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ABSTRACT

This document contains the technology plan for North Carolina Public Schools. The plan has three primary purposes: to consolidate previous work towards the vision of technologically literate students; to indicate the commitment of the Department of Public Instruction to provide schools with the necessary technology framework to work towards the objectives in the plan; and to recommend guidelines, options, and processes for integrating technology into classrooms to expand the opportunities and capacities of all children to learn and achieve. The plan begins by identifying the challenges present in education and then identifies the benefits of technology in solving these challenges. Next, the state of technology and education in North Carolina are presented in three areas--computer literacy, student information management, and distance learning by satellite. Five objectives for change are presented: (1) changed definitions and percentages of schools and schooling; (2) changed student roles and activities; (3) changed teacher roles and activities; (4) changed administrator roles; and (5) expanded methods of assessment. The technology infrastructure of a networked school is described; strategies for action are suggested; and the roles and responsibilities of the participants are identified. Included in the appendices are criteria for approval for local technology plans; the technology equipment plan; and media and technology visitation sites. (Contains 43 references.) (JLB)

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a Technology Plan for North Carolina Public Schools . . .

North Carolina Department of Public Instruction
Bob Etheridge, State Superintendent
February 1994

Foreword

Few of us anticipated the economy that our children will face as adults, the political situations that exist, or the technology that has reshaped our world. The future has presented grand opportunities for us that make much of our old knowledge, skills, and equipment inadequate or obsolete. What all of this means for education is that schools of the future must be dramatically different, and technology will play a central role. The expectation that every child have computer training does not begin to describe the scope of technology that I envision for North Carolina's public schools in the near future. In the schools I envision, computers will be a central tool in every classroom, for every teacher and every student.

Computers and communications technology will allow students to interact with their peers who are working on similar projects—even when those peers live in a different community or different state. Diverse individual and group activities will become commonplace in every classroom every day, and technology will be integral to these activities. Through multimedia instructional materials and assessment software, teachers can better address varied proficiency levels and learning styles and provide students more "real-life" educational experiences. Using the tools and resources of technology, *all* students can guide themselves, step by step, toward the mastery of knowledge and skills and will discover that their classroom options for learning and achievement have increased significantly.

I believe that these things must happen, but I do not believe they can happen without technology. I believe in technology and what it can do. With the appropriate application of technology to achieve educational goals, I believe our schools can become everything they need to be and everything we want them to be.

Bob Etheridge

State Superintendent of Public Instruction

Acknowledgments

The Department wishes to recognize the many groups who have provided direction for using technology to improve schooling and whose previous or current work contributed to this plan. Among those groups are:

Department of Public Instruction Instructional Technology Task Force
Governor's Advisory Council on Telecommunications
Impact North Carolina
Interagency Task Force
NASDC (New American Schools Development Corporation)
North Carolina Information Highway Planning and Implementation Committees
North Carolina 2000 Technology Subcommittee
North Carolina Public School Forum
North Carolina Science and Math Alliance
North Carolina Science and Mathematics Education Network
SERVE (SouthEastern Regional Vision for Education)
SREB (Southern Regional Education Board)
Teach Tech
University System Task Force: Technical Study
Committee on Networking and Telecommunications
Vision Carolina

The Department would especially like to thank the many North Carolina school districts and schools who have developed and are implementing local technology plans and whose vision, knowledge, experience, and insight were instrumental in the development of this plan.

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Plan Vision

Fundamental to this plan is a vision of every child in the state's public schools equipped with technology to increase his or her capacity (1) to become proficient in the enabling skills of reading, writing, mathematics, and thinking at levels sufficient to ensure success at the next level of schooling and (2) to receive a high school diploma that reflects attainment of proficiencies sufficient for the technological needs and jobs of the future.

The vision of this plan expands to include administrators, teachers, and school staff using technology on a daily basis to increase their effectiveness in helping all students reach high standards and become prepared for tomorrow's workplace.

Finally, the vision expands outside the school walls, to technology-based communities where data and resources are accessible and appropriately shared by home, school, service agencies, educational institutions, research facilities, businesses, and organizations. Such communities, joined by the North Carolina Information Highway and a variety of technologies, may be as small as a town or networked throughout the state, nation, and world.

Wherever the vision goes within the context just described, it must begin with and return to the individual child, who has unique learning needs and styles, and who must master particular skills to thrive in a changing world. Technology has already become the framework for many facets of the child's world. It must now become the framework for every child's education.

Plan Purpose

Numerous groups, for years, have advocated the use of technology to achieve educational goals. However, not until recently has it become imperative to adopt, without further delay, a comprehensive plan encompassing their efforts. With an increasing number of North Carolina schools offering the benefits of technology to students, the need to provide these benefits to *all* students in *all* schools becomes imperative. The urgency for equipping all students with technology is further underscored by the establishment of the North Carolina Information Highway. Our schools must be ready to connect with, contribute to, and benefit from this unprecedented access to people, information, and services throughout the state and nation. This plan was developed to assist these efforts and has three primary purposes.

The first purpose of the plan is to consolidate the previous work of technology-schooling advocates to provide a vision for future schooling and to provide direction for moving toward the vision. An enormous amount of work within and outside the Department of Public Instruction preceded this plan. Much of the plan's content reflects and is indebted to the thinking and work of others.

The second purpose of the plan is to indicate the commitment of the Department of Public Instruction to provide all schools a technology framework necessary to work toward the educational objectives outlined in the plan. With a clear vision and objectives for the future of schooling, all schools can begin developing local technology plans to tap the power of technology's resources, tools, and networks, including the North Carolina Information Highway.

The third purpose of the plan is to recommend guidelines, options, and processes for integrating technology into classrooms and schools in order to expand the opportunities and capacities of all children to learn and achieve. The complexities of this task will require local plans that are guided not only by the larger vision but by manageable strategies and significant steps toward change.

Education's Challenges

1. Students poorly equipped for personal well-being

Education has always been about giving individuals the knowledge and skills necessary to become healthy and productive family members, employees, and citizens. Before technology reshaped the world, before a global marketplace emerged, and when only a small number of individuals were anticipating the future, more students had a better chance of fulfilling these prerequisites for well-being. Now, to cope and thrive in a changed world, students must move far beyond the essentials of yesterday's education.

Without higher level thinking and problem solving strategies, graduates will be unable to access, sort, and digest the ocean of information that surrounds us all; they will be ill equipped to solve complex problems and to make informed choices and decisions; and they will lack the advanced communication skills that enable them to express and share what they know and to work well with others. Until the benefits of technology-based resources, tools, and connections become commonplace in our classrooms, the means for helping students acquire these more advanced lifelong learning skills, too many students will leave school with too few options for well being.

> "All ages learn best when they have many opportunities to interact with their environments: responding to questions, posing questions, hypothesizing, experimenting, falling, and trying again in a positive setting....Information technology literally exists for the exploration and expansion of intelligence, through communication and the promotion of higher-order thinking... Conscientious educators have longed for centuries to treat every student as an individual, with individual aptitudes, backgrounds, and needs....With multimedia (resources), educators can address the individuality of all students."
>
> Dee Dickinson
> "Multiple Technologies for Multiple Intelligences,"
> *The Electronic School*, September 1992

2. A changed state economy and job market

The tools and methods used in most of the state's schools cannot prepare students to fill jobs in our changed state economy. The age of information, technology, and an international economy have changed the characteristics of North Carolina's workplace and the skills required for successful employment. With the movement of many low-skill jobs to other countries and automation becoming the predominant means of production, the health of today's state economy depends upon high school and college graduates who not only are *more* educated but who have been educated *differently*.

Whether recruiting for entry-level or advanced positions, employers in North Carolina's changed economy need workers who are comfortable with technology's tools,

who can collaborate and communicate effectively with others, who are adaptable and flexible, and who can use higher-level skills to identify and solve problems. Equally important, when employers outside of North Carolina are searching for new locations, they look for identical qualifications. The relationship between technology, schooling, and a healthy economy are unmistakable: the characteristics that define our schools also shape our workforce and determine not just the employability of graduates but the availability of jobs.

In stark contrast to current and projected occupational demands, the dominant instructional content and format in many of our schools remains tied to the previous century. Textbooks and teacher presentations dominate instructional content and format. Teachers dispense materials to students at the same time and rate. Students remain in rows with few opportunities for exploration and interaction, functioning more as observers and recipients than as real participants in their own learning. In most classrooms, technology's tools and resources are conspicuously absent.

> Productivity in the Workplace:
> The Five Competencies that Drive It
>
> - **Resources:** Individuals who can identify, organize, plan, and allocate resources
> - **Interpersonal:** Those who can work well with others
> - **Information:** Workers who know how to acquire and use information
> - **Systems:** People who understand complex interrelationships
> - **Technology:** Individuals who can work comfortably with a variety of technologies
>
> *What Work Requires of Schools, A SCANS Report for America 2000*
> The Secretary's Commission on Achieving Necessary Skills
> U.S. Department of Labor, June 1991

3. Goals for the future, tools from the past

Minimal application of technology in the state's schools is insufficient to meet its educational mission, goals, and standards. With North Carolina's curriculum and tests focused on building advanced thinking and communication skills, and graduation requirements specifying more rigorous coursework and computer proficiency, technology-based instructional management and learning systems —and training for teachers and administrators to use these systems—are essential next steps.

> "It took ten years to get the overhead projector from the bowling alley to the classroom! Chances are, the Bowlerama where your kids spend their Saturdays is still more sophisticated technologically than the classroom where they spend their Mondays."
>
> Bernard R. Gifford
> Founder and Chief Instructional Officer, Academic Systems Corporation
> "The Future of Technology in Education," Business Week, November 1993

4. Inequities among school districts and student populations

Solutions to inequities among school districts and student populations remain illusive, while polarization of the haves and have-nots continues to erode the fabric of our society, our institutions, and our economy. Establishing collaborative services for families, closing gaps in achievement between student populations, providing after-school academic services to at-risk students, addressing the needs of special students, providing assistance and money to low-wealth and low-achieving school districts—all of these initiatives and legislation indicate a strong commitment to addressing differences that can impact the success of schools and students. However, without better means to implement new programs and assistance, it will be difficult to honor these commitments.

Whether applied to isolated or low-wealth school districts, or students and teachers in classrooms, the "technology advantage" is a powerful one. Awareness of this power is evident in the home market for instructional hardware and software, which is expanding daily into every facet and topic of learning. For students who cannot afford home learning systems, technology at school is an especially critical issue . For them, tools that address varied learning levels and styles, resources that motivate and challenge, and networks that broaden experience and knowledge can make the difference between catching up and falling further behind.

5. Teachers in need

Most teachers lack the resources necessary to prepare students for a changed job market. To produce the kind of graduates employers seek, teachers must begin to move away from the traditional "teaching" roles that served yesterday's schools and become stronger *facilitators* for both individual and group activities, competent *managers* of diverse instructional materials and technologies, and *guides* who can lead students to self-sufficiency and excellence. Inherent in new roles are expectations that teachers address a variety of proficiency levels and learning styles and provide all students the opportunities and attention needed to acquire higher level skills, to complete advanced coursework, and to become computer proficient. Changing roles and meeting these expectations will require more support than is currently available to most teachers. North Carolina's teachers need additional training, more time, and better tools.

Additional Training. Current teacher preparation and training suffer from the same shortcomings as student preparation. Learning is restricted to specific times and places, with limited options for getting *what* they need *when* they need it. The scarcity of time and tools to communicate, to share ideas, and to learn from peers further obstruct a teacher's efforts to connect with timely and meaningful professional development.

Time and Tools. Many teachers are still spending a substantial amount of time on nonteaching tasks, most of which could be performed in less than half the time by technology. For many teachers, devoting time to plan for quality instruction, track individual student progress, and address different levels of proficiency often means working at home after a full school day divided between paperwork and teaching. Prioritizing and time management, alone, cannot begin to address the workload carried by the best of today's teachers.

> In 1988, Madeleine R. Grumet, Dean of the Brooklyn College School of Education spoke of a device that if installed in every classroom could change the professional lives of teachers across America—the telephone. Five years later, 99 percent of homes have telephones, but only two percent of classrooms do....You cannot phone a teacher to ask a question, offer information, or share an idea. "Teachers are the most over-controlled workforce, being asked to do the most creative work that we have," says Grumet. "The issue of changing the school site is a fundamental issue about human creativity."
>
> The Future of Technology In Education"
> Business Week, November 1993

6. Principals in need

Like teachers, principals divide their time between administrative detail and the activities that really count. Although the need for record keeping, testing, and reporting has dramatically increased, technology-based tools for integrating test data and student records are not fully functional in most of the state's schools. These tools enable principals to make better administrative decisions and improve resource management. Equally important, these tools can help principals find the time they need to strengthen staff training and support, help remove obstructions to quality work, and build school-community networks.

7. Weak school-home and school-community relations

The mission to establish better connections with parents and the community, in most schools, is limited by modes of communication that are cumbersome and ineffective. Many parents want to become more involved with the education of their children. Many community members want to contribute to improved schooling to assure educated citizens and a sound economy. However, under current circumstances, many find it inconvenient or impossible to become involved or to contribute support. School staff are often restricted by their schedules—and lack of access to appropriate technology tools—from making timely and meaningful contacts outside of the classroom. Just as often, parents and community members are restricted by similar conditions at home or work that prevent them from contact with schools—adhering to tight schedules, arranging transportation, securing child care, getting permission to leave work, etc.

With priorities focused on home-school-community links, programs to establish and support these vital links are growing. Schools who have technology's tools and resources may find it easier to establish and support such programs and will be a step ahead of those who must use alternative means.

8. Increased school violence, inadequate security systems

While school violence is a symptom of fundamental causes which must be addressed elsewhere, violence on school property has prompted many schools to think more seriously about security measures. Whether simple or sophisticated, technology can be used for communication, detection, and warning systems to help assure a safer environment for learning.

Technology's Solutions

Conclusions from empirical evidence of technology's effectiveness in achieving educational goals range from maybe to definitely. Some of the most highly publicized works include:

- *Power On*, Office of Technology Assessment, Congress of the United States, 1988.
- *Linking for Learning: A New Course for Education*, Office of Technology Assessment, Congress of the United States, 1989.
- *Accomplished Teachers: Integrating Computers into Classroom Practice*, Center for Technology in Education, Bank Street College of Education, 1990.
- *Telecommunications and K-12 Educators: Findings from a National Survey*, Center for Technology in Education, Bank Street College of Education, 1992.

> - Computer-assisted drill and practice has proved to be effective in helping elementary school students learn mathematics.
> - Both mainstream and special education students who use word processors as a supplement to writing instruction write better than those who don't.
> - Students who use computers in science lab to measure changes in light and temperature, as well as other phenomena, have a deeper understanding of complex scientific concepts than students who don't.
> - Computers have been especially successful in teaching students graphing skills.
>
> *Power On*, Office of Technology Assessment, Congress of the United States, 1988

Regardless of research conclusions, the impact and effectiveness of technology may be an irrelevant study. Technology is NOT another educational approach or experiment to be validated with statistics. It is a pervasive presence in society—a phenomena that not only launched the information age but is integral to life and success in an information-driven culture. Technology has a long track record as a viable tool and medium for many purposes. It has changed the way we see the world, the way things get done, and the amount of time it takes to accomplish a multitude of tasks. It determines if, when, and how we communicate with each other and, in many respects, the nature and scope of our individual and collective worlds.

Many who develop and implement technology plans soon discover that a single application of technology to meet a particular goal brings unexpected benefits in other areas. It is not unusual for a single technological application to lead not only to better strategies for meeting other goals but to creative solutions to problems that were not being addressed at the time.

> "As a result of our technology plan, we wanted our school and classrooms to model the workplace, so that what they experience 'here' is what they will confront 'out there.' We especially wanted to reduce teacher frustration, energize teachers with ownership of the plan, and give them the time and means technology provides to do a better job. As it turns out, our plan accomplished all of that by changing the way we treat students and teachers."
>
> N.C. Teacher

Technology's solutions for education's challenges, and for challenges in many other fields of endeavor, are powerful not because they produce a particular result here or there, but because they *improve process* and *effect systemic change*. The lists that follow provide only a few examples.

Some of Technology's Benefits for Students

- With the appropriate application and effective training, technology makes it possible to facilitate collaborative and cooperative learning while retaining individual goals and accountability.
- Electronic networks, telecommunications, video, CD-ROM interactive software—all provide options for learning, communicating, and developing skills in real-world contexts that no single teacher with limited resources can provide.
- With multimedia courseware, the same knowledge and skills can be presented different ways and within more informative contexts, to address varied learning styles and the need for reinforcement through association.
- The self-directed learning and assessment, made possible by technology, can result in increased motivation and enthusiasm for learning.
- Desktop publishing in every classroom is a real-life experience with technology's tools, establishes a context for teaching students the principles of design that enhance communication, and can raise motivation and promote pride in work.
- Technology can increase self-esteem and achievement for all students.
- Only by using technology can students become comfortable with technology-based resources, tools, and connections common in the workplace.

> The success of technology in learning depends on a number of factors, including the subject area, the type of students in class, the teacher's training and role in the use of technology, and the design of the software.
>
> Ellen Bialo
> *Report on the Effectiveness of Microcomputers in School*, 1990

Some of Technology's Benefits for Teachers

- With increased access to data, resources, and time-saving applications, technology can give teachers more time to attend to students and instruction.
- Online access to lists of media center resources makes it possible for staff to review materials and equipment without leaving a classroom or office. In addition, resources offered by the center can be used to full capacity, reaching and helping more students than would be possible using former systems.
- Technology can provide the means for the careful diagnosis and planning required to make individualized instruction successful.
- With access through technology to more detailed information on state curriculum and tests, schools can more easily maintain consistent academic expectations and instructional goals.
- Integrated databases for instructional management and student record keeping, assessment and tracking can address all facets of teachers' needs.

The Bank Street College of Education surveyed 608 teachers who use technology. A vast majority of the teachers surveyed said their students take more initiative in pursuing and refining their work now that they use technology. The teachers said it has given them more time to spend with students and made them more comfortable letting students work independently. Technology has also enabled them to present more complex material and to tailor lessons to individual needs. These benefits, though difficult or impossible to prove, may be the most convincing evidence for the use of technology in schools.

