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ABSTRACT

Policy briefs are reports on the status of current issues in education from a national perspective; descriptions of actions and agendas in the North Central Regional Educational Laboratory (NCREL) region; and commentaries by experts from their particular point of view; and resources for further information. The focus of this report is technology and education. The brief begins with a report entitled "Education as a Component of the National Infrastructure" (Dennis Gooler) that examines the role of schools in the national information infrastructure (NII). Next, regional actions and agendas are presented for the states in the region, i.e., Illinois, Indiana, Iowa, Michigan, Minnesota, Ohio, and Wisconsin. The following information is given for each: local efforts; state efforts; financial aspects; key groups in education technology; educational equity; and education technology needs. Recent legislative developments are presented in the report "Recent Legislative Initiatives Expected To Affect Educational Technology," (Rafael Ramirez and Rosemary Bell). Finally, state contacts are listed. (JLB)

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Policy Briefs

A Publication of the North Central Regional Educational Laboratory

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Toward a Technology Infrastructure for Education: Policy Perspectives I

Director's Note:

Technology information is changing while we write. New legislation and funding, new technologies and emerging expertise about how to use them to enhance student learning, and new relationships between educators and the private sector will require that decision-makers stay alert and positioned to respond appropriately. This ***Policy Briefs*** *and the other policy work of the Regional Policy Information Center are designed to capture and bring knowledge of these emerging resources to the decision-maker.*

We are convinced that technology is transforming and will continue to transform the way teachers and students learn. This transformation involves much more than merely changing paper work sheets to computer ones or providing advanced calculus to rural students through distance learning. Technology will change the nature of the learning process from a passive endeavor to an active one as students, young and old, access information and work with others from around the world. The North Central Regional Educational Laboratory shares the responsibility with policymakers at all levels to guide this transformation.

Overview

Education as a Component of the National Infrastructure

by Dennis Gooler, Northern Illinois University

Discussions about the nature, quality, and structure of the American education system can be viewed as part of a broader discussion about the national infrastructure. People are taking a closer look at the condition of water and sewer systems, highways, bridges, and other physical elements, and in many instances are finding them to be inadequate. Schools are a vital part of the national infrastructure, but concerns about the nation's schools extend beyond the physical structures to the basic processes of teaching and learning that go on in our schools.

An important part of the debate during the last presidential campaign concerned the need for and desirability of strengthening or rebuilding the basic infrastructure of American society. In a report from the National Telecommunications and Information Administration (NTIA), U.S. Department of Commerce (1991), the authors suggested that infrastructure:

> refers to a nation's stock of physical capital that provides the underlying foundation or framework for private-sector endeavors, or that is used to furnish essential services to the public. As such, the term encompasses both the capital owned or funded by government (e.g., highways and airports) and the capital assets controlled by private firms subject to varying levels of government oversight (e.g., railroads and electric companies). (p. 13)

Presumably, each presidential candidate declared his intention to improve our infrastructure as needed; the central debate was over how to finance such improvements in a time of significant national debt and a slow economy. This broader debate about financing infrastructure improvements has its counterpart in education: How is restructuring and reform to be financed in these times?

Educators and educational policymakers rightfully focus on the education subset of the national infrastructure, but their focus must be broadened to include other subsets that affect education or could affect education in the future. One such subset of the national infrastructure that has an ever-increasing impact on education is communications—particularly the telecommunications, mass media, and customer premises equipment (CPE) elements of the communications infrastructure. The importance of the communications subset of the national infrastructure and especially the telecommunications component was emphasized in the NTIA (1991) report:

> Telecommunications is a vital component of the U.S. economy and, indeed, of the nation's way of life. Rapid and efficient communication—initially by telegraph, and later by telephone—was important in the nineteenth century in unifying the country as the United States expanded westward and developed into an industrial power. As economic markets became more and more globalized, America's domestic communications system was important in permitting U.S.-based firms to operate efficiently and to compete internationally. Finally, even the most casual telephone user cannot but marvel at the ease and simplicity with which he or she can communicate, using either voice or data, with others in other parts of the country or the world. (p. 21)

