as to generate support for one's program. The following are recommendations for what NCDPI and LEAs should do to create the support they require:

- Create a local public relations program focused on students, parents, and the general public.
- Involve local businesses, community groups, and major employers in the development and evaluation of local technology initiatives.
- Form a Technology Committee for the development, updating, and evaluation of the local technology plan that includes representatives from the community, the school system, IHEs, and local government bodies.
- Provide summary data for the NCDPI Annual Media and Technology Report, the Milken Exchange/*Education Week* survey, and the US Department of Education.
- Have a clear vision of how they will collaborate with outside resources such as ExplorNet, LEARNNC, PEP, NCCAT, Teacher Academy, etc..
- Communicate the impact of media and technology programs on teaching and learning on each LEA based on research aggregated from NCDPI and other LEAs.
- Provide opportunities for students and staff to showcase what is happening in North Carolina's schools.

Evaluation

Current Situation

North Carolina has created a variety of instruments to evaluate various aspects of technology use. The Annual Media and Technology Report tracks the amount of equipment and connectivity available for use in each public school in the state. The Milken surveys that school systems complete allow 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 farther in the future than immediate end-of-year tests. 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

Evaluations of educational technology are really evaluations of instruction enabled by technology, and the outcomes are highly dependent on the implementation of the instructional design. Technology use must be fully correlated to the districts' standards and tests. (Barnett, 2000) Formative monitoring and evaluation of the **North Carolina Educational Technology Plan** should focus on all strategies for designing, developing, and implementing the overall program. Everyone who authorizes, manages, and uses the proposed technology initiatives will share responsibility for shaping the embedded technology resources to best support education reform. The process of implementing the plan must provide feedback that can be used in adjusting operational procedures to achieve maximum results. The main tool that will be utilized to provide formative data will be the Annual Media and Technology Report. This report will be redesigned to measure school system progress toward statewide goals. Each LEA should measure progress toward local goals as well.

LEAs also should consider using the STaR chart, developed by the CEO Forum on Education and Technology as another tool to assess progress in the implementation of technology initiatives. This tool can help schools or communities to answer the following critical questions:

- Is your school using technology effectively to ensure the best possible teaching and learning?
- What is your school's current education technology profile?
- What criteria should be used in judging your progress?

The STaR Chart can be used to help school systems:

- Set benchmarks and goals.
- Identify current education technology profiles, establish goals, and monitor progress.
- Identify their education technology needs as they apply for grants.
- Determine funding priorities.
- Create individualized assessment tools.

The goal of the **North Carolina Educational Technology Plan** revision is to provide answers to these essential questions:

- How is technology integrated into educational settings?
- How are new electronic resources interpreted and adapted by their users?
- How can we best match technological capacities with students' learning needs?
- How can technology serve as a tool for planning, analyzing, and managing information?
- How can technology serve as a catalyst for school improvement?
- How does technology impact learning and teaching, especially student achievement?

Statewide Recommendations

The purpose of monitoring and evaluating technology plan initiatives is to provide data to assure that resources are being used to accomplish state and local goals. Hard data provides information such as test scores and number of computers per classroom. Anecdotal data, on the other hand, allows educators to illustrate how technology-infused instructional practices are improving student learning by affecting such difficult-to-measure student attitudes as self-confidence and motivation. The plan should be revised and improved as needed. This is also a step in the continuous quality improvement process. No planning

committee can possibly foresee all of the underlying circumstances, which might cause detours along the way.

Monitoring and evaluation efforts must be designed to keep initiatives on course and aligned with state and local school improvement and technology goals. A careful monitoring and evaluation plan will help to ensure an effective and efficient investment of public funds. Appropriate strategies include both formative (process) and summative (result) evaluation.

- Determine the methods of evaluating the progress of the technology plan using feedback from the groups responsible for implementation.
- Determine responsibility for conducting the formative evaluation.
- Determine the methods for evaluating the final outcome of the technology plan goals and the target date for completion.
- Determine the responsibility for conducting the summative evaluation.
- Involve each level within the North Carolina education hierarchy with the process of collecting, aggregating, analyzing, and reporting evaluation information.
- Support evaluation research aimed at determining critical factors in the successful implementation of large-scale change efforts.
- NCDPI will apply lessons learned from other states that are in different stages of technology plan implementation by using assessments of those states' programs to assist in focusing the evaluation for the **North Carolina Educational Technology Plan**.
- Improve program evaluation by using the power of the technology applications to capture and report automatically relevant information concerning the use of the innovations.
- Using the STaR Chart and AMTR, the LEAs will measure their annual growth in implementing media and technology programs to impact teaching and learning across the state.
- Continuously survey LEA personnel to ensure that training, support, and equipment are meeting their instructional and administrative needs.
- Continuously monitor 8th grade computer skills testing to insure that students are learning the skills necessary for a knowledge-based economy.
- Continuously survey LEA students to ensure that they are receiving the instruction needed to allow them to access the information necessary to be successful in their learning environment.
- Continuously (K-12) assess student competencies to determine their level of computer proficiency (*i.e. portfolios, skills inventory, checklists, and periodic skills test*).