Power On, Office of Technology Assessment
Congress of the United States. 1988

Some of Technology's Benefits for Administrators

- Automated inventories, class scheduling software, simulation and calculation software for transportation management, food service, etc. can pay for themselves in more cost-effective decisions for resource management.
- Electronic integrated data systems that are accessible and functional can be used to make more informed decisions more quickly than with manual systems and procedures.
- A desktop publishing system in the office can produce materials about the school that are invaluable in building community awareness and support of educational goals. This system can be used year-round by office staff or school volunteers to generate improved reports, forms, newsletters and for developing meeting and presentation materials.

Some of Technology's Benefits for School-Community Relations

- Real-time interaction using technology allows schools and communities to share resources and expert capacities, at minimal cost and with greater speed. More people can be included in the process of change, providing more people with a stake in our education system.
- Homework hotlines and school-community bulletin boards can be small steps with big impact on more positive home-school-community connections.
- Classroom use of telephones to complete student projects can open doors to building important school partnerships with business and community.

Technology and Schooling in North Carolina: Where We Are Now

During the last decade, the N.C. General Assembly signaled support for technology in the state's public schools through efforts that resulted in specific funding in three areas: computer literacy, student information management, and distance learning by satellite.

Computer Literacy. In 1983 a study commission appointed by the General Assembly examined the existing use of microcomputers in the North Carolina schools and determined a need for funding for computer literacy for the K-12 public schools. As a result, from 1984-1987, the North Carolina General Assembly provided $28.6 million to the public schools to provide computer opportunities for all students. This money was used for hardware, software, training, and maintenance and was based on the objectives of a school system computer plan and yearly budget submitted to the North Carolina Department of Public Instruction. This funding provided the initial microcomputer purchases for many school systems and established a ratio of one microcomputer for every 50 students for instructional use.

Student Information Management. In 1985, the Department of Public Instruction determined the time and cost benefits of computerizing the school student information management process and successfully obtained funding from the General Assembly. The Department developed and implemented a microcomputer-based information management system for student demographic data, attendance records, and grades. A minimal hardware system was placed in each school principal's office. The system development and hardware acquisition cost $16 million. Since the initial design, the system, knows as the Student Information Management System (SIMS) has evolved into a comprehensive system of student data and is used by 90 percent of the North Carolina K-12 schools. Currently, related modules for the central office and state reporting are in various stages of completion and a study on the next evolution of the system is in progress.

Distance Learning by Satellite. The final years of the 1980's decade included the third major technology initiative for the public schools. As a result of a need to provide specialized courses for students in small high schools that was not possible under the existing allotment of teachers, the Department of Public Instruction obtained funding from the North Carolina General Assembly to equip 45 small high schools with distance learning by satellite (DLS) equipment and to deliver selected courses. The equipment for these sites provides one-way video and two-way audio transmission with a customized audio-visual unit (AVU) consisting of monitor, VCR, phone, and printer for each classroom. Additionally, 100 similarly equipped sites for staff development training were funded and allotted to the school systems in the 100

geographical counties. Since the initial funding in 1987, the Department of Public Instruction has managed these DLS activities, which now reach approximately 1100 high school students annually in 77 schools and is available to over 60,000 educators at another 102 sites.

These appropriations—which resulted primarily in one-time purchases of computers, instructional software, distance learning facilities, or training programs—put North Carolina ahead of some states in the use of educational technology and prepared the way for other developments. In many cases, investments in school technology made almost a decade ago have been maintained and benefits are ongoing. In many other cases, however, technology's impact quickly faded or disappeared due to inadequate training, uninformed purchasing decisions, or inability to service equipment and troubleshoot problems. In the meantime, outside of school walls, more advanced technological applications have developed so quickly and become so common that earlier public school investments in technology appear archaic by comparison.

Now, almost midway through the 1990's, the definition of educational technology goes far beyond the limited applications discussed in the 80's. Discussions about comprehensive technology-based workstations in every classroom have replaced discussions about computers in every school. Discussions about distance learning through television or teleconferencing have turned into discussions about two-way interactive communication throughout the state via the North Carolina Information Highway. Instructional applications are no longer discussed in isolation, but often lead to a discussion of applications in other areas that significantly impact the quality of education—organizational effectiveness, parent and community involvement, and wiser use of resources—to name a few.

With the presence of technology in so many facets of daily life and its benefits evident in the most successful businesses and organizations, we now know that we must not delay further in tapping its power. We need technology in our schools not only to prepare students for the future, but to help administrators and teachers honor current commitments inherent in the Basic Education Plan, the Performance-Based Accountability Program, new curricula and tests, and more rigorous graduation requirements, including special requirements for computer proficiency. Even *with* the tools and resources of technology, these will continue to be enormously challenging commitments.

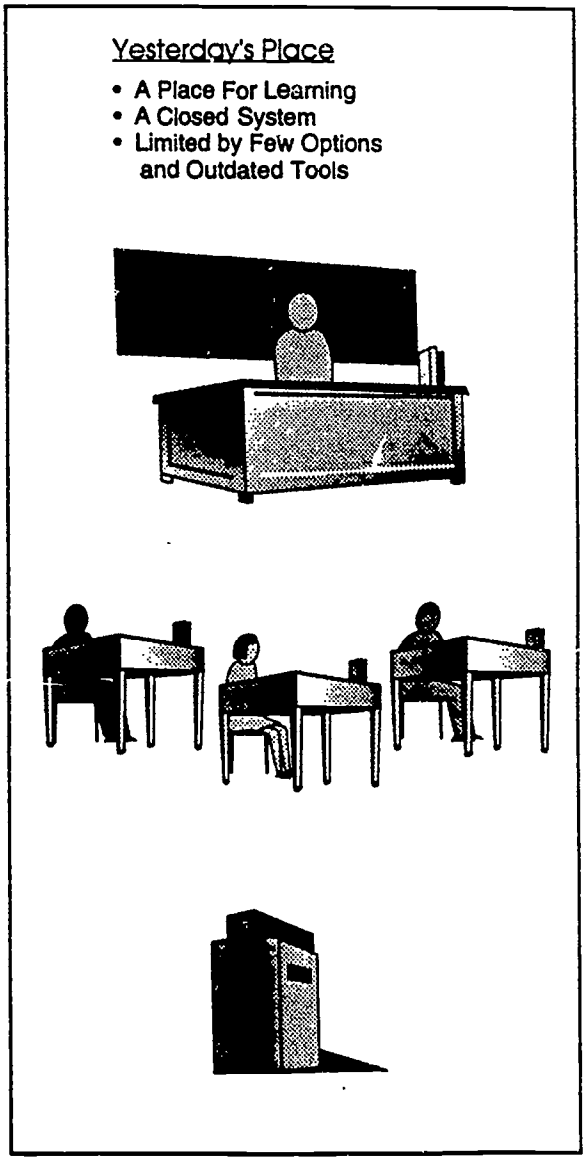
Where Schooling Needs to Go: Our Objectives

From Yesterday's Place

In making decisions to invest in technology, two descriptions may be more helpful than one: a description of yesterday's schooling as a departure point, and a description of tomorrow's schooling, to guide the journey into the future. Observations regarding the limitations of yesterday's schooling speak for themselves: many of our schools still more closely resemble windows on the past than doors to the future.

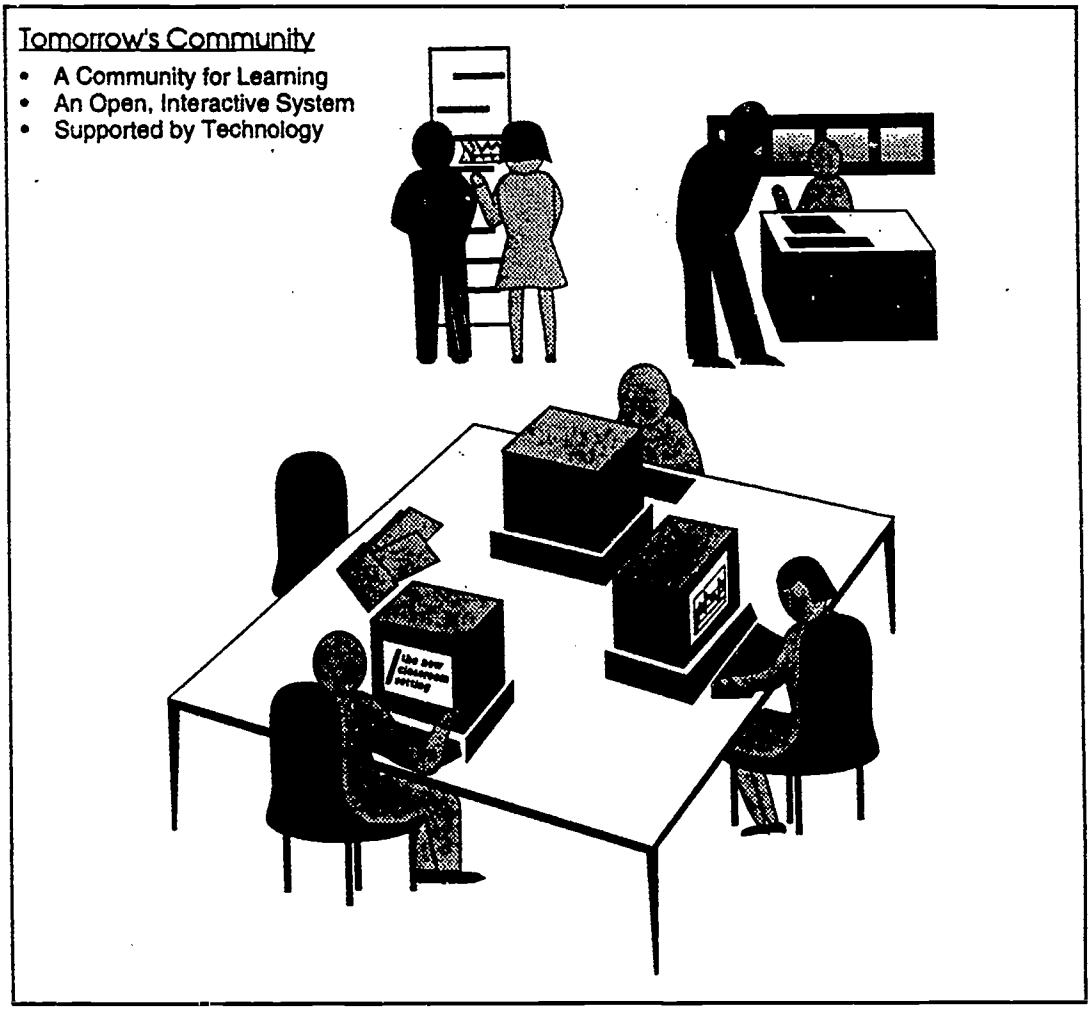
"When you think about our basic educational technology in its broadest sense, we're still in the nineteenth century. We still have a person stand in front of 24 to 40 persons, talk to them about a textbook that's sitting in front of them, and then send them off to all do the same exercises from that book."

Lou Gerstner, IBM Chief Executive
"The Future of Technology in Education"
Business Week, November 1993



Toward Tomorrow's Community

In contrast, investments in the future must be guided by the belief that schools and classrooms should be open, interactive learning communities, *fully supported by technology.*



New technologies and wider, faster networks will allow students and teachers to use the world at large as their classroom, and each other as guides....New learning systems will allow children—working alone or in groups—to define and solve problems, working toward clear goals at their own pace, in a format and sequence suited to their own learning styles....Tomorrow's schools will not be 'schools without walls,' but rather schools whose walls do not confine learning."

"The Future of Technology in Education"
Business Week, November 1993

Objectives for Change

To achieve tomorrow's learning community - where all students reach high standards and where all teachers, school staff, and administrators are effective in reaching their goals - state and local investments in technology must support one or more of the following objectives:

1. *Changed definitions and perceptions of schools and schooling* to create an active, flexible environment, open to the community.
2. *Changed student roles and activities* that provide students more opportunities to master higher level skills, to practice effective communication, and to work individually and collaboratively with others on real-world tasks.
3. *Changed teacher roles and activities* that enable teachers to provide direction, momentum, and motivation to all students, regardless of level of proficiency or learning styles.
4. *Changed administrator roles* that enable administrators to better manage resources, improve communication, and provide stronger school-community leadership.
5. *Expanded methods of assessment* to assist diagnosis, inform instruction, and support accountability.

The following comparisons between yesterday's schooling and tomorrow's schooling establish specific directions for change needed to meet the above objectives.

Objective 1: *Changed definitions and perceptions of schools and schooling* to create an active, flexible environment, open to the community.

Yesterday's Schooling...	Tomorrow's Schooling...
a. Schooling is a highly structured process with limited options for individual activity, growth, and assessment.	a. Schooling is a seamless and flexible process, full of options for individual activity, growth, and assessment.
b. Credit for schooling is based on homework, tests, and activities which occur in a single, physical location and at a particular time.	b. Credit for schooling may be earned with activities and accomplishments at home, in the library, the community or elsewhere.
c. Students perceive their school as a place where they "receive" an education.	c. Students perceive their school as an active learning community where they solve problems, create, produce, make decisions, and control their own development.
d. Parents and the community perceive the school as belonging to and controlled by educators and the state.	d. Parents and the community perceive the school as a community resource, where their presence and input is needed, valued, and appreciated.
e. Use of the school is limited to the daytime education of students enrolled in the school.	e. The school is open to and used by the community day and night on year-round basis.

"We want schools to be a state of mind, not a place; we want students to return to contribute and parents to pitch in."

"Attack the Edifice Complex," *Notes from the Front Lines RJR Nabisco's Foundation's Next Century's Schools Program*, 1993

Objective 2: *Changed student roles and activities* to provide students more opportunities to master higher level skills, to practice effective communication, and to work individually and collaboratively with others on real-world tasks

Yesterday's Students...	Tomorrow's Students...
a. Study separate subjects taught in a fixed sequence by the teacher.	a. Learn through tasks, projects, and assessments that integrate information across subject matter and grade level.
b. Listen to teacher lectures and presentations; observe teacher presentations; read and perform textbook-based activities and exercises. These three activities dominate student time.	b. Learn by selecting among technology-based tools, resources, and methods: modeling, simulation, distance learning, network communication, self-assessment, idea testing, desktop publishing, etc. No one media or method dominates student time.
c. Work occasionally with real-world projects, problems, and activities which are supplemental to instruction.	c. Work constantly with real-world projects, problems, and activities, which are integral to and ongoing in daily work.
d. Most of the time, are completing the same tasks at the same time, alone at their desks .	d. At any given time, are working on different projects, together or individually, in a variety of areas: class conference room, VCR stations, individual work stations, in the library or computer room, at the FAX machine, on the telephone, out in the community, etc.
e. Collaborate, communicate, and interact with other students, adults, and members of the community infrequently.	e. Collaborate, communicate, and interact with other students, adults, and the community daily, as part of learning activities.

"The art of learning is defiantly active, rather than passive. It involves gathering information and the synthesizing of that information into knowledge. It entails the honing of a point of view, and the communication of that viewpoint to others—to students, parents, teachers, and peers....It is a path that cuts freely across arbitrary boundaries between disciplines, cultures, media, epochs, languages, and geographical borders."

Poster, Apple Education Division, 1992

Objective 3: *Changed teacher roles and activities* to enable teachers to provide direction, momentum, and motivation to all students, regardless of their levels of proficiency or learning styles

Yesterday's Teachers...	Tomorrow's Teachers...
a. Sit behind desks or stand at lecterns, occasionally circulating among students who are completing seat work at desks.	a. Spend the majority of time interacting with students as mentor, guide, and resource for activities controlled, to a large extent, by the student. The focus of all interactions is to balance challenge with adequate support.
b. Develop class lesson plans, lecture and demonstrate, answer questions, grade papers.	b. Provide teaching demonstrations as needed; work as needed with students to develop individual goals and learning plans and to schedule resources for learning.
c. Interact occasionally at staff meetings with principal and peers.	c. Interact frequently with peers and principal for professional support, idea sharing, technical assistance, and collaborative planning.
	d. Spend time as needed at computer workstations to: - analyze data for resource management decisions - explore, acquire, or reserve instructional tools and resources - maintain student records (attendance, grades, parent contact, etc.) - communicate with peers, principal, parents, and volunteers - access resources (people, information, workshop schedules, university offerings, state curricula, etc.) for his or her own professional growth and development

"The solution was to leave my 'Sage on the Stage' posture, ... and adopt a 'Guide on the Side' philosophy....The computers were a source of constant nonjudgmental feedback, actually serving as teacher aides."

"The Integrated Technology Classroom"
The Computing Teacher, March 1991

Objective 4: *Changed administrator roles* to enable administrators to better manage resources, improve communication, and provide stronger school-community leadership

Yesterday's Administrators...	Tomorrow's Administrators...
a. Spend some time interacting with teachers as a mentor, guide and resource.	a. Spend a substantial amount of time interacting with teachers as an instructional mentor, guide, and resource. The focus of all interactions is balancing challenge with adequate support.
b. Respond to parents and community as current circumstances require.	b. Interact in a proactive leadership role with parents and the community as an advocate for education and to anticipate issues of concern and appropriate responses.
c. Learn about technology when it is required by state policy.	c. Provide leadership in identifying, implementing, and utilizing technology in school administration and classroom management.
d. Interact occasionally with peers, as time allows, when attending the same meetings or conferences.	d. Interact frequently with peers for professional support, idea sharing, technical assistance, and collaborative planning.
e. Spend a substantial amount of time manually scheduling classes, routing busses, analyzing resource needs, and performing other tasks related to administrative and operational decisions.	e. Spend time as needed at computer workstations to: - analyze data for resource management and policy decisions (facility, transportation, school safety and security, nutrition, grants, instruction, training, etc.) - conduct ongoing research and analysis to improve all facets of schooling in his or her school - access resources (people, information, workshop schedules, university offerings, state curricula, etc.) for his or her own professional growth and development

"Technology blurs the boundaries between student, teacher, and administrator. It provides a way for all to explore the world together."