Using Technologies in Education

As part of plans for school reform and restructuring—particularly in teaching and learning—many argue that the education systems of our nation ought to be active users and shapers of current and emerging communications elements. Telecommunications, mass media, and various forms of customer premises equipment (e.g., microcomputers,

CD-ROM players, VCRs, etc.) can and should play a vital role in our vision of teaching and learning for tomorrow's schools. Technologies are fundamental in preparing our young people for the world that we believe they will occupy, both as vehicles for learning and as basic tools in the workplace. To be sure, the nature of tomorrow's workplace is not certain, and numerous scenarios have been formulated to describe the impact that technologies will have on the nature of work itself, as Zuboff (1988) has so compellingly portrayed.

If schools are to help us gain proficiency in the use of these technologies, then those technologies must be readily available to teachers and learners.

Regardless of the precise changes in the nature of work and workplace or indeed in how information is accessed and used by citizens in the future, schools have a very strong interest in these matters. After all, schools are in the information business and in the business of helping young citizens prepare to live in a rapidly changing world. To the extent that we will be required to use (and live with) telecommunications and other technologies simply to survive as citizens and workers, it is appropriate that our schools engage us in the use of these technologies throughout our formal schooling. As individuals, we need to achieve a "comfort level" with technology that permits us to use technologies to learn and to manipulate information. In short, we must learn to use creatively the technologies that play an increasing role in our daily lives.

If schools are to help us gain proficiency in the use of these technologies, then those technologies must be readily available to teachers and learners. It is one thing to acknowledge the importance of communications in our lives and the need for a communications infrastructure in schools and in informal educational settings. It is quite another to enable schools to take advantage of such an infrastructure.

> As telecommunications and applications develop, education appears to be a secondary actor in the process. Simply put, the educational community is not sitting at the telecommunications policymaking table where important decisions are being made that will have a significant impact on education in the future. . . . Schools need to connect to the national telecommunications highways much like communities need on- and off-ramps to the interstate transportation highways. Many classrooms do not have even telephone lines, for example, while other higher band applications for schools, such as videoconferencing and high-speed computing, are already commercially available. (Gooler, Firestone, and Clark, 1991, pp. iii-iv)

The education system is not automatically included in plans for advanced telecommunications and technology systems, for a host of reasons. (There are exceptions, of course, such as the Star Schools projects and other local and state initiatives involving technology applications in schools.) Educators have not always insisted on having a local communications infrastructure that meets the information and communications needs of teachers and learners. Furthermore, when educators have promoted the use of technology to improve teaching and learning, they often have opted for "stand-alone" technologies, meaning that an individual classroom, school, or (less often) school district obtains a form of technology that is not connected to any other setting or system. Yet, the characteristics of emerging technologies, coupled with demands for information resources and technology-based learning tools, suggest the need to create a national technology infrastructure for education.

Toward a Technology Infrastructure for Education

To move toward a telecommunications and educational technology infrastructure for education requires educators and policymakers to expand and substantially change the discourse on technology applications in education. Melmed and Fisher (1991), in a study from the Center for Educational Technology and Economic Productivity at New York University, touch on some of the reasons that such a change is needed:

> Current developments in digital technology, powerful market forces, and public policy concerned with scientific computing could combine to create the potential for widespread use of high-tech information technology with great social, educational, and economic benefit for all Americans. This outcome is not assured. Many technical, economic, and regulatory barriers stand in the way, with little effort by political and social institutions to ensure public participation in the nation's emerging digital communication and information infrastructure. (p. 1)

Americans are not starved for information, argue Melmed and Fisher, since most citizens have access to newspapers, magazines, books, radio, broadcast and cable television, libraries, and 800 and 900 telephone numbers. But a coordinated electronic infrastructure gives individuals the capacity to connect and interact with one another and with information sources, together with universal access and a broad array of images and tools. Electronic technology infrastructures have the potential to alter radically the range of information and resources that learners can access as well as what they can do with what they can access. One small example: Individual learners, regardless of where they live, might have access through the electronic infrastructure to the extensive databases created by major newspapers, only a small part of which appears in print in the daily newspaper. Or learners might gain access to the holdings of the Library of Congress.