Poster, Apple Education Division, 1993

Objective 5: *Expanded methods of assessment* to assist diagnosis, inform instruction, and support accountability

Yesterday's Assessment...	Tomorrow's Assessment...
a. Is infrequent and separate from instruction, relying primarily on teacher-made and standardized tests.	a. Is ongoing, integrated with instruction, with content and performance requirements focused on real-world situations, problems, and projects.
b. Administers assessment to all students in the class or grade at the same time.	b. Administers assessment at different times to different students, as appropriate and timely to provide information needed to guide instruction.
c. Provides results from a week to six months after assessment, preventing prompt use of data to guide and improve instruction.	c. Provides instant feedback on an hourly or daily basis to direct the content, sequence, level, and format of learning.
d. Relies on reports based on standard norms and expectations for a particular grade level, revealing few specifics about the actual content and quality of learning.	d. Relies on reports of progress that are varied in format (test scores, portfolios, computer printouts and diverse profiles) and that reflect incremental growth of the learner's skills and knowledge.
	e. Designs report content and format to promote frequent student reflection on progress in a variety of knowledge and skill areas, and to offer parents specific information about the direction and quality of their child's learning experiences and accomplishments.

"Tomorrow's courseware will allow the computer not only to detect recurrent patterns in an individual's work—evaluating strengths and weaknesses on an ongoing basis—but also to respond to those patterns, moving us toward the goal of linking assessment with instruction on an hour-by-hour, or even minute-by-minute basis."

"The Future of Technology in Education"
Business Week, November 1993

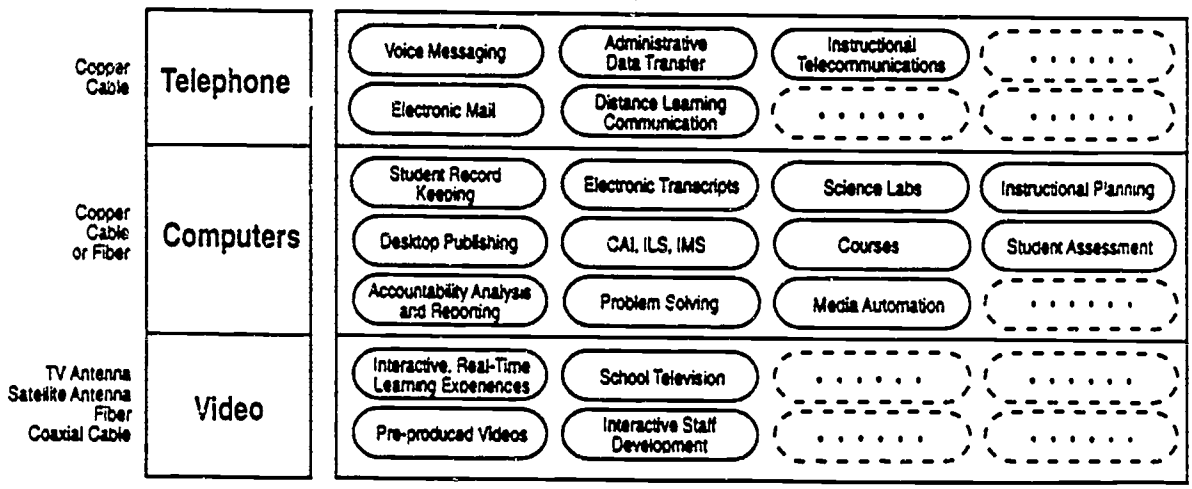
Expanding Instructional and Administrative Applications

Working from the Heart of the Infrastructure

In planning to meet instructional and administrative objectives, schools will build technology infrastructures. For purposes of this plan, the term "technology infrastructure" refers to the presence of electronic tools and connections used as a foundation for achieving instructional or administrative goals. Whatever technological tools or connections a school currently has are considered components of the technology infrastructure.

The heart of a school district's technology infrastructure is located in the communications closets of individual schools. What comes into a school through cables, wires, and fiber ultimately determines the range of possibilities and options schools can use to build or expand their own custom-designed infrastructures. Once schools have a few basics, they can go anywhere they wish with technology-based schooling, depending on their vision, objectives, and resources. The diagram below illustrates the concept of the communications closet as the source of options and applications for improved schooling. The information following the diagram describes some of these options for achieving local administrative and instructional goals. (Schematics and scenarios for building and expanding infrastructures, both instructional and administrative, are presented in Appendices C and D. Additional models and scenarios will be provided, as needed.)

Communications Closet: The Source of Options and Applications



1. *The Use of Telephone Lines*

Today, copper telephone lines in schools generally can have one of two implements at the end of them—the telephone itself or a modem. Both are critical to administration and instruction. *The telephone* is the tool by which principals make contact with parents; guidance counselors contact social service agencies; teachers reach their colleagues about instructional issues or reach parents about children's needs; students in distance learning classes communicate with their teachers either during class or after class hours; and parents reach the school after hours for information about their children's attendance, bus route or homework assignment. *The modem* is the device by which schools transmit administrative data to their central offices; teachers communicate with services such as Learning Link for lesson plans on current events; and students reach databases, external library resources, or students in other states and other countries to exchange learning experiences.

Expanding Applications with Telephone Lines and the North Carolina Information Highway

Schools entering the twenty-first century with only telephone lines are going to be severely, if not impossibly, limited. "Plain old telephone lines" can be a means for two-way interactive video distance learning, electronic mail, graphics transmission, and networking through ISDN service but fiber optic cable can offer faster, more data-intensive delivery of information with a greater integration of media. Since many schools in North Carolina have not begun even to fully utilize telephone lines, an essential first step toward the future would be to bring additional lines into the building. For many schools, the media center is a good place to start, because it provides students and teachers access to a central location that holds a wide range of external print and database resources. A next stage of growth would be to ensure one telephone line into each classroom for use with a modem for administrative and instructional use.

For long-range cost-effectiveness, more than one phone line to every classroom and access to the North Carolina Information Highway from multiple locations is recommended. While students are using the computer to access information over one pair of wires, the teacher might be using the telephone to dial a parent or the integrated video system to "dial up" a video clip from the media center over other lines or wires. Or, students in a classroom may be connected by the North Carolina Information Highway to view and converse simultaneously with another class across the state or nation while conducting a science experiment. These multiple activities necessitate more than one phone line in a school building.

2. The Use of Computers

A computer as a communications link may be as simple as a microcomputer in the media center for on-line searching or a microcomputer in the school office for managing attendance and grading records. Today, these microcomputers vary from stand alone units to components of building networks to devices connected via modem to outside sources. Yearly, for the past five years, the number of schools reporting the use of microcomputers for telecomputing to distant databases and people, the availability of modems, and the use of networks has grown steadily. However, computers are not available and in use in every North Carolina school.

Expanding Applications with Computers

From one computer, multiple units can be added and networked within the school, increasing access to databases, library resources, etc. For example, one computer in the media center might become the file server that supports microcomputers located in computer labs or classrooms throughout the school. At the same time schools are working on their internal networks, they can use a modem or a North Carolina Information Highway connection to link to sites outside the school, expanding student, teacher, and administrator outreach to external resources—databases, library resources, video retrieval—and other individuals. For example, the media center network could expand to include an administrative file server linked to the central office and to teacher workstations. This network could also expand; for example, the use of the North Carolina Information Highway would make it possible to move student grades and other work directly from the teacher's desk to the school district office or a college admissions office. Additionally, peripherals, such as CD-ROM drives, can be added to diversify the applications at the various computer workstations, on the internal building network, and across the external wide area network.

3. The Use of Video

Currently the majority of North Carolina schools receive video-based instructional resources through master antenna or cable television. Approximately 5 percent are also equipped to receive televised instructional or staff development programs and services from satellite equipment. Typically, the media center serves as the central receiving point for the television signal. Some students and teachers use the programming in the media center itself. However, in most cases, the media coordinator captures the signal onto videotape and makes it available to teachers and students with roll-about units (videocassette recorders or players and television monitors) on loan from the media center. In a growing number of instances, schools are equipped with an internal distribution system which enables the media coordinator to distribute either an off-air television signal, video cassette program or video text message to any location in the school.

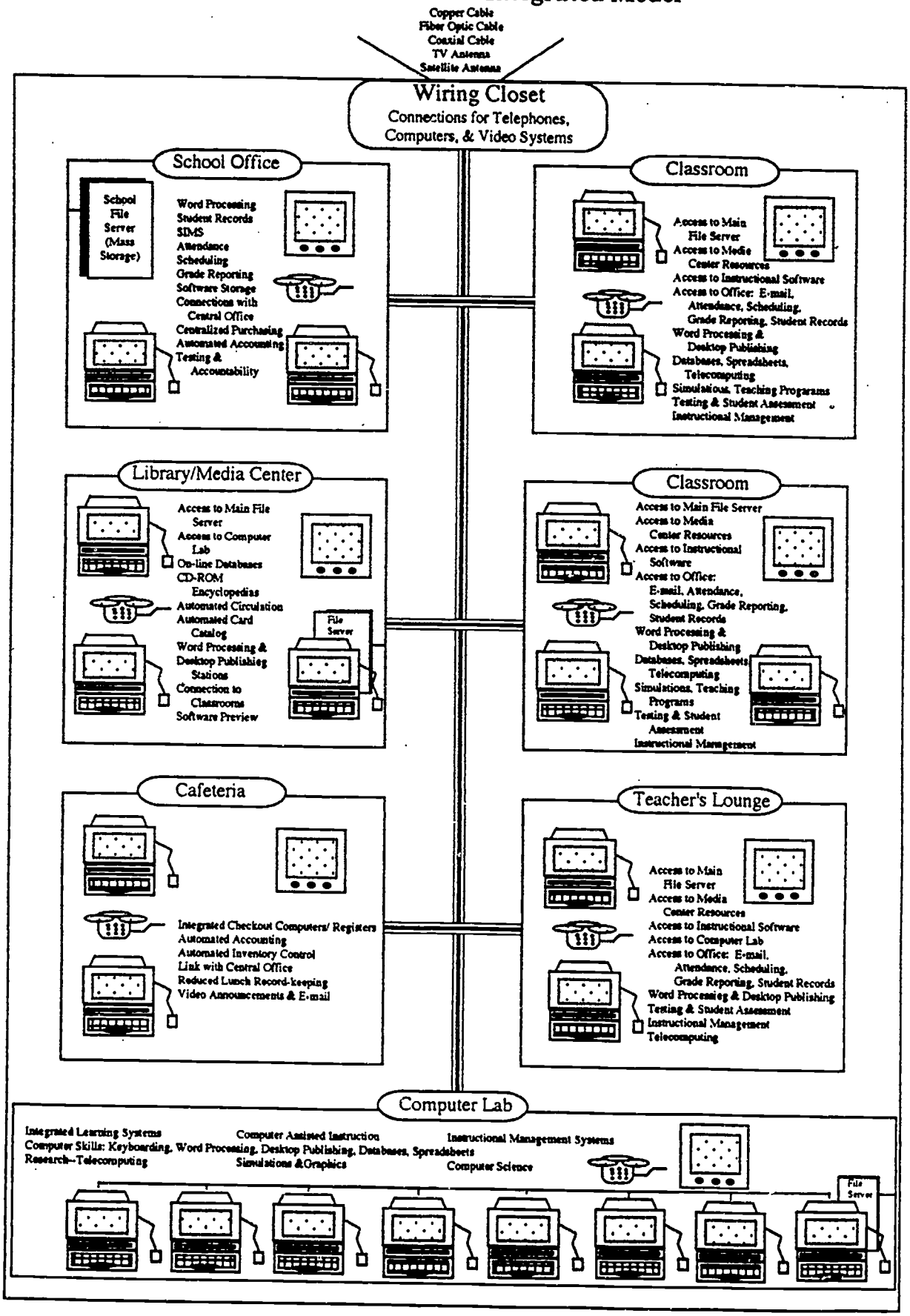
Expanding Applications with Video

Becoming equipped with either a master antenna system or a cable drop is the first step that schools can take to receive instructional and staff development programming as described above. As financial resources allow, additional roll-abouts or distribution systems can be added. However, this is only the beginning. While it is important to increase the number of telephone lines for instructional and staff development purposes, it is equally important to end the era of schools as isolated entities. All schools must move outside their own internal connections and connect with the interests, activities, and resources of the community, state, nation and world. Hopefully, the North Carolina Information Highway will be the vehicle that will make this possible for North Carolina schools.

Working Toward an Integrated Model of a Networked School

As applications of telephone lines, computers, and video expand to meet instructional and administrative goals, schools will move inevitably toward their own unique integrated model of a networked school. As indicated in the diagram that follows, integrated models of networked schools are those designed to connect most or all parts of the school, so that technologies and databases are accessible and useful wherever they are needed.

The Networked School--An Integrated Model



Putting Time in Perspective

There is really no "end point" or "same destination" for schools who are working to achieve the vision outlined in this plan. In fact, changes of this scope and magnitude warrant much more than a beginning-middle-end approach to achieving objectives. Schools, like children, have their own way and time of growing, with their own set of options and directions for acquiring new knowledge, skills, tools, processes, and results. No two school systems will develop the same technology plans; select the same infrastructure resources, tools, and connections; or need the same amount of money to build or expand. There are many reasons for this but three come to mind immediately: (1) schools will have different goals and priorities to guide the decisions they make; (2) many types of resources, tools, and connections can effectively achieve the same goals; and (3) the choices that schools make in developing their plans will vary significantly, depending upon what they already have to work with and their options for funding and assistance.

It is simply not important or relevant to the overall vision and objectives that all schools get from one point to another in the same amount of time. What is important and relevant is that all school districts, regardless of where they are now between yesterday and tomorrow, start somewhere and keep going and that they make the very best of their individual circumstances. The strategies that follow call for action to help all school districts do just that.

Strategies for Action

To integrate technology into schools and classrooms, so that all children have expanded opportunities to learn and achieve, school districts must address five essential facets of building sound technology infrastructures: ongoing planning; ongoing, flexible funding; ongoing communication; a human resource base for training and assistance; and an evaluation process that builds on success, failure, and innovation. This section outlines strategies in each of the five areas, and subsequently outlines roles and responsibilities to be assumed or shared by the local school districts and the Department of Public Instruction.

Ongoing Planning

1. Establish an *ongoing* planning process at both state and local levels.
   a. Adopt criteria and guidelines for integrating technology into schooling efforts of state and local agencies. (See Appendix A)
   b. Obtain feedback from educators, the community, and a structured evaluation to revise and improve the plan.

> "There has been a tendency in schools to look at technology for technology's sake: let's buy some computers and teach children how to use them. Technology is a tool, not an end objective. It lets you do something—once you've set out what you want to accomplish."
>
> Lou Gerstner, Chief Executive Officer, IBM
> "The Future of Technology in Education"
> Business Week, November 1993

   c. Identify basic technology tools which can provide a solid beginning for all school systems to explore and expand applications for achieving their administrative and instructional goals. A basic equipment list designed with input from statewide surveys and North Carolina educators at all levels is outlined in Appendix B.
   d. Develop guidelines and options for schools who are beyond the basics (already equipped with tools outlined in Appendix B), to assist them in making their own technology infrastructure decisions, based upon local administrative and instructional needs.

Ongoing, Flexible Funding

2. Provide ongoing funding for building state and local technology-schooling infrastructures. Funding policy and procedure should:

   a. Insure a minimum standard of technological resources for all school districts

   b. Consider broad funding categories that (1) provide incentives for flexible, creative, and efficient use of monies to achieve the objectives outlined in this plan, (2) enable school districts to address their own unique needs and circumstances, (3) address special needs of isolated, rural, low-wealth, and low-performing school systems, and (4) provide research and development funds as incentives for experimenting with emerging technologies and applications.

   c. Place a high priority on initial and ongoing training that is based on a train-the-trainer approach

   d. Reflect support for ongoing technical assistance, maintenance, repair, upgrading and replacement of infrastructure components

> "If we apply a short-term perspective to implementing technology to create a new education system, then invariably we will not make the commitment to technology or a restructured education system. This will perpetuate the current situation in which those who are able to afford technology at home will continue to use it to improve educational opportunities while those who cannot afford it will continue to be deprived."
>
> From USE IT
> Teleconference Briefing Materials
> Council of Chief State School Officers
> August 6, 1993

> "In 1993 our (U.S.) public schools spent close to $300 billion. Of this total, less than $2 billion will go to instructional technologies and applications—about two-thirds of one percent. In contrast, most knowledge-based organizations devote anywhere from five to eight percent of their expenditures to cutting-edge technologies.
>
> The Future of Technology in Education"
> Business Week, November 1993

Ongoing Communication

3. Develop technology-based networks and other means for ongoing communication of ideas and collaborative problem-solving among those using technology to improve instruction and administration in their districts and schools. For example:
   a. Successful educational applications of technology could be demonstrated and disseminated through videotapes, interactive video conferences, and computer forums.
   b. Parents could contact staff at schools their children attend during and after hours through voice messaging to make suggestions and recommendations for school technology planning, as well as to receive updates and information about infrastructure components and applications.

Human Resource Base for Training and Assistance

4. Develop a human resource base of individuals who are skilled in the use of technology and comfortable leading teachers and administrators as they plan, conduct needs assessments, and integrate technology into the curriculum, classroom, and school to meet objectives outlined in this plan.
   a. Coordinate with institutions of higher learning to develop programs that insure technology awareness and skills in new classroom teachers.
   b. Develop programs to ensure the ongoing updating of technology skills for current classroom teachers.
   c. Identify a database of skilled personnel who can assist with ongoing training and evaluation.

> "Some people have the view that technology itself yields improvements. They think that you can just wheel it in, plug it in, give four hours of training, and it will transform teaching. That's simply not true."
>
> Karen Sheingold
> Bank Street College of Education
> "But Does It Work?"
> *Teacher Magazine*, January 1991

Evaluation Process That Builds on Success, Failure, and Innovation

5. Adopt an ongoing, cyclical evaluation-revision process at state and local levels that finds success and builds on it, encourages innovation, and uses the opportunities of failed efforts to learn, improve, and make appropriate changes.

> "Jonas Salk was a good friend of mine, and he once said 'That's all that scientists do is document their failures....That's how I discovered the vaccine; I documented all my failures until something worked.' It is the understanding of failure that tells you what to do next"
>
> Richard Saul Wurman
> Author of *Information Anxiety, 1992*

Roles and Responsibilities

To achieve the vision and objectives of this plan, the steps just outlined must be shared within the framework of clearly defined roles and responsibilities at the state and local levels. The following chart defines tasks for the Department of Public Instruction and local school districts, who will work together to establish a sound technology infrastructure for quality schooling in North Carolina.

A. Ongoing Planning

Department of Public Instruction	Local School Districts
1. Establish criteria for and approve technology plans for local school districts. (See Appendix A for basic criteria.) These will include guidelines and options for districts in a variety of instructional, technological, economic, and geographic circumstances. Assure that districts already implementing technology plans receive assistance in planning to improve, upgrade, or expand current tools and applications.	1. Adopt a local vision for schools and schooling.
2. Define basic technology tools that are essential for all school districts and that provide a basic foundation for local technology plans. (See Appendix B for list of tools.)	2. Develop a site-based technology plan, linked to the local vision and goals for improved schooling and to the basic tools identified by DPI as an essential starting point for local technology planning. (See Appendices A and B.)
3. Assist school districts in assessing administrative and instructional needs that can be addressed with technology; use this information in the ongoing process of updating guidelines and basic tools list.	3. Identify school-based technology teams and appropriate staff to implement the local technology plan.
4. Assist school districts in establishing policy, guidelines, and training framework for developing and enhancing local technology plans.	4. Inventory existing technological capacity of district schools; match the inventory against the district technology plan.
	5. Develop implementation timeline based on district's plan and available funding.

B. Ongoing, Flexible Funding

Department of Public Instruction	Local School Districts
1. Identify funding needs to acquire the basic equipment defined by DPI as an essential starting point for local technology planning. (See Appendix B.)	1. Identify funding needs to acquire the basic tools defined by DPI as an essential starting point for local technology planning. (See Appendix B.)
2. Distribute funds as they are acquired to school districts, addressing equity and needs issues, as specified by law.	2. Establish a funding schedule for acquiring the basic tools defined by DPI as an essential starting point for local technology planning; identify funding source on schedule.
3. Assist school districts in complying with funding regulations.	3. Implement the funding schedule.
4. Assist school districts in establishing budgets and in making efficient and effective use of technology funds.	
5. Provide guidance to school districts in applying for and obtaining grants to fund their local technology plans.	

C. Ongoing Communication

Department of Public Instruction

Use all available and emerging communication tools to:

1. Disseminate to school districts the policies, procedures, practices and materials previously identified under "Ongoing Planning."
2. Answer questions and provide ongoing assistance to school districts as they develop and implement local plans.
3. Communicate as needed to assure that training needs of school districts are being adequately met by DPI staff.
4. Assist districts in communicating with parents and community about local technology plans and related policy, procedure, and applications.

Local School Districts

With school-based technology teams:

1. Develop strategies for ongoing communication within and between schools and school district staff to facilitate plan development and implementation.
2. Develop strategies for ongoing communication with parents and the community about local technology plans and applications.
3. Coordinate appropriate facets of local planning—such as curriculum and training for successful integration of technology in schools—with TAC and Raleigh-based DPI staff.
4. Explore and use a variety of means to involve parents and the community in implementing the local technology plan.

D. Human Resource Base for Training and Assistance

Department of Public Instruction

1. Work with the school district technology coordinating council to identify training needs and to provide assistance with training.
2. Assist school districts in developing the framework and content for training school-based technology teams in using technology to achieve local instructional and administrative goals.
   a. Provide technology demonstrations and staff development for school district and the community.
   b. Develop appropriate curriculum, assessment strategies, and instructional practices incorporating the use, application, and networking of state-of-the-art technology in K-12 education; prepare related materials, guidelines, diagrams and other resource materials.
   c. Review and communicate trends and practices of technological applications in K-12 educational settings, assisting in development of the curriculum program appropriate to the needs of young children, middle school, and high school children.
   d. Conduct teacher training seminars, presentations, and short courses related to development and implementation of local plans.
   e. Provide consultation services and budget information to assist school districts with design, identification, and selection of state-of-the-art computer/telecommunication hardware and software to meet plan objectives.
3. Collaborate with colleges of education to incorporate technology proficiencies for teachers in pre-service programs.
4. Provide guidelines for ongoing teacher in-service training on uses of current and emerging technology in instruction.
5. Provide renewal credit for in-service activities, as appropriate.

Local School Districts

1. Using a train-the-trainer approach, build school-based teams who can effectively integrate technology into instruction and administration and provide training in these areas to others.
2. With representation from each school, establish a technology coordinating council for the district at large to plan, evaluate, and improve local training and staff development efforts.

E. Evaluation Process That Builds on Success, Failure, and Innovation

Department of Public Instruction	Local School Districts
1. Develop assessment tools that measure student achievement and cost/benefit ratios for technological applications. 2. Establish a review board to identify and recognize successful technology applications in schools and also to identify and help those who have had implementation difficulties and need assistance.	1. Report progress in implementing the district-developed and state-approved technology plan, including its impact and role in achieving instructional and administrative objectives. 2. Coordinate with state in formal assessment efforts.

Appendices

Criteria for Approval of Local Technology Plans

A technology plan submitted by a school district should meet all of the following criteria:

Vision	❑ States characteristics of tomorrow's schooling that the district supports and wishes to achieve.
Goals/ Objectives	❑ Outlines both short- and long-term goals/objectives for improved schooling that: a. Are linked to the district's vision for improved schooling b. Are consistent with state educational mandates and goals c. Contain provisions for technology investments that address significant need and resource inequities among various student populations within individual schools.
Needs Assessment	❑ Documents: a. The current technology components (resources, tools, and connections) of the school and their use, and explains why items are usable or unusable, based on the vision and goals stated in the plan. b. Student, staff, and administrator competencies in the use of technology. c. Facility readiness for technology and modifications necessary to address the vision and goals of the local plan.
Responsibilities	❑ Identifies: a. A technology plan coordinator, responsible for overseeing all activities necessary for implementation and evaluation of the plan. b. A technology team of facilitators who help the coordinator make decisions and perform tasks necessary to the plan. c. Independent roles to be assumed by schools and school districts necessary to make the plan work. d. Collaborative roles to be assumed by school districts and the community in building support for and involvement with the plan.
Training	❑ Identifies: a. Methods by which initial and ongoing training will be provided to assure that all staff are comfortable using the identified technologies to achieve goals and objectives outlined in the local plan. b. Roles, responsibilities, and schedule for implementing training and staff development programs.

Technical Support	❑ Based on size and resources of the school district, considers designation or hiring of: a. A full-time technical advisor or advisors (1) To assist the school district in developing a plan focused on the use of technology to achieve specific objectives. (2) To guide the school district in making important choices and decisions regarding resources, tools, and connections. b. Full-time technicians with primary responsibility for maintaining and upgrading the planned technology infrastructure (repair, expansion, or replacement of resources, tools, and connections). c. One full-time staff position responsible for generating continued funding to support ongoing expansion, upgrading, and maintenance of the technology infrastructure and related staff training in its use. This person would be qualified in some or all of the following areas: fund-raising, building community partnerships, recruiting volunteers, writing grant proposals, developing other strategies for financing technology in schools (reapportionment of operating budget, bonds, tax levies, etc.) ❑ Indicates when and how the district will collaborate with the Department of Public Instruction for assistance and guidance as needed.
Budget/ Resources	❑ Identifies resource needs and funding required to meet the needs. ❑ Prioritizes resource acquisition and distribution, based on needs assessment.
Timelines	❑ Identifies timelines related to stages of implementation for the local plan.
Evaluation	❑ Identifies the process by which progress in implementing the plan will be reviewed and reported. ❑ Delegates responsibility for modifying the plan based on evaluation results.

STATE SUPERINTENDENT'S TECHNOLOGY EQUIPMENT PLAN 1
FOR
NORTH CAROLINA PUBLIC SCHOOLS

CLASSROOM

Elementary (K-5)	Cost	Middle (6-8)	Cost	High School (9-12)	Cost
1. At least 5 Computers with printer for each classroom. (1700 x 5 = 8500 + 600)	136,500.00	At least 5 Computers with printer for each classroom. (1700 x 5 = 8500 + 600 = 9100 x 20))	182,000	Computer labs for individual/ group use, problem solving, and simulation with appropriate instructional courseware. (30)	55,800.00
2. Instructional computer networked systems, e.g., Integrated Learning (ILS) and Instructional Management (IMS).	Customized Pricing Required	Instructional computer networked systems, e.g., Integrated Learning (ILS) and Instructional Management (IMS).	Customized Pricing Required	Instructional computer networked systems, e.g., Integrated Learning (ILS) and Instructional Management (IMS).	Customized Pricing Required
3 Computer workstation with printer networked to central file server(s) for each teacher. (2300 x 15) File Server	34,500.00 2,500.00	Computer workstation with printer networked to central file server(s) for each teacher. (2300 x 20) File Server	46,000.00 2,500.00	Computer workstation with printer networked to central file server(s) for each teacher. (2300 x 43) 2 File Servers @ 2,500 ea.	98,900.00 5,000.00
4. 25-27" TV monitor and VCR per classroom with access to MATV (Master Antenna) Distribution System.(800 x 15)	12,000.00	25-27" TV monitor and VCR per classroom with access to MATV (Master Antenna) Distribution System.(800 x 20)	16,000.00	25-27" TV monitor and VCR per classroom with access to MATV (Master Antenna) Distribution System.(800 x 43)	34,400.00
5. Overhead Projector and Wall mounted screen per classroom.(175 x 15)	2,625.00	Overhead Projector and Wall mounted screen per classroom.(175 x 20)	3,500.00	Overhead Projector and Wall mounted screen per classroom.(175 x 43)	7,525.00

MEDIA CENTER

Elementary (K-5)	Cost	Middle (6-8)	Cost	High School (9-12)	Cost
1. Private telecommunications line, modem, and software.	400.00	Private telecommunications line, modem and software.	400.00	Private telecommunications line, modem and software.	400.00
2. Subscription to Electronic Bulletin Board Service.	–	Subscription to one External Database and Electronic Bulletin Board Service.	550.00	Subscription to one External Database and Electronic Bulletin Board Service.	550.00

3. Automated Catalog and Circulation System.	17,000.00	Automated Catalog and Circulation System.	17,000.00	Automated Catalog and Circulation System.	17,000.00
4. CD-ROM Computer workstation /printer for one CD-ROM reference source.	2,800.00	2 CD-ROM Computer workstations with reference sources.	5,600.00	3 CD-ROM Computer workstations with reference sources.	8,400.00
5. Video Laser Disc Player (3-5) for checkout to classrooms with accompanying instructional video discs and barcode reader.	3,500.00 140.00	Video Laser Disc Player (3-5) for checkout to classrooms with accompanying instructional video discs and barcode reader.	3,500.00 140.00	Video Laser Disc Player (3-5) for checkout to classrooms with accompanying instructional video discs and barcode reader.	3,500.00 140.00
6. 2 computer workstations with a printer for individual student use. ($1700 x 2 + $600)	4,000.00	4 computer workstations with 2 printers for individual student use. ($1700 x 4 + $600 x 2)	8,000.00	5 computer workstations with 2 printers for individual student use. ($1700 x 5 + $600 x 2)	9,700.00
7. MATV Distribution System (headend equipment) with access to open-air broadcasts and/or satellite delivered resources.	7,500.00	MATV Distribution System (headend equipment) with access to open-air broadcasts and/or satellite delivered resources.	7,500.00	MATV Distribution System (headend equipment) with access to open-air broadcasts and/or satellite delivered resources.	7,500.00
8. At least one LCD Panel for check-out to classroom.	1,400.00	At least three LCD panels for checkout to classrooms. (3 x $1400 = $4200)	4,200.00	One LCD panel per Department for use in classrooms. (8 x $1400 = $11,200)	11,200.00
9. Video Projector for large group use.	2,500.00	Video Projector for large group use.	2,500.00	Video Projector for large group use.	2,500.00
10. Overhead projector and screen for use in Media Center.	175.00	Overhead projector and screen for use in Media Center.	175.00	Overhead projector and screen for use in Media Center.	175.00
11. Camcorder with tripod, lights, and wireless mike.	1,300.00	Camcorder with tripod, lights, and wireless mike.	1,300.00	Camcorder with tripod, lights, and wireless mike.	1,300.00
TOTALS:	$228,840.00 x 824 schools = $188,564,160		$300,865.00 x 728 schools = $219,029,720		$263,990.00 x 404 schools = $106,651,960

TOTAL: $514,245,840

BASIC TECHNOLOGY TRAINING FOR NORTH CAROLINA SCHOOLS
Based on "Effective Schools" Training Model

- Elementary Schools

Stipend, lunches, and breaks for two teachers per school	$580
Lunches and breaks for principals	$40
Materials for each school	$15
Number of Elementary Schools	1,484
Total Cost for the Above	.....$942,340
Number of participants in Elementary schools	4,452
Number of sessions at 30 participants per session	148
Instructor per session	$500
Total Cost for the Above	.....$74,000
Total Cost for <u>Elementary</u> Schools	.....$1,016,340

- Secondary Schools

Stipend, lunches, and breaks for two teachers per school	$580
Lunches and breaks for principals	$40
Materials for each school	$15
Number of Secondary Schools	462
Total Cost for the Above	.....$293,370
Number of participants in Secondary Schools	1,386
Number of sessions at 30 participants per session	46
Instructor per session	$500
Total Cost for the Above	.....$23,000
Total Cost for <u>Secondary</u> Schools	.....$316,370
Total for <u>all</u> Schools	.....<u>$1,332,710</u>

BASIC TECHNOLOGY MODEL FOR NC PUBLIC SCHOOLS
Developed by Instructional Technology Advisory Task Force
February, 1993

This model provides a *minimal* level of technology for *every* elementary, middle, and high school in the state and a technology staff development training package that utilizes both Distance Learning by Satellite training and a local school-based "train-the-trainers" model for all teachers.

Basic technology equipment includes, but is not limited to, the following: a computer lab, with 30 student stations, for the use of instructional software such as computer-assisted instruction (CAI), or an integrated learning system ((ILS), teacher workstations connected to an instructional management system (IMS), integration and data sharing with administrative systems, and application software such as word processing, database, spreadsheet, desktop publishing, etc.

The model provided assumes the following:

- Every school has a need for basic (minimal) instructional and administrative technology tools. Taking full advantage of the benefits of technology would require an investment far beyond the basic model.
- Software costs, which will dramatically increase the overall cost of implementing computer technology in the schools, are not included in the model (i.e. IMS software per school: $10-$12,000; ILS software per school: $40-$60,000 per lab [with a $5-$10,000 annual maintenance/support cost]). However, the basic model will provide an operational environment which would allow the installation and operation of ILS and IMS technology.
- The cost of administrative technology that is not directly related to instruction is not included in this model.

The model includes:

- A computer workstation in *every* classroom, networked with central file servers for teachers to use in preparation and delivery of instruction as well as administrative recordkeeping.
- Flexibility to allow for exploitation of lab-based or classroom-based technology implementation strategies.
- A television monitor and videocassette recorder in *every* classroom with access to the school's Master Antenna Distribution System to take advantage of open-air broadcast programs, satellite programs, as well as instructional videotapes available from the library/media center.
- At least two computer workstations at each elementary school and five computer workstations at each secondary school housed in the library/media center for individual student use of basic skills instructional software.
- A telecommunications line, modem, and software in each school's library/media center that will allow students and teachers access to external databases and resources for research purposes.

BASIC TECHNOLOGY EQUIPMENT LIST FOR NORTH CAROLINA PUBLIC SCHOOLS

February, 1993

BASIC CLASSROOM EQUIPMENT

	Elementary (K-8)	Cost	High School (9-12)	Cost
1.	One computer lab for individual group use, problem solving, and simulation with apppropriate instructional courseware. (30 stations per lab)	$55,800.00	Two Computer labs for individual/group use, problem solving, and simulation with appropriate instructional courseware. (30 per lab)	$111,600.00
2.	Instructional computer networked systems; e.g., Integrated Learning (ILS) and Instructional Management (IMS).	Customized Pricing Required*	Instructional computer networked systems; e.g., Integrated Learning (ILS) and Instructional Management (IMS).	Customized Pricing Required*
3.	Computer workstation with printer networked to central file server(s) for each teacher. (2300 X 15) File Server (1)	$34,500.00 $2,500.00	Computer workstation with printer networked to central file server(s) for each teacher. (2300 x 43) 2 File Servers @ 2,500 each	$98,900.00 $5,000.00
4.	25-27" TV monitor and VCR per classroom with access to MATV (Master Antenna) Distribution System. (800 x 15)	$12,000.00	25-27" TV monitor and VCR per classroom with access to MATV (Master Antenna) Distribution System. (800 x 43)	$34,400.00

BASIC MEDIA CENTER EQUIPMENT

	Elementary (K-8)	Cost	High School (9-12)	Cost
1.	Private telecommunications line, modem, and software.	$400.00	Private telecommunications line, modem and software.	$400.00
2.	Subscription to Electronic Bulletin Board Service.	—	Subscription to One External Database and Electronic Bulletin Board Service.	$550.00
3.	Automated Catalog and Circulation System.	$17,000.00	Automated Catalog and Circulation System.	$17,000.00
4.	CD-ROM Computer workstation/printer & one-CD-ROM reference source.	$2,800.00	CD-ROM Computer (3) workstations & 3 CD-ROM reference sources.	$8,400.00
5.	Video Laser Disc Players (3-5) for checkout to classrooms with accompanying instructional video discs and barcode reader.	$3,500.00 $140.00	Video Laser Disc Players (3-5) for checkout to classrooms with accompanying instructional video discs and barcode reader.	$3,500.00 $140.00

Basic Technology Equipment List

6.	At least 2 computer workstations with a printer for individual student use.	$4,000.00	At least 5 computer workstations with printer for individual student use.	$9,700.00
7.	MATV Distribution System (headend equipment) with access to open-air broadcasts and/or satellite delivered resources.	$7,500.00	MATV Distribution System (headend equipment) with access to open-air broadcasts and/or satellite delivered resources.	$7,500.00
8.	At least one LCD Panel for check-out to classroom.	$1,400.00	One LCD panel per Department for use in classrooms. (8 x $1400 = $11,200)	$11,200.00
9.	Camcorder with tripod, lights, and wireless mike.	$1,300.00	Camcorder with tripod, lights, and wireless mike.	$1,300.00
	SUB-TOTAL	$142,840.00 x 1484 Schools	SUB-TOTAL	$309,590.00 x 462 Schools
	TOTAL	211,974,560.00	TOTAL	143,030,580.00

ELEMENTARY K-8		SECONDARY 9-12	
Technology K-8	$211,974,560.00	Technology (9-12)	$143,0[illegible]580.00
Staff Development	$1,016,540.00	Staff Development	$316,470.00
TOTAL	$212,991,100.00	TOTAL	143,347,050.00

TOTAL FOR EQUIPMENT	$355,005,140.00
TOTAL FOR STAFF DEVELOPMENT	$1,333,010.00
GRAND TOTAL	$356,338,150.00

BASIC TECHNOLOGY TRAINING FOR NORTH CAROLINA SCHOOLS
Based on "Effective Schools" Training Model

- Elementary Schools

Stipend, lunches, and breaks for two teachers per school	$580	
Lunches and breaks for principals	$40	
Materials for each school	$15	
Number of Elementary Schools	1,484	
Total Cost for the Above		$942,340
Number of participants in Elementary schools	4,452	
Number of sessions at 30 participants per session	148	
Instructor per session	$500	
Total Cost for the Above		$74,000
Total Cost for Elementary Schools		$1,016,340

- Secondary Schools

Stipend, lunches, and breaks for two teachers per school	$580	
Lunches and breaks for principals	$40	
Materials for each school	$15	
Number of Secondary Schools	462	
Total Cost for the Above		$293,370
Number of participants in Secondary Schools	1,386	
Number of sessions at 30 participants per session	46	
Instructor per session	$500	
Total Cost for the Above		$23,000
Total Cost for Secondary Schools		$316,370
Total for all Schools		$1,332,710

Education Accountability and Student Information (EASI)

Overview:

Education Accountability and Student Information (EASI) is a proposed new student information system that ties traditional automated student accounting technology to the State Testing Program. It is designed to work closely together with instructional management technology to provide relevant student and program information to those who are responsible for delivering or defining educational services. Current plans are to develop and implement the system over the next three years with full installation by the end of the 1996-1997 school year.