If one accepts the argument that schools and other educational institutions must be connected to a national communications infrastructure, what are the issues to be considered in making the necessary connections and taking advantage of those connections? Given that many of the technical elements of a national communications infrastructure are in place (such as cable systems, electronic highways such as the Internet and the emerging National Research and Education Network (NREN), and advanced telephone and video systems), what would prevent schools from "plugging in" to the networks?

Policy Implications

For educational policymakers, calls for creating a universal, powerful, and flexible telecommunications and technology infrastructure that can be used by the nation's education systems raise a myriad of complex policy and operations questions that must be addressed. Melmed and Fisher (1991), for example, make the following observation:

> Many barriers exist to realizing the social benefits of an emerging modern communication and information structure. . . There are technological and economic issues; there are public policy issues of different kinds, including, inevitably, who pays and who gets. This is a formidable agenda for the nation. (p. 13)

Hezel (1991) argues that state-level policy issues involving telecommunications infrastructures center around the concepts of equity, access, and quality. Williams (1991), examining the concept of the Intelligent Network (a technology infrastructure), outlines some of the services that might be available to schools and other social institutions through an intelligent network and asks what kinds of policies must be established to balance citizen, business, and public service goals in deployment of a network. In its study of distance education, the Office of Technology Assessment (1989) observed that "telecommunications policies can be

barriers to implementation or they can expedite development. They require immediate attention at the national level." (p. 19)

As state and local policymakers seriously consider making schools an integral part of a communications infrastructure and ask how technologies might best serve the goals of education and education reform, they also must confront issues in substantive areas, including but not limited to the following:

- **Programming Issues.** How do we develop programming that takes advantage of the power of the infrastructure? How do we determine intellectual property rights when programming is available through an electronic infrastructure? How is programming best shared among users?
- **Training Issues.** What kinds of skills and perspectives do teachers and learners need in order to use the infrastructure effectively? How will teachers and learners gain these skills and perspectives? What are the implications for preservice and inservice teacher and administrator preparation programs? How can we develop and sustain long-term staff development and technical assistance programs for teachers?
- **Financial Issues.** How will we pay initial capital costs? How can we ensure equity in financing capital costs? What are the ongoing and recurring costs of using the infrastructure, and how shall those costs be paid? How do we fund programming development costs
- **Coordination and Planning Issues.** How much and what kind of planning and coordination will be required to make effective use of the communications infrastructure? Who should provide needed planning and coordination?
- **Technical Issues.** What kinds of hardware and software should schools purchase to use as part of the infrastructure? What standards should be followed? How do we deal with changes in technologies? How do we maintain needed equipment?
- **Regulatory Issues.** Who regulates the infrastructure? What are the specific regulatory roles of state and national agencies? How are rate structures established, and do special rates apply to educational uses of infrastructure services? Does widespread use of the infrastructure by schools present curriculum, certification, or other education regulation issues?
- **Evaluation Issues.** How do we determine whether the infrastructure is serving the needs of educators and learners? How do we make modifications in the infrastructure as they are suggested by research and evaluation data? Is the infrastructure a cost-effective means of providing educational opportunities, and in what settings?

A central question is: Can educational policymakers afford not to begin addressing these complicated issues and fashioning policies to enhance the use of communications and information technologies in our nation's classrooms? Is it possible that the education system can function effectively without making use of these emerging technologies?

It will be apparent to local, state, and national policymakers that categorizing these issues masks a large number of complicated and interrelated policy concerns. A central question is: Can educational policymakers afford not to begin addressing these complicated issues and fashioning policies to enhance the use of communications and information technologies in our nation's classrooms? Is it possible that the education system can function effectively without making use of these emerging technologies? For years, advocates have insisted that if schools would just use a given technology their instructional, administrative, and fiscal woes would be over. Too often, advocates for a specific technology promise far more than the technology can deliver. No wonder policymakers at the state and local level are a bit cautious—even a bit cynical—about the most recent round of technology advocacy.