A student information system integrating administrative and testing data and working closely with Instructional Management System technology is needed to support informed instructional decisions, accountability, policy development, effective resource management, trend analysis, and program planning. Educators must be able to ask and answer the following questions:

- Who are the students?
- What are they doing?
- Who is helping them?
- How are they doing?
- How did resources affect performance?

Background:

Student Information Management System (IMS): Implementation of SIMS, the state's automated student accounting system, began in 1985. SIMS was predicated on a mandate to improve the accuracy and timeliness of student information accountability from local schools and LEAs to the Department of Public Instruction and the General Assembly. Currently in place in over 1700 schools statewide, it is used to schedule classes, report course grades, take attendance, and provide automated reporting such as the School Activity Report, the Principal's Monthly Report, the Exceptional Children Headcount, and the North Carolina Standard Transcript.

State Testing Program: Installation began in 1970 and the system was re-designed in 1993. It scores and maintains data on 2-3 million tests annually. It analyzes data by test, group, and school which is then mailed to the Department of Public Instruction.

Instructional Management System (IMS): IMS technology is intended to assist the teacher to manage classroom and instructional activities. IMS software is designed to generate tests which tie to a course of study and record and report student progress.

Reason for Development:

Non-Integration: The current SIMS software provides inadequate tools for educators with little or no direct support for instruction. Its data transmission capabilities are too slow to send test data to the state. The State Testing Program scores tests, but does not feed data easily to SIMS. Data collection is duplicated by the two systems. Neither system is integrated easily or seamlessly with IMS software and makes data access and use are difficult.

Obsolete Technology: SIMS is not flexible enough to support new mandates and initiatives such as OBE and year-round education. Equipment in place is old, slow, and in need of expensive repair. No tools are provided for easy access or analysis of data. Users are widely dissatisfied and frustrated.

Timing:

The time for EASI is right for several reasons. The current SIMS system has been stretched beyond its original design and realistic capabilities, and is too expensive to fix. Today's technology is better and cheaper. EASI will position schools to take advantage of the North Carolina Information Highway. The newly re-designed State Testing Program and emerging IMS technologies are in place and waiting.

Characteristics of EASI:

EASI will utilize powerful new database management software tools and a graphical user interface. Multiple computer platforms will be supported, taking advantage of both PC and Macintosh microcomputers. School personnel will be able to access and analyze student and testing data easily on multiple networked workstations in the school and the LEA central office.

- Teachers will have direct access to the system in their classrooms, enabling them to handle daily student timetables and class rosters, seating plans and attendance processing, and communicate directly with the school office.

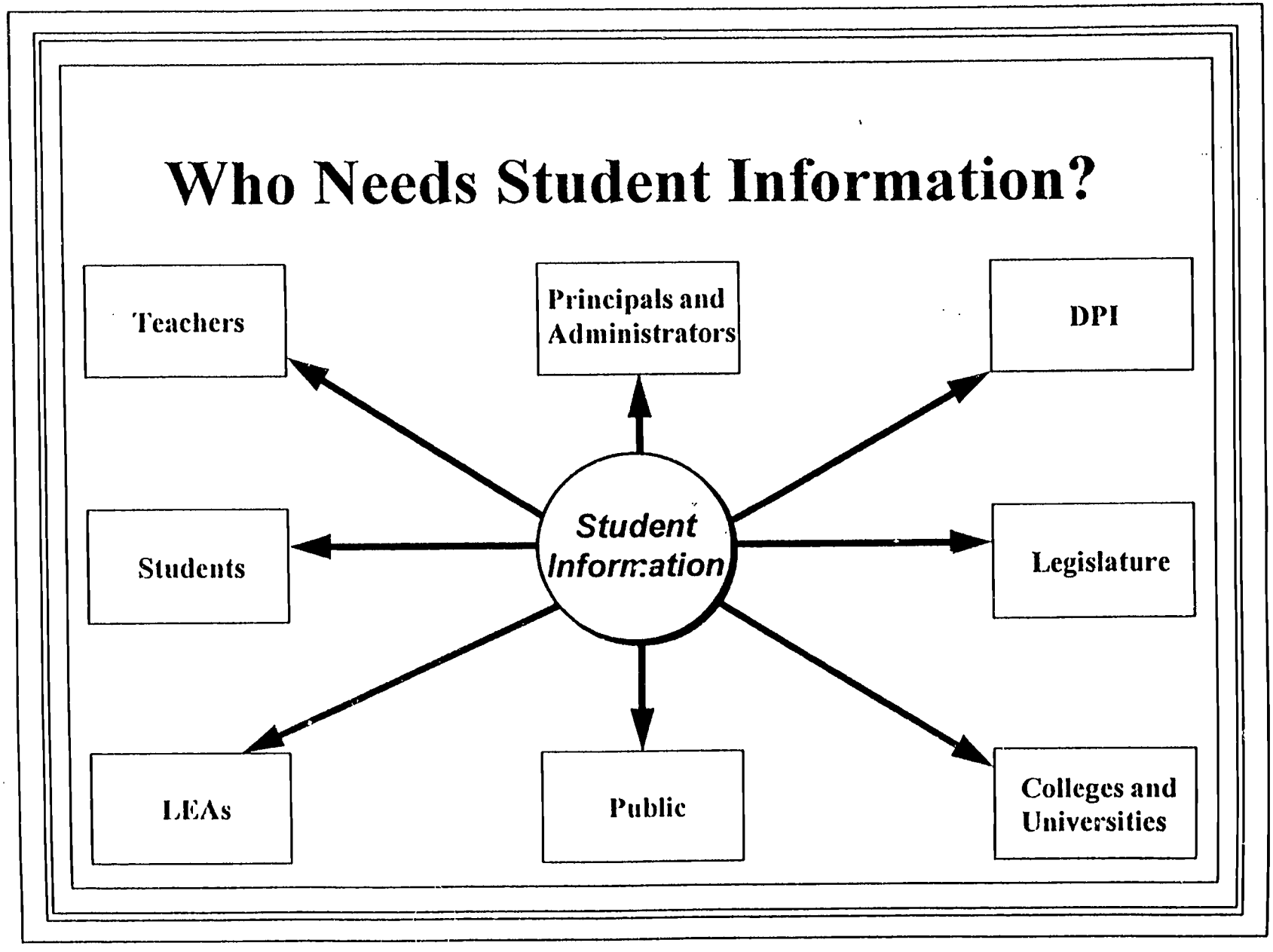
- Principals will have access to easy-to-use site-based data analysis tools, an improved class scheduler, and electronic connectivity to the LEA central office, institutions of higher education, and the Department of Public Instruction.

- The superintendent will be able to centrally manage district-wide student IDs and class assignments and school-to-school student record transfers. He will have access to detailed up-to-date student data with powerful query and Executive Information System tools. Central control will be provided for exceptional children and other LEA-wide data.

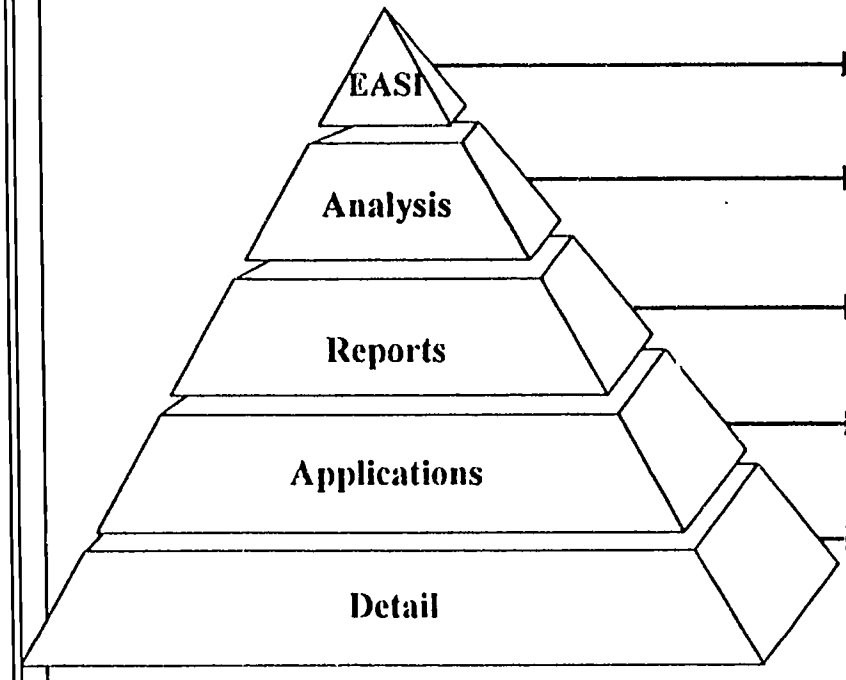
- The Department of Public Instruction will also benefit from access to more accurate and timely detail student and testing data from the easier-to-use It will be able to respond in a timely manner to legislative and policy mandates. Software modifications will be less expensive and less training and user support will be required.

Implementation Plan:

Design of EASI is planned for the 1994-95 school year, with development to take place during 1995-96. Full roll-out of the system, including equipment purchase and installation, data conversion, and training, is planned for the 1996-97 school year.

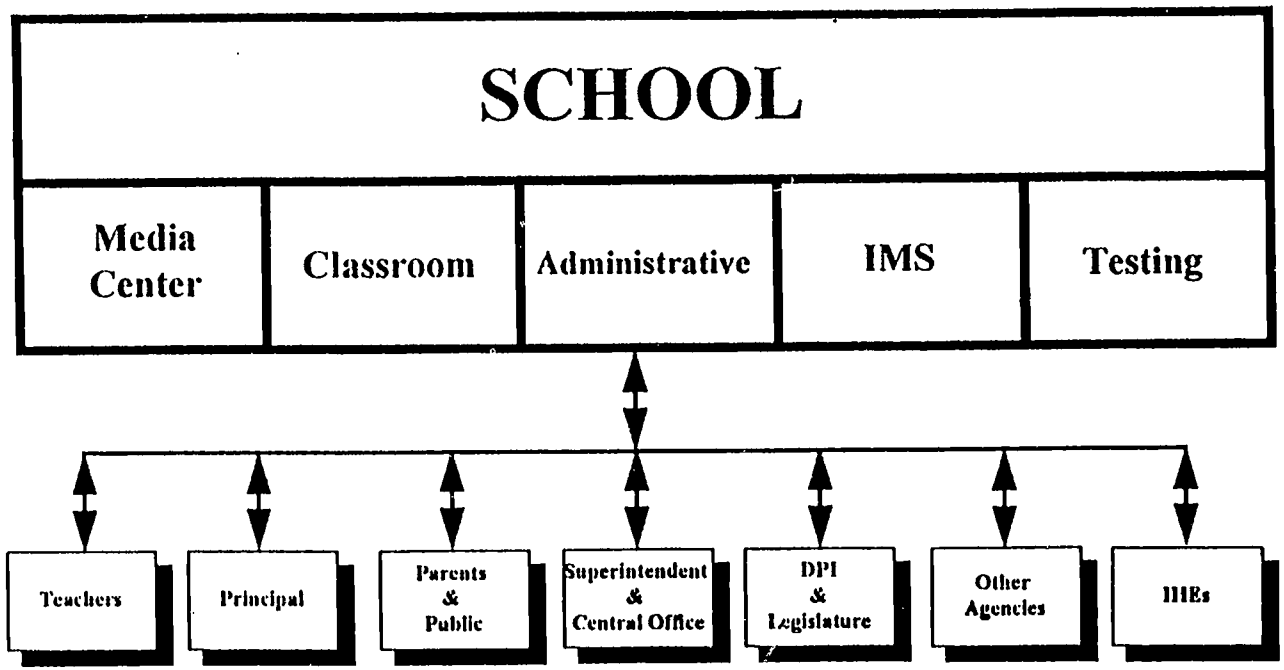

Who Needs Student Information?
Teachers
Principals and Administrators
DPI
Students
Student Information
Legislature
LEAs
Public
Colleges and Universities

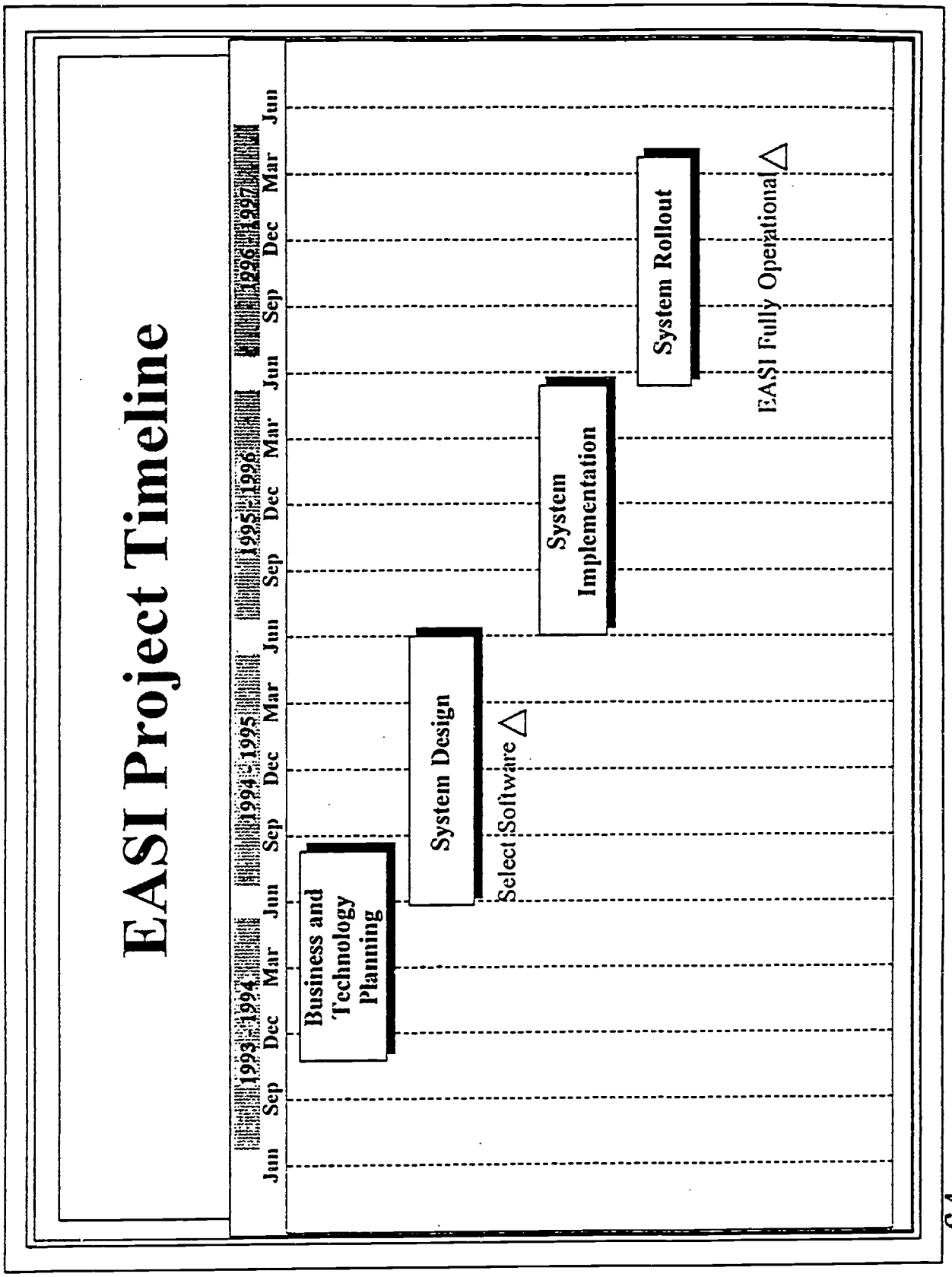
How It Works



- Graphical interface allows consumers to access information easily
- Easy-to-use analysis tools support custom and ad-hoc information needs
- Menu-driven reports can be modified to accommodate changing requirements
- Flexible application supports the right way of providing educational services
- Integrated database stores detailed student information with flexibility for the future

System Architecture




EASI Project Timeline
1993 1994 1995 1996 1997
Jun Sep Dec Mar Jun Sep Dec Mar Jun Sep Dec Mar Jun Sep Dec Mar Jun
Business and Technology Planning
System Design
Select Software
System Implementation
System Rollout
EASI Fully Operational
64
65

NORTH CAROLINA
INFORMATION HIGHWAY

NEWS RELEASE

EMBARGOED UNTIL
10 A.M., JANUARY 25, 1994

Governor Hunt Names North Carolina Information Highway Sites

RALEIGH — Gov. Jim Hunt today announced the first 106 sites on the North Carolina Information Highway (NCIH), a public-private undertaking which is the first of its kind worldwide.

The NCIH will use state-of-the-art telecommunications technology to provide educational, medical, economic development and public safety benefits to all parts of the state.

A briefing on the NCIH locations was also delivered today at ComNet '94 in Washington, D.C., by N.C. Secretary of State Rufus Edmisten on behalf of Hunt. Edmisten is chairman of the state's Information Resource Management Commission (IRMC), which works to direct North Carolina's future course with respect to information technology.

The Governor named 106 NCIH sites — from the coast to the mountains — which will be operational beginning in August. More than 80 sites will be added to the NCIH in January 1995. A total of 3,400 potential state government sites have been identified.

"We are very happy to have these pioneer sites for North Carolina's Information Highway," Hunt said. "By linking these 106 sites with cutting-edge technology, we can boost education, public safety, economic development, health care and criminal justice in all communities across North Carolina.

"The Highway is a product of a public-private partnership effort by North Carolina with its major telephone companies, Southern Bell, GTE and Sprint/Carolina Telephone, as well as many other telephone companies. As these sites are brought on-line in August, they will become part of a high-capacity telecommunications infrastructure. This project represents a significant upgrade of present voice, data and video communications networks. The Highway is expected to provide great increases in operational capabilities."

Initial funding for the NCIH project of $4.1 million was authorized by the N.C. General Assembly. House Speaker Dan Blue and Senate President Pro-Tem Marc Basnight joined Hunt on May 10 to announce the Information Highway public-private partnership. The funds from the Legislature will form the foundation as the Highway begins to provide rural areas with the strong educational and health care opportunities which are found in urban settings.

(More)

According to Jane Smith Patterson, the Governor's technology advisor, the NCIH will employ new and emerging technologies, particularly high-speed asynchronous transfer mode (ATM) switches, fiber-optics and synchronous optical network (SONET) transmission systems. The network will be the first in the world to employ these advanced technologies, Patterson said.

This telecommunications infrastructure will be part of the public-switched network, in which the state will offer communications services to its agencies primarily through the facilities of the local telephone companies and long-distance carriers. The fundamental role of the state will be to handle the administrative aspects of its sites on the Highway. The telephone companies will own and operate the network.

The telephone companies' capital expenses for building the NCIH will be recovered over time through fees paid by those using the network. The costs for audio, video, data and communications equipment within the site, as well as computer and local area networking devices, must be incurred by the entities connecting to the network, such as a schools and medical centers.

Areas with immediate uses for the NCIH are public schools, universities, community colleges, hospitals and medical centers, economic development, crime control and criminal justice, along with state and local government. Major applications include distance learning, video conferencing, tele-medicine, multimedia collaboration, imaging and high-speed data exchange for business and research.

An example of applications would be police or officers of the court in Mecklenburg or Gates counties having the ability to access databases across the state through an Integrated Criminal Justice Information System. In this manner, a district attorney, judge or other member of law enforcement could have up-to-date records — with both text and video photograph — of defendants or suspects in a manner of seconds. A road officer using this system in the patrol car would know immediately whether or not a person stopped for a speeding violation was also wanted on felony charges elsewhere.

The NCIH is a statewide initiative involving the departments of Community Colleges, Public Instruction, Correction, and Justice; the University of North Carolina System; many of the state's medical centers (including four medical schools); area health education centers (AHECs); and the Microelectronics Center of North Carolina (MCNC).

Many construction and technical activities are progressing on-schedule for the sites coming on-line in August. Plans for building and/or converting classrooms and conference rooms have been developed; contracts for all room and communications equipment are being finished; and instructions for designing and installing the interior wiring and equipment have been prepared.

Basic site commitments include, but are not limited to: (1) designating facilities to accommodate distance learning and data communications; (2) choosing site personnel to support the project; (3) acquiring strong support from key leaders (including their participation in planning/training activities); (4) a willingness to work with other sites; (5) training and support of staff; and (6) purchasing and maintaining necessary site-based equipment.

(A Site List Is Attached.)

For More Information Contact Andrew R. James, N.C. Office of the State Controller, 200 West Jones Street, Raleigh, N.C. 27603-1337; Telephone (919) 733-0178; FAX (919) 733-9162

North Carolina Information Highway Sites For August 1994

1. Cape Hatteras High School — *Buxton*
   Craven Regional Medical Center — *New Bern*
   East Carolina University(Academic Site) — *Greenville*
4. East Carolina University Medical Center/ Eastern AHEC (Area Health Education Center) — *Greenville*
5. Elizabeth City State University — *Elizabeth City*
6. Lenoir Community College — *Kinston*
7. Manteo High School — *Manteo*
8. Martin General Hosptial — *Williamston*
9. Northern Nash High School — *Rocky Mount*
10. Pitt Community College — *Greenville*
11. Roanoke Amarath Community Health — *Jackson*
12. Roanoke Chowan Hospital — *Ahoskie*
13. Rocky Mount High School — *Rocky Mount*
14. Southern Nash Senior High School — *Bailey*
15. Wayne Community College — *Goldsboro*
16. Appalachian State University — *Boone*
17. Bandys High School — *Catawba*
18. Bunker Hill High School — *Claremont*
19. Catawba Valley High School — *Hickory*
20. Catawba Memorial Hospital — *Hickory*
21. Catawba Valley Community College — *Hickory*
22. Hickory High School — *Hickory*
23. St. Stephens High School — *Hickory*
24. Fred T. Foard High School — *Newton*
25. Maiden High School — *Maiden*
26. Newton-Conover High School — *Newton*
27. Ashbrook High School — *Gastonia*
28. Carolinas Medical Center/ Charlotte AHEC (Area Health Education Center) — *Charlotte*
29. Central Piedmont Community College (CPCC) — *Charlotte*
30. CPCC/North Central Satellite — *Huntersville*
31. East Lincoln High School — *Denver*
32. East Mecklenburg High School — *Charlotte*
33. Garinger High School — *Charlotte*
34. West Charlotte High School — *Charlotte*
35. Harding High School — *Charlotte*
36. M.A. Thompson/Charlotte Staff Development — *Charlotte*
37. North Mecklenburg High School — *Huntersville*
38. Olympic High School — *Charlotte*
39. University of North Carolina at Charlotte — *Charlotte*
40. West Mecklenburg High School — *Charlotte*
41. South Point High School — *Belmont*
42. Gaston Community College — *Dallas*
43. West Lincoln High School — *Lincolnton*
44. Central Prison — *Raleigh*
45. N.C. Department of Community Colleges — *Raleigh*
46. Department of Criminal Investigations — *Raleigh*
47. N.C. Department of Public Instruction — *Raleigh*
48. Duke University Telecommunications Center — *Durham*
49. Duke University Medical Center — *Durham*
50. N.C. Government Administration Building — *Raleigh*
51. MCNC (Microelectronic Center of North Carolina) — *Durham*
52. North Carolina State University/Computing Center — *Raleigh*
53. North Carolina Central University — *Durham*
54. Research Triangle Institute — *Durham*
55. N.C. School of Math & Science — *Durham*
56. N.C. Office of the State Controller/ State Information Processing Services — *Raleigh*
57. University of North Carolina at Chapel Hill/ Computer Science — *Chapel Hill*
58. University of North Carolina at Chapel Hill/ Academic Computing — *Chapel Hill*
59. University of North Carolina at Chapel Hill/ School of Medicine — *Chapel Hill*
60. Brunswick Community College — *Supply*
61. Cape Fear Community College — *Wilmington*
62. Cape Fear Community College/Satellite — *Burgaw*
63. Coastal Carolina Community College — *Jacksonville*
64. Fairmont High School — *Fairmont*
65. Fayetteville Technical Community College — *Fayetteville*
66. Fayetteville State University — *Fayetteville*
67. Hoggard High School — *Wilmington*
68. Western Carolina University — *Cullowhee*
69. Lumberton Senior High School — *Lumberton*
70. N.C. Justice Academy — *Salemburg*
71. New Hanover High School — *Wilmington*
72. New Hanover Medical Center/ Coastal AHEC (Area Health Education Center) — *Wilmington*
73. Pembroke State University — *Pembroke*
74. Pender High School — *Burgaw*
75. Purnell Swett High School — *Pembroke*
76. Red Springs High School — *Red Springs*
77. South Robeson High School — *Rowland*
78. Southeastern Community College — *Whiteville*
79. St. Pauls High School — *St. Pauls*
80. Topsail Junior-Senior High School — *Hampstead*
81. University of North Carolina at Wilmington — *Wilmington*
82. West Brunswick High School — *Shallotte*
83. University of North Carolina at Asheville — *Asheville*
84. Tri-County Community College — *Murphy*
85. Andrews High School — *High Point*
86. Bowman-Gray Medical Center/ Northwest AHEC (Area Health Education Center) — *Winston-Salem*
87. Dudley High School — *Greensboro*
88. Eastern High School — *Gibsonville*
89. Forsyth Technical Community College — *Winston-Salem*
90. Grimsley High School — *Greensboro*
91. Guilford Technical Community College — *Jamestown*
92. Guilford Technical Community College/Satellite — *High Point*
93. High Point Central High School — *High Point*
94. North Carolina A&T State University — *Greensboro*
95. Northeast High School — *McLeansville*
96. Northwestern High School — *Greensboro*
97. Page High School — *Greensboro*
98. Ragsdale High School — *Jamestown*
99. Smith High School — *Greensboro*
100. Southeast High School — *Greensboro*
101. Southern High School — *Greensboro*
102. Southwest High School — *High Point*
103. University of North Carolina at Greensboro — *Greensboro*
104. Weaver Education Center — *Greensboro*
105. Western High School — *Greensboro*
106. Winston-Salem State University — *Winston-Salem*

From *A Primer on Cabling Design and Implementation: Consideration for Decision Makers*
North Carolina Department of Public Instruction, May 1992

Scenarios for Change

MEDIA AUTOMATION

Overview:

When discussions of automating the school library media center begin, one of the topics should be how to use a school telecommunications system to support the automation of the media collection. As of June 1991, over 1500 of the North Carolina schools reported media automation for circulation or an online catalog. Approximately half of these locations were involved in some stage of implementing a local area network for the online catalog with user stations within the school library media center. Of this number, approximately five were involved in placing user stations in classrooms. The number of these online catalog users exploring the possibility of placing user stations throughout the school is increasing each year. To accomplish this distribution of online catalog access outside the school library media center, planners need to consider a school telecommunications wiring plan.

Connections:

Even though most media automation networks currently consist of a few networked micros, all located within the media facility, media coordinators and school administrators need to plan for possible expansion of the network to include one or more of the following:

- connection to the school administrative computer to transfer student personal data. This is being done now by diskette transfer either by the user or by the media automation software company. Transferring the data from the administrative system eliminates rekeying of information about each student into the media computer and allows transfer of data on media fines and other obligations from the media computer to the administrative system. Replacing diskette transfer with network data transfer would save time and ensure better data integrity.

- connection to the classrooms enabling students and teachers in the classroom to search the online catalog or databases available on the same host or a peripheral CD-ROM drive in the school library media center.

- connection with other school networks enabling students to use those networks to search the school library media center host for information and incorporate into their assignment on the instructional network.

From *A Primer on Cabling Design and Implementation: Consideration for Decision Makers*
North Carolina Department of Public Instruction, May 1992

Implementation Stages:

Stage 1: Within the School Library Media Center

To "automate" the school library media center collection, the media coordinator undertakes to provide by use of microcomputers and special software access to the books in the school library media center. Periodicals and other print/nonprint materials are added often at a later stage or as time and money allow. For many school library media centers the first step is to purchase a computer with a barcode pen and a printer and a software program for circulation of items. In this stand-alone machine scenario, the students check out books by scanning with the barcode pen the barcode which is placed on each book. The circulation software on the "circulation station micro" records the transaction and updates various records for later use for overdues, circulation tracking, and collection development.

A second scenario involves the purchase of several microcomputers and networking software, cables, and interface cards in order to implement not only the circulation of materials but also the online catalog search activity. In these setups, the students can use a "search station micro" to access the record of a particular item or to scan for a group of items instead of searching the paper cards in the card catalog. This search station is networked by cables to a host microcomputer on which the full record for the collection items reside. The "circulation station micro" is attached also by network cables to this same host.

The total minimum media automation network for use in the school library media center consists of 3 microcomputers, 2 printers, and 1 barcode pen: 1 host/server with printer, 1 circulation station with barcode pen, 1 user/search station with printer. Depending on the automation software used, the maximum number of "search stations" will vary. A desired network would include 1 host micro, 1 circulation micro, and one user/search station micro for every 250 users, with printers for each user station and the host.

A third scenario is the addition of a CD-ROM drive to the online catalog local area network. This addition requires special CD-ROM network software (e.g., CBIS, Optinet, SCSI Express) in addition to the local area network software (e.g., Novell Netware) already installed.

Stage 2: To Other Locations

Administrative Unit: Several options exist for connecting the school library media center network system to the administrative office system: (1) bridging compatible but separate networks, (2) placing both system hosts and user stations on the same network, and (3) using a common host computer for both systems with user stations on a common network. In any of these options, planning for implementation should be part of a school telecommunications network.

From *A Primer on Cabling Design and Implementation: Consideration for Decision Makers*
North Carolina Department of Public Instruction, May 1992

Classrooms: A second option in adding additional user stations to those in the school library media center is to place user stations in each classroom. These user stations would consist of a microcomputer similar to those in the school library media center, with a printer added as funds allow. To accomplish this extension of the network, the classroom user stations should be part of a school telecommunications network. This connection will improve data access time and allow easier relocation of classroom units. Connecting the classroom user stations to a combination outlet in the classroom wall and adjusting the connections in the nearest wiring closet is a much easier and safer connection than stringing cabling across the ceiling from the library, down the hall, and into the classroom.

Stage 3: Instructional Networks

A third stage in providing access to the school library media collection by telecommunications is to connect the media center's network with other school networks, using special software and network connections. The use of a school telecommunications network will allow these connections to be made with minimal effort and increased assurance of data transfer. However, utilization of the data from another system will require special software or software modifications. Simply connecting the hardware does not ensure that the applications on the different networks can exchange the data in a usable format.

■ TEACHER STATIONS

Overview:

As various types of technology are becoming more commonplace in the school setting, the classroom teacher is faced with a growing need to have ready access to computer databases for both management and instructional purposes; to develop and deliver lessons using interactive technology; and to open the classroom walls to the world in search of new information and connections to others. Yet, in most North Carolina schools, inadequate funding and a lack of vision have limited the access of the teacher to the necessary technology. Teachers either use a centrally-located staff computer, a student station in a lab or school library media center, or an "older" micro placed at the back of the classroom, or have access to no computers at all. As new facilities are being built and renovations are being made to existing buildings, educators need to consider providing a sophisticated micro-based teacher station in every classroom and connecting it to the school-wide telecommunications network.

From *A Primer on Cabling Design and Implementation: Consideration for Decision Makers*
North Carolina Department of Public Instruction, May 1992

Connections:

Three different, but very important, activities become more effective and efficient when a classroom teacher station is connected to the school telecommunications network. For example:

- During the course of any work day, a teacher receives or sends a variety of information to the principal's office: student attendance, field trip lists, class time changes, and school events. These data are transferred from the office to the classroom or vice versa by paper or by a voice intercom system. Even though attendance records are computerized in the principal's office for most North Carolina schools, the teacher still maintains a paper system within the classroom.

- Teachers are using a variety of equipment to develop and present their lessons; however, a majority of the equipment does not offer interactive features. Thus, once the lesson material is developed or selected, it is presented only in the sequence or format of its original development. There is no opportunity to explore "what if" questions or to proceed with the lesson in the direction of questions from the students or to interact with students in other locations focusing on that same issue.

- As teachers search for additional resources and information to incorporate into their lessons that will prepare students for the twenty-first century, they are beginning to use multimedia materials. For instance, they may use videodisks, which have full motion video sequences and full color still prints, and access online databases or electronic mail systems for current information. In most cases there is limited technology in the school for these activities. For example, as educators have begun using videodisks, the school has purchased one videodisk player to connect to a mobile computer system or has placed the unit in a lab or an area of the school library media center for group use. Likewise, as teachers have requested access to online databases such as Dow Jones News Retrieval to acquire timely information for economics projects, schools have installed a phone line or a cut-off switch on an existing line--often in the school library media center. Thus, the teacher has to move the class to that location or "string" a long stretch of phone cabling to the classroom.

Implementation Stages:

Stage 1: Within the Classroom

The first teacher station in a classroom is typically a stand-alone computer with some form of large group display device. The display may be a 25"-27" monitor or a liquid crystal display (LCD) palette placed on an overhead projector. In this scenario, the teacher may use the teacher station for software demonstrations or lesson enhancements. Most microcomputers in this situation are older units with specific software for which the teacher has ready access. A second step for classroom use is the specialized mobile unit. In this case a stand-alone unit is placed on a cart, with a peripheral such as a VCR or a videodisk player or a CD-ROM drive. This mobile unit then becomes the multimedia station that the teacher reserves to present a lesson or demonstration. Neither of these examples of a teacher station within the classroom is part of a school telecommunications network. However, both have the potential to become part of the school-wide network with the addition of network cards, cabling, and additional memory.

From *A Primer on Cabling Design and Implementation: Consideration for Decision Makers*
North Carolina Department of Public Instruction, May 1992

Stage 2: Beyond the Classroom

Administrative Connection: One of the first applications of connecting the classroom teacher station to a location outside of the classroom is an administrative one. With the existence of the Student Information Management System (SIMS) in most North Carolina schools, examples already exist of connecting classroom stations to the SIMS network. However, the first application is usually electronic mail, rather than a SIMS function. The school principal can use an electronic mail software package on the network to send messages, request information, and publish the daily announcements. Some schools are trying a second step: teachers keying their students' grades into a grade reporting program on the network. This action replaces the diskette transfer necessary now from miscellaneous stations containing the grade reporting software to the SIMS station or network. In both of these instances, the use of a school telecommunications network would facilitate the data transfer and allow easier expansion both to other classrooms and to other applications. A third administrative application which should be considered in planning for a school telecommunications network would be an extension of some of the electronic homework hotlines currently being used. Teachers could use their classroom teacher station to type absentees and homework assignments into the school network, rather than waiting their turn to use the one specially-configur(homework hotline station.

Multimedia Connection: One of the first instructional, interactive uses of a teacher station is to "deliver" the lesson or to conduct a group activity. Often the teacher connects a videodisk player to the teacher station. Using a barcode pen or a computer program the teacher accesses random segments on the videodisk to present a concept with a combination of full motion video, still images, and audio. This visual and audio experience provides new dimensions to the lesson. A second step is for the teacher to use scripting or authoring language on the teacher station to access the multimedia images via "hot spots" as the lesson progresses or as students ask questions. Both of these scenarios succeed in a stand-alone or mobile cart environment. Yet, with a connection of the classroom teacher station to the school telecommunications network, the videodisk could be in the school library media center, accessible to more people rather than available to only one class.

Information Accessing Connection: A second instructional application connecting the classroom teacher station to another location is accessing information. Many North Carolina schools are experimenting with a variety of information accessing arrangements: the classroom teacher station connected to telephone lines in the classroom wall for online database access, the classroom teacher station networked to the online catalog or CD-ROM drive in the school library media center, or the classroom teacher station connected as a station on an instructional network in the school.

This involves connecting the classroom teacher station to a host/server computer containing the application software. In almost all of these instances, only one of these applications is being tested at one time. However, a school telecommunications network would provide the optimum route for data connections and flexibility for multiple applications to be available simultaneously.

■ STUDENT STATIONS

Overview:

From *A Primer on Cabling Design and Implementation: Consideration for Decision Makers*
North Carolina Department of Public Instruction, May 1992

As reports are made by various commissions studying skills needed by students in the twenty-first century, educators continue to be told that each student needs basic skills. Often, however, a new basic skill is mentioned: computer skills or information accessing skills. Indeed, to succeed in the technology-rich, information-filled society which is fast developing, students need to be comfortable using computers and other technologies.

Connections:

Students should have the opportunities not only to strengthen their knowledge of basic content, but also to develop problem solving, information accessing, and communication skills. Thus, school leaders and planners will face the need for a multitude of student stations throughout the school facility. With a school telecommunications network, the use, expansion, and support for these individual student stations will be implemented and managed. Possible student station benefits with a school telecommunications network would be:

- In a computer lab with stand-alone microcomputers, the teacher, media coordinator, or students must load the software into each machine to be used. This involves locating the software, loading it into the machine, and returning the package to the proper location after use. Daily diskette handling of this type decreases the student work time and increases the possibility of damage to or loss of the diskette. With these microcomputers networked to a host computer within the room, the students have more work time and the diskette handling issue is resolved. However, the software now resides on the host in the computer lab and is not available for use by students at computers in other locations of the building. With the computer lab units connected to a school telecommunications network, students could use the software and their work files from other locations in the building.

- In order to strengthen student math and language arts skills, educators have begun using computer programs for students to practice the skills they need and for teachers to track the student progress. Often school leaders purchase a complete, networked computer lab for these special applications. If a school telecommunications network exists, this special application network can be connected in order for student progress reports to be transferred to student information files in the administrative office and for students to access the lessons from stations throughout the school.

From *A Primer on Cabling Design and Implementation: Consideration for Decision Makers*
North Carolina Department of Public Instruction, May 1992

Implementation Stages:

Stage 1: Within One Location

Historically, a student station in North Carolina schools has been either a stand-alone microcomputer with one disk drive in a general-purpose computer lab or a similar unit placed in a classroom. In both instances, printers were added as monies allowed. Students are using a wide variety of software, typically basic skill software and word processing software. A second step has been to network the units in the computer lab in order to better manage the software and to implement student performance management software.

For most cases, the microcomputers in the classroom and those in a lab--networked or stand-alone--could become part of a school telecommunications network but they would need networking cards and cables, and possibly additional memory. Some of the older microcomputers might be better used as stand-alones for special applications than spending money to "improve" them to communicate on the school network. However, if the investment would be cost effective, then the connection of the stand-alone student stations in the classroom and in the computer lab to a school network would allow access to the same software throughout the school, would provide availability of student performance tracking information at different stations, and would eliminate possible occurrences of copyright violations.

Stage 2: Distributed/Multiple Locations

A second stage in providing easy access to student stations is to form a distributed student station network with a host microcomputer in one location networked to student stations in the classroom. In this scenario, educators often distribute the stand-alone stations in an existing lab to classroom locations or purchase additional units to place in the classrooms. They purchase a more powerful microcomputer to be the host computer and they invest in network software, cards and cabling. This distributed network provides common software programs to each classroom and allows file transfer of student work. However, the halls become areas with cabling looped from beam to beam and the classrooms have cabling flowing from the transom to be taped down the wall and across the floor molding to the computer area. As other classrooms are added to this network, the cabling becomes a more confused mass of wires, almost impossible to manage or to follow in order to trace a transmission problem. With a school telecommunications network, the classroom activity of a distributed network would remain the same but the consistent delivery of programs would be more assured and the appearance and safety conditions of the facility would improve.

From *A Primer on Cabling Design and Implementation: Consideration for Decision Makers*
North Carolina Department of Public Instruction, May 1992

■ ADMINISTRATIVE STATIONS

Overview:

In the North Carolina schools, the use of microcomputers for administrative applications is a common practice. At least one microcomputer system is available in the administrative offices for student information. Many schools have extended this beginning use in several ways: other microcomputers networked to the host unit for student information; unit or units for grade reporting; unit with a scanner for test scoring; unit for an electronic homework hotline. Several schools are connecting classroom or lab computers to the administrative network to facilitate reporting of grades while a few are experimenting with placing their media automation software on the same host as the administrative software. This latter activity has been undertaken to save purchase of a second host computer and to more easily transfer student information between the two applications. In only a very few schools--in some of the newest facilities--have educators implemented a school-wide administrative network. In these cases, the full potential administrative use is still several years away.

Connections:

With a school telecommunications network the possible administrative applications are numerous. In fact, such a network could restructure the existing way of "doing business" in a school of today. For example:

- Many advances in automating attendance reporting have already occurred. However, if a teacher could key or scan the student identification numbers of those absent from a given class into the networked classroom teacher station, attendance reporting would be transferred on the spot.

- The school intercom system or public address system has been viewed by many teachers as a necessary nuisance. If the administrative staff could "send" the message to the classroom either via electronic mail (data) to the classroom teacher station or via video messaging to the classroom monitor, then the classroom activity is not interrupted. The existence of a school telecommunications network would provide the "path" to send these messages to every location simultaneously or just to selected locations.

- As fund raising activities increase, record keeping becomes a major job for the classroom teacher. Using paper charts and daily reporting forms, the teacher spends considerable time maintaining the records. If the teacher or a student could key into the classroom teacher station the amounts received as the money is collected and then transmit this record to the bookkeeping office on a daily basis, the teacher spends less class time and improves the chance for correct record keeping.

From *A Primer on Cabling Design and Implementation: Consideration for Decision Makers*
North Carolina Department of Public Instruction, May 1992

Implementation Stages:

Stage 1: Within the Office Complex

The first expansion of computer use in the administrative office area is usually to provide workstations for the assistant principal, the attendance counselor/secretary guidance staff, and others. (Typically, the initial SIMS hardware is dedicated to the SIMS operator/data manager for data entry and maintenance. Additional workstations must be supported by and connected through a microcomputer-based local area network with a powerful file server. Usually an optical mark reading scanner and a high-speed, heavy-duty or laser printer are added to the office complex.

Sometimes a different second step is to add additional applications such as a homework hotline for calling student homes concerning attendance and providing an announcement bulletin board for the community to call. Or a second step might be a grade reporting application station to which teachers bring their data diskettes of student grades to be moved into a school file.

Stage 2: To Other Locations

Once an office complex network is in place, the next stage for administrative application expansion is to place administrative stations in other locations. Stand-alone units can suffice to offer the staff opportunities to input grades, check student performance progress, and record homework assignments. However, if these administrative units are connected to a school telecommunications network the data can be input directly rather than transferred by diskette. These particular units would be similar to the teacher stations but would be more powerful processors for faster online interactive and greater numerical calculations. Also, they would include voice capability for recording homework assignments.

■ TELECOMPUTING STATIONS

Overview:

Since the mid-1980's North Carolina schools have been "reaching out to touch someone" via telecomputing. Using a computer, modem, telephone line, word processing package, and communications software, students have exchanged letters and participated in collaborative projects with students in other North Carolina locations, in other states, and in countries such as Australia, Japan, and England. These activities have increased student knowledge of geography, world events, universal student interest, and multicultural differences. Students have gained computer skills of general computer use, of word processing, and of telecomputing. They have also learned to work cooperatively. Yet, perhaps the greatest outcome has been improvement of writing skills. Teachers report that student writing skills improve when they are writing for a distant, peer audience. Teachers have used telecomputing to enrich their lessons with current information and to provide students an opportunity to go beyond the four walls of the school.

From *A Primer on Cabling Design and Implementation: Consideration for Decision Makers*
North Carolina Department of Public Instruction, May 1992

Connections:

Telecomputing is currently a stand-alone activity in the North Carolina schools. However, with the existence of a school telecommunications network, students, teachers, and other staff members could have access to the world from any location in the school facility. Several possible connections would be:

- As a seventh grade social studies class is discussing current events in Africa, they could "dial up" the Dow Jones News Service or check the X-Press X-Change latest transmission. On the monitor of the computer station in their classroom they would have the latest information available. This would be possible from any of the seventh grade classrooms or any other location with a dedicated telecomputing computer and modem connected to the school telecommunications network. Otherwise, each classroom would need access to a mobile telecomputing station and a separate phone line.

- A sixth grade class is working with a peer class in Australia on travel brochures for kids visiting their locality. Part of the class is investigating resources in the school library media center and the remainder of the class is preparing the brochure in the computer lab down the hall. Each group has been assigned to compile a list of questions that need to be answered by the kids in Australia before they can finish their research and draft the brochure. With a school telecommunications network, each group uses the telecomputing station in their location to send the file with the list of questions to their school system FrEdMail system for overnight transfer to Australia. Thus, they are able to continue work rather than relocating to the one telecomputing station in the school.

- An economics teacher is working with the media coordinator to prepare a unit on the stock market. As they investigate materials in the school library media center, the media coordinator demonstrates the various online databases that the students could search. Once the teacher returns to his classroom, he uses his teacher station connected to the school telecommunications network to connect to one of these databases to gather more ideas for the design of the unit. He also tests how he could use the classroom station as a teaching station by connecting to the online database during the lesson.

Implementation Stages:

Stage 1: One School Telecomputing Station

The first occurrence of telecomputing in a school is when an individual becomes excited about the possibilities, having read an article, heard a presentation at a conference, or witnessed an activity at a neighboring school. Once the staff member begins investigating telecomputing, the first obstacle to arise is usually not the availability of equipment but access to a phone line. Many times a computer and word processing software can be re-assigned for telecomputing and sufficient funds can be obtained to purchase a modem and communications software. Even money for the subscription or online charges to the database service or bulletin board is "found." However, the installation of a separate phone line or a new, dedicated phone line involves an initial installation cost and recurring monthly charges. These monies are often not in the existing school budget. This funding issue is

often coupled with apprehension about the control of the use of the line for appropriate calls. With sufficient data and plans for appropriate access, many schools have overcome all of these barriers in order to benefit from telecomputing.

The first telecomputing station is usually an older microcomputer system placed in the school library media center. This system includes a printer, modem, word processing software, and communication software. It is typically on a cart to be rolled from a secured place into the main use or reference area for easier use by small groups or classes. By use of a long telephone cable, the mobile unit can be connected to the phone in the school library media center. However, the next step, once use of the system really begins, is to install a separate line to the usable location in the main use or reference area and place the mobile unit there. If the unit remains on a mobile cart, then it can be used in another location in the building where there is access to a phone line.

Stage 2: Multiple School Telecomputing Stations

As interest in telecomputing grows and monies are available for additional units and phone lines, many schools are adding telecomputing units in order to have permanent access in the school library media center reference area, in the general computer lab, and in the vocational education wing (e.g., for business classes, for health occupations). With a school telecommunications network, these classes could share use of the equipment and the telephone lines rather than each having separate units. As the variety of telecomputing use and the number of users increase, educators will need to consider a "better" way to provide telecomputing stations than to continue to add a system and another phone line each time a request is made. A school telecommunications network is one solution. Educators need to consider such a network as they develop long-range plans which include telecomputing opportunities for students and teachers.

From *A Primer on Cabling Design and Implementation: Consideration for Decision Makers*
North Carolina Department of Public Instruction, May 1992

CASE STUDIES

CASE STUDY 1: THE WEATHER PROBLEM

It is 4:30 a.m. and the principal's home telephone is ringing. Upon answering it, the principal is confronted with the superintendent's voice proclaiming that schools will be closed due to bad weather. This situation would normally call for a pot of coffee and the school's telephone directory. There is usually a legion of people to call. Call the cafeteria workers. Call the janitor. Call the teachers who live over in the next county. Call the bus drivers. Call the local radio station.

Once all the calling is done, there is still the required trip to the school. There is the security system to reset. There are lights to turn off and thermostats to turn down. And somebody should be in the building to answer the phone.

This year the situation is different. With the addition of a six classroom wing came the realization that the old intercom system would not handle the new load and would have to be replaced. A new, fully integrated communication system was installed. The new system not only replaced the intercom system, but it also replaced the old clock system and the old bell system. Furthermore, the new system can do so many more functions.

Now, when the superintendent calls at 4:30 a.m., the principal merely calls a special, unlisted number into the communication system. Using the keypad on the phone, the principal directs the system to make all the necessary phone calls playing a prerecorded message advising the listener of the current conditions. Next, the principal changes the schedule on the security, energy and environmental control systems to "weekend," and instructs the system to direct all incoming phone calls to voice mail which issues a "school closed" message. The principal can then return to bed.

Four hours and half a pot of coffee later, the principal again calls the system and directs it to forward all phone calls to her home phone for the day.

CASE STUDY 2: THE PAPER PROBLEM

What principal has not experienced the frustration of mundane paper trails? Watching teachers dash about the building trying to gather all the information to be placed on report cards. The librarian stuffing the teachers' mail boxes with lists of students with overdue books. The parade of teachers with their purchase order forms should monies become available. The anguish of the teacher who discovers her film request form got "lost." The conscientious guidance counselor that discovers three different spellings of a student's name. The over-worked secretary with a tower of typing requests. The salvos of students scurrying through the halls, carrying hall passes, headed for the media center to find "a" book.

Now, add to the frustration with daily routines. The janitor is needed in Room 34. Three parents are in the office to pick up their children. The maintenance crew is trying to locate the leak in the third-floor boys' bathroom.

This need not be the typical school scenario. A telecommunications network can support how students learn. It can also support how teachers teach and how the staff works. One master file server with the complete records of all students, accessible to teachers, librarian, guidance counselors, etc., should eliminate any problems locating a student. From the classroom, students would have access to the on-line catalog in the library. Teachers could type their reports and letters and then send the data to the laser printer in the control room. A group of students in one classroom could have an electronic interchange with students in another school -- in another state.

Teachers could post grades and comments in files from their workstations. The librarian could post overdue notices to files from the library workstation. The principal, or any teacher, could pick up the phone and page the janitor for assistance without disturbing any other person in the school. The school secretary could search the online phone log for information on who reported the leaking pipe.

CASE STUDY 3: THE VIDEO PLAYBACK PROBLEM

The physical education teacher received a videocassette concerning a health topic that had been a very important and current issue during recent class discussions. The timing of the receipt of the cassette could not have been better.

On this day the teacher had to go to the media center storage area and check out a VCR and television set mounted on a rack with wheels. The main problem was that there were five classes which would be held in five different locations in the school on this particular day. Not only did the rack with the VCR and television set have to be pushed to one classroom, it had to be pushed to five different classrooms.

Moving the rack and television set required not only the teacher but at least one other student to assist in transporting the cart from classroom to classroom. This took time and caused some minor disruptions in the normal activity of the classroom.

So first thing in the morning the teacher went to the media center and checked out the rack with the television set and VCR. She then, with the assistance of a student, rolls it to the first classroom. The class is taught and the video shown. After the class, the teacher with the assistance of a student rolls the cart to the next classroom. This is repeated three more times during the period of the day. The rack with the VCR and television were then returned to the media center.

With a modern integrated telecommunications system, this roving teacher has a much easier task to perform. When the teacher receives the videocassette (it could be a laser disc in the modern school) and takes it to the media center, the cassette is given to the media consultant in charge of communications. The teacher lists the times that she would like the videocassette shown and the various classrooms in which the teacher will be located. The media consultant takes the videocassette and places it into a VCR located in the media telecommunications room, and then hands to the teacher a piece of paper with a few numbers written on it. The teacher then walks confidently and leisurely to the first classroom.

When the time comes to review the videocassette, the teacher turns the attention of the class to the television monitor located near the ceiling in the front corner of the room. The teacher

walks to the telecommunications handset located near the door, lifts the handset and enters a code in the keyboard and in about five seconds the videocassette program is displayed on the screen of the television set in the classroom. When the cassette ends, the teacher goes back to the telecommunications handset, removes the handset and enters a code into the keyboard which rewinds the videocassette and has it ready for the next showing. At the end of the class, the teacher leisurely walks to the next class to show the videocassette to that group of students.

When the teacher is ready to show the videocassette program to the next class, she repeats the action of removing the handset from the telecommunications wall-mounted device, punches in a code and the videocassette program appears on the screen of the television set located in the classroom. This scenario is repeated three additional times during the remainder of the day.

Not only can the teacher control the videocassette recorder located in the media center, this teacher can communicate with other teachers through the same wall-mounted telecommunications set. The teacher can relate the fact that this videocassette has been received and will be shown to the class at the appointed time. She can alert various people who may be interested in viewing the videocassette without having to do an all call announcement. She can contact each person directly and individually without disturbing the entire school.

The teacher in the school with the integrated telecommunications system does not have to push a heavy television/VCR cart around the school building, nor request the assistance of a student or another teacher to push the cart. If a student does assist, the teacher normally will have to provide an excuse slip for that student in the event he might be late to the next class. The most difficult task of the day would be the transporting of the videocassette to the media center.

From *Teaching, Learning, & Technology: A Planning Guide*, Apple Computer, Inc., 1991

Middle School Scenario

I am working with two other teachers in a cross-disciplinary program that combines science, social studies, and language arts in major student projects. My classroom is set up with clusters of desks, with six students in each cluster. The students have learned about the process of cooperative learning and can quickly adopt a variety of roles in their group. Alternating with some direct instruction and individual student work, teams get a project assignment and then have three weeks to bring together all of the materials that focus on the problem and develop a "product" that can be shared within the class and, if they choose, with other classes in the state studying the same unit. Through flexible scheduling, students have extended class periods to work on the assignment three times a week. The other two teachers and I serve as advisers to different groups of students, depending on the needs of the groups and what our interests are.

My students may begin one unit by experiencing a simulation of a real-life occurrence of an extraordinary nature. Some of the groups learn about volcanoes, others are given the topic of earth quakes or other natural disasters. Each group begins by vicariously experiencing the catastrophe, for instance, what the explosions were like for the people of Pompeii, of Mt. St. Helens, of the Hawaiian Islands. Using videotape and videodisks, the groups of students pull together visual representations of the event and find out what happened not only to the people, but also to the plants, the animals, and the surrounding land. They build extensive visual, sound, statistical, and print databases from computer resources, CD-ROM databases, and on-line data services; using electronic mail or fax, they correspond with experts and with schools in Washington and Hawaii. Some groups of students produce reports based on their experiences and their observations. Others write stories, produce videos, or create dramas about particular aspects of what they learned. Their curiosity takes them to the next step—which is usually a different place for one student than it is for another.

We teachers meet once a week to plan out the resources and activities for each project, and to make sure that the students have opportunities to cover the necessary materials in the district's curriculum plan, while, at the same time, having the experience of studying something in sufficient depth to "know" it. Almost every night, we use our home computers t sign on our electronic mail system and check with other teachers around the state teaching the same unit. This way, we can exchange ideas and help solve one another's problems.

The two other teachers and I developed an assessment system for the outcomes of each group, using a combination of evaluations for content, mastery of new skills, communications, work styles, and level of effort. Recently, we've begun to include peer assessments within the class. Following each unit, we meet with the small group and with each individual student to discuss his or her performance and make individual plans for what they should stress during the next project. We then reorganize the teams for the next set of projects.

Much of the pain of scheduling this complex system is left to the school's centralized computer system and, just like the students, we have to check into the system each day to confirm our schedule of classes and meetings or to set up times to go to the media center to use the production facilities. The students seem to enjoy the project-oriented approach to the curriculum and we, the teachers, get a chance to work with colleagues and learn something new with each new unit. We find we're students as much as we are teachers!

Media and Technology Visitation Sites
February, 1994

Distance Learning Projects

Ashe County: Beaver Creek High School ***Distance Learning by Satellite receive site for high school instruction*** - J. Richard Blackburn, Principal, 919/246-5311

Buncombe County: Buncombe County Central Office ***Distance Learning by Satellite receive site for staff development*** - Carolyn Crew, Media Supervisor 704/255-5921

Durham: North Carolina School of Science & Mathematics ***Cable distribution system (one way video, two way audio)*** - Peggy Manring, Media Director, 919/286-3366

New Hanover/Gaston/Lincoln/Mecklenburg Counties: ***Two way video fiber optic networks*** - New Hanover - Lisa Gurganus, Technology Supervisor, 919/763-5431; Gaston - Melinda Ratchford, Media and Technology Director, 704/866-6100; Lincoln - Vicky Ratchford, Instructional Supervisor, 704/732-2261; Mecklenburg - Hal Gardner, Instructional Technology Director, 704/343-5400

Sampson County: Union High School ***Distance Learning by Satellite receive site for high school instruction*** - Freddie Williamson, Principal, 919/592-4026

Transylvania County: Rosman High School ***Distance Learning by Satellite receive site for high school instruction*** - Bill Cathey, Principal, 704/862-4284

Watauga County: ***ISDN Network with ASU*** (two way video over copper telephone lines) Sally Anderson, Computer Coordinator, 704/264-7190

Wayne County: Rosewood High School ***Distance Learning by Satellite receive site for high school instruction*** - Wayne Williams, Principal, 919/705-6050

Integrated Communication Systems

Johnston County: Glendale-Kenly Elementary School - Bill Gilbert, Principal, 919/284-2821

Watauga County: Mabel Elementary - Mitchell Yates, Principal, 704/297-2512

Video Production Facilities

Guilford County: Weaver Center - Mike Parrish, Instructor, 919/370-8282

Harnett County: Coats School - Marie Salmon, Media Coordinator, 919/897-8353

Orange County: New Hope Elementary - (Principal vacant), 919/942-9696

Local Area Networks (Labs)

Buncombe County: Enka High School - ***CD-ROM networks; online catalog*** - W. Bruce Peterson, Principal, 704/667-5421

Carteret County: Broad Creek Middle School: ***Online catalog; Macs/IBMs online together*** - Mary Forrest, Media and Technology Supervisor, 919/728-4583

Catawba County: ***HS Macintosh writing labs*** - Terry Bledsoe, Computer Coordinator, 704/464-8333

Cleveland County: ***ILS networked labs*** - Don Loftis, Computer Director, 704/487-8581

Charlotte/Mecklenburg: Winterfield Elementary - (Principal vacant), 704/343-6400 or Karen Ganzert, Computer Coordinator, 704/343-5400

Rowan-Salisbury: ***Variety of networked labs*** - Zelia Frick, Technology Director, 704/636-6750

Distributed Networks (Multiple Rooms)

Davidson County: ***Digicard connecting Macintosh micros and Apple IIe micros*** - Judy LeCroy, Media and Technology Director, 704/249-8181

Charlotte/Mecklenburg County: Nations Ford Elementary - ***General software use*** - Beverly S. Moore, Principal, 704/343-5838

Shelby City: Graham Elementary and Shelby High School - ***Skills and ILS networks*** - Mitchell Self, Computer Coordinator, 704/487-6367

Watauga County: Mabel Elementary School - Mitchell Yates, Principal, 704/297-2512

Total School Networks

Burke County: Table Rock Middle School & Heritage Middle School - Margaret Church, Supervisor, 704/437-4482

Cabarrus County: Mt. Pleasant High School - Jean White, Technology Director, 704/786-9805

Durham County: Riverside High School - Diane Kessler and Kim Mayo, Media Coordinators, 919/560-3965

Orange County: New Hope Elementary - (Principal vacant), 919/942-9696

Randolph County: Southwestern Randolph Middle School - Billie Durham, Media Coordinator, 919/381-3900; **Seagrove Elementary School** - Doris Talley, Media Coordinator, 919/873-7321

Integrated Learning Systems

Charlotte/Mecklenburg: Hornet's Nest Elementary - ***Josten's*** - Karen Ganzert, Computer Coordinator, 704/343-5400
Johnston County: ***CCC*** - Doc McCullouch, Technology Director, 919/934-5961
Mooresville City: ***Acceleration 2000*** - Dr. Steve Kanipe, Technology Director, 704/664-5553
Nash/Rocky Mount: ***MECC Management Master*** - Carolyn Grantham, Computer Resource Teacher, 919/459-7021
Shelby City: ***CSR*** - Hale Bryson, Associate Superintendent, 704/487-6367
Union County: ***Josten's*** - Pam Jack, Computer Coordinator, 704/283-3885

Special Technology Magnet/Focus Schools

Forsyth County: Cook Middle School - Ray Midgett, Media and Technology Director, 919/727-2730
Guilford County: Washington & Bluford Elementary Schools, Lincoln Middle School, - Helen Tugwell, Media and Technology Director, 910/370-8100
Wake County: Enloe High School - Dian Midness, Media Coordinator, 919/856-7860

Technology Staff Development Centers for Teachers

Cabarrus County - Jean White, Computer Coordinator, 704/786-9805
Charlotte/Mecklenburg - Karen Ganzert, Computer Coordinator, 704/343-5400
Guilford County - Helen Tugwell, Media and Technology Director, 910/370-8100

Telecomputing Activities

Duplin County: James Kenan High School - ***Learning Link Use for Business Ed*** - Alinda Pope, Teacher, 919/293-4218
Lee County: ***FrEdMail for K-8; Business Ed at High School*** - Camp Price, Computer Coordinator, 919/774-6226 ext. 155
Union County: ***FrEdMail projects*** - Pam Jack, Computer Coordinator, 704/283-3885
Wilkes County: Wilkesboro Elementary - Susan Kuensel, Media Coordinator, 919/838-4261

Special User/Administrative Support

Asheville City: Asheville High - Arts Education Facility - Laurence Liggett, Principal, 704/255-5352
Lenoir County: Teachers Memorial Primary - Stephen Scroggs, Principal, 919/527-0225
Onslow County: Bell Fork Elementary - William Kelley, Principal, 919/347-4459

Media Automation Sites

Columbia Sites:

Wake County: Leesville Middle School - Jane Parker, Media Coordinator, 919/870-4200

Henderson County: Rugby Junior High School - Barbara Hunnicutt, Media Coordinator, 704/891-6566

Follett Sites:

Forsyth County: Atkins Middle School - Ruby Hunt, Media Coordinator, 919/727-2781

Wayne County: Southern Wayne High School - Rachel Kennedy, Media Coordinator, 919/705-6060

Winnebago Sites:

Carteret County: Newport Elementary School - Bill O'Neal, Media Coordinator, 919/223-4201

Rockingham County: Dalton McMichael High School - Ellen Hawkins, Media Coordinator, 919/427-5165

Computer Skills Program

Anson County - Suzanne Griffin, Computer Coordinator, 704/694-4885
Cabarrus County - Jean White, Computer Coordinator, 704/786-9805
Rowan-Salisbury - Zelia Frick, Computer Coordinator, 704/636-6750
Watauga County - Sally Anderson, Computer Coordinator, 704/264-7190

Information Skills Program

Gaston County: William C. Friday Middle School - Debbie Cone, Media Coordinator, 704/922-5297

Haywood County: Canton Middle School - Nita Matzen, Media Coordinator, 704/646-3467

Kings Mountain City: North Elementary - Jane Talbert, Media Coordinator, 704/734-5663

Lincoln County: Battleground Elementary - Judy Jones, Media Coordinator, 704/735-3146

Charlotte/Mecklenburg County: East Mecklenburg High School - Augie Beasley, Media Coordinator, 704/343-6430

McDowell County: McDowell High School - Linda Wood, Media Coordinator, 704/652-7920

Newton-Conover City: Newton-Conover High School - Danny Lentz, System Supervisor, 704/465-0920

Rowan-Salisbury: Bostian Elementary School - Karen Isenhour, Media Coordinator, 704/857-2322

System-Level Contacts

Sue Spencer, Randolph County, 919/318-6100
- Integrated Communication System (video retrieval)
- Homework Hotlines
- Totally Networked Schools
- Follett's Circulation Plus/Catalog Plus/Textbook Plus
- Networked Telecommunications (modems)
- Technology Planning in New/Renovated Building

Mary Forrest, Carteret County, 919/728-4583
- County Wide On-Line Catalog
- Information Sharing: Fax, Modem, Union Catalog
- Networking a School with Multiple Platforms
- Lego Logo: Robotics, Problem Solving and Co-op Learning
- Accelerated Reader

D. J. Brice, Gaston County, 704/866-6100
- Instructional Management System: Using ABACUS/MCAD
- Technology Minigrants Sponsored by District
- CD-ROM Network Planning
- Networking Instructional Labs, Schools and Central Office
- Technology Training Program for Principals, Assistant Principals
- A Pyramid Staff Development Model

Lisa Gurganus, New Hanover County, 919/763-5431
- Fiber Optics/Vision Carolina Project
- County-Wide Electronic Bulletin Board
- Integrated Learning Systems: WICAT/Jostens
- Technology Planning for Schools
- Technology Fairs

Carolyn Crew, Buncombe County, 704/255-5921
- Media Automation
- CD-ROM Network and Jukeboxes
- Staff Development with Distance Learning
- System-level AV/Computer Repair
- Media Facilities Planning and Upgrades

Bibliography

Boone, Mary E., Leadership and the Computer - Top Executives Reveal How They Personally Use Computers to Communicate, Coach, Convince, and Compete, Prima, 1991.

Cetron, Marvin and Margaret Gayle, Educational Renaissance: Our Schools at the Turn of the Twenty-First Century. St. Martin's, 1991.

Clinton, William J., and Gore, Albert, Jr, Technology for America's Economic Growth, A New Direction to Build Economic Strength, Government Printing Office, Washington, D.C.,1993.

Collins, Susan R., et al., Teaching, Learning, and Technology: A Planning Guide, Apple Computer, Inc., 1991.

Commission on the Skills of the American Workforce, America's Choice: High Skills or Low Wages, National Center on Education and the Economy, 1990.

Council of Chief State School Officers, U.S. Education and Instruction through Telecommunications: Teleconference Summary, Council of Chief State School Officers, 1993.

Dickinson, Dee. "Multiple Technologies For Multiple Intelligences." The Electronic School, May 1992.

Dworetzky, T.A., "Roadmap to the Information Highway," MM, February/March 1994.

Durham, Alden E., "Educational Reform: The Critical Role of Information Technology," Occasional Paper #14, Institute for Educational Leadership, Washington, D.C., 1992.

Espinosa, Leonard J., Microcomputer Facilities in Schools, Libraries Unlimited, Inc., Englewood, Colorado, 1990.

Gifford, Bernard R., ed., "The Future of Technology in Education," Business Week, November 1993.

HEIRA,ed., "What Presidents Should Know --- About the Integration of Information Technologies on Campus," Background Papers for HEIR Alliance Executive Strategies Report #1, HEIRA, 1992.

Honey, Margaret, and Andres Henriquez, Telecommunications and K-12 Educators: Findings from a National Survey, Center for Technology in Education, 1993.

Hopkins, Michael., "Technologies as Tools for Transforming Learning Environments." The Computing Teacher, April 1991.

IBM Corporation, Science Success Stories, EduQuest, the IBM Educational Systems Company, Atlanta, Georgia, 1992.

Kearsely, Greg, Computers for Educational Administrators, Ablex, 1990.

Lewis, Peter H., The Technology of Tomorrow, The New York Times Company 1991.

MECC, Improving the Use of Technology in Schools: What We Are Learning, Center for the Study of Educational Technology, University of Minnesota, 1988.

National Foundation for the Improvement of Education, Images of Potential: Learning Tomorrow, National Foundation for the Improvement of Education, Washington, D.C., Undated.

North Carolina Department of Public Instruction, A Primer on Cabling Design and Implementation: Considerations for Decision-Makers, North Carolina Department of Public Instruction, Raleigh, 1992.

North Carolina Advisory Council on Telecommunications in Education, Telecommunications in Education, Executive Order 136, Volume 1, Office of the Governor of North Carolina, 1992.

Okey, James, et al., Uses of Technology in Education: A Task Force Report to the BellSouth Foundation, Bell South Foundation, Atlanta, 1991.

Pellegrino, James W., "Technology and Cognitive Science," Science Briefs, September/October 1993.

Public School Forum of North Carolina, Technology in the School House, Public School Forum of North Carolina, Undated.

Reilly, Brian. "The Negotiation of Group Authorship Among Second Graders Using Multimedia Composing Software," Apple Classrooms of Tomorrow Report #14, Apple Computer, Inc., Cupertino, CA, 1992.

Ringstaff, Cathy, et al. "Trading Places: When Teachers Utilize Student Expertise in Technology-Intensive Classrooms," Apple Classrooms of Tomorrow Report #15, Apple Computer, Inc., Cupertino, CA, 1991.

Sandholtz, Judith Haymore, et al. "The Relationship Between Technological Innovation and Collegial Interaction," Apple Classrooms of Tomorrow Report #13, Apple Computer, Inc., Cupertino, CA, 1991.

Schultz, Elizabeth, "But Does It Work?," Teacher Magazine, January 1991.

Sheingold, Karen & Tucker, Marc, Restructuring for Learning With Technology, Center for Technology in Education, Bank Street College of Education, 1990.

Sheingold, Karen, and Martha Hadley, Accomplished Teachers: Integrating Computers into Classroom Practice, Center for Technology in Education, Bank Street College of Education, 1990.

Software Publishers Association, Report on the Effectiveness of Microcomputers in Schools, Software Publishers Association, Washington, D.C., 1990.

Southeastern Regional Vision for Education, Using Technology to Improve Teaching and Learning: Hot Topics Usable Research, Southeastern Regional Vision for Education, 1993.

Southern Regional Education Board, A Proposal for Educational Technology Partnership to Help Reach America's Education Goals, Southern Regional Education Board, 1993.

Southern Regional Education Board, The Key Elements of Effective State Educational Technology Planning, Southern Regional Education Board, 1992.

Spielberger, Charles D., "Learner-Centered Psychological Principles: Guidelines for School Redesign and Reform (Draft)," Communiqué, September 1992.

Talia, Marcie, ed., Inspiring Educators: True Stories about Macintosh in Schools, Apple Computer, Inc., Undated.

Technology & Learning Editors, "Update: The Latest Technology Trends in the Schools," Technology & Learning, February 1993: 28-32.

Texas State Board of Education, Choosing Excellence: The Long-Range Plan for Technology, Texas State Board of Education, Dallas, Texas,1988.

Tierney, Robert J. et al., "Computer Acquisition: A Longitudinal Study of the Influence of High Computer Access on Students' Thinking, Learning, and Interactions." Apple Classrooms of Tomorrow Report #16, Apple Computer, Inc., Cupertino, California, 1992.

U.S. Congress, Office of Technology Assessment, Power On! New Tools for Teaching and Learning. U.S. Government Printing Office, Washington, D.C.,1988.

U.S. Congress, Office of Technology Assessment, Linking for Learning: A New Course for Education, U.S. U.S. Government Printing Office, Washington, D.C.,1989.

U.S. Department of Labor, What Work Requires of Schools. A SCANs Report for America 2000. The Secretary's Commission on Achieving Necessary Skills, U.S. Department of Labor, Washington, D.C.,1991.

Wurman, Richard Saul, Information Anxiety: What to Do When Information Doesn't Tell You What You Need to Know, Bantam Books, New York,1989.