The difference in today's discussion of technology may be that the kinds of technologies (and related services and applications) being discussed for education are also prominent in the workplace, the home, and the community. Williams (1991) reiterates this point:

> In the last decade, telecommunications has moved from a background role of a utility to applications meant to create new competitive advantages in businesses, increased productivity in public services, and economic development in cities, states, and nations. (p. vii)
>
> As we witness the benefits of the coalescence of telecommunications and computing, many are calling this the arrival of the intelligent network, which is as much a national resource as a communications medium. (p. 1)

Connections by schools into the communications infrastructure no longer appear to be luxuries, but necessities if our schools (and our learners) are to gain knowledge that is relevant in tomorrow's world.

Technology applications in education cannot easily be distinguished from technology applications in many other sectors of society. Connections by schools into the communications infrastructure no longer appear to be luxuries, but necessities if our schools (and our learners) are to gain knowledge that is relevant in tomorrow's world.

The education policymaker is faced with a difficult proposition: A persuasive argument can be made that schools must be connected to the national communications infrastructure and draw on the information resources and interconnectivity of the infrastructure, yet the short- and long-term implications of using the infrastructure raise potential problems. Wurman (1989) has described the "information anxiety" that overcomes many people when faced with access to large amounts of information (information that the infrastructure surely could, in time, deliver to each user). Postman (1992) warns us against the surrender of culture to technology, asserting that the uncontrolled growth of technology can destroy the vital sources of our humanity. Roszak (1986) advises caution in approaching a technology infrastructure for education:

> Thanks to the high success of information theory, we live in a time when the technology of human communications has advanced at blinding speed, but what people have to say to one another by way of that technology shows no comparable development. (p. 16)

Some Pervasive Questions

It is clear that our national infrastructure will include electronic highways that will reach most areas of the nation, offering the potential for a vast communications network. Whether appropriate on and off ramps from these highways will connect our schools to this network remains an open question. There is no doubt that some schools will connect to the network, and this fact alone suggests some fundamental questions for education policymakers at all levels: What does education equity mean in an age of technology and information? Will the "haves" connect to the infrastructure, while the "have-nots" are denied access? What might be the long-range consequences of this division within our nation's schools? What policies need to be shaped, practices followed, and regulations imposed to prevent inequity from taking a new form for a new generation? To the extent that the prognosticators are accurate—that information accumulation, manipulation, and transmission will define life in the next century—what happens to those young people who do not have the opportunity to gain knowledge, perspectives, and skills germane to these information-related activities? If we look at our history, we know the answer.

For those students who do have access to the communications infrastructure and have the tools and information resources promised as part of that infrastructure, other questions are raised. Will access to these tools and resources involve students in what Postman (1992) describes as an "ahistorical, information-saturated, technology-loving character of Technopoly"? Or, as Leebaert and Dickinson (1991) ask, will these students and their teachers "ignore the creative possibilities and become dynamically passive, using the obvious to get the extraordinary rather than discerning the less obvious to achieve the miraculous"?

The policy issues associated with schools and the communications infrastructure are made complex by rapid changes in technologies, by the morass of agencies and processes that regulate and coordinate technology and education throughout the nation, and by ambiguities in what we want for our education system and its processes and what we want out of them.

That is, will exposure to and involvement with technology resources alter the nature of teaching and learning in ways that are less than desirable?

The policy issues associated with schools and the communications infrastructure are made complex by rapid changes in technologies, by the morass of agencies and processes that regulate and coordinate technology and education throughout the nation, and by ambiguities in what we want for our education system and its processes and what we want out of them. We need to decide first whether it is important for our schools to be connected to the national communications infrastructure. If the answer is yes, we must address a number of *how, how much, when*, and *with whom* questions.

Organizing these questions around groups of issues and understanding the relationships among those groups may make the policy-setting task more manageable.

I wish to close this overview with a personal observation. In my judgment, we as a nation cannot afford even to contemplate *not* "plugging in" education to a national and international telecommunications infrastructure. To remain outside of that infrastructure is to deny students and teachers access to what will be the basic information resources of future society, thus robbing future generations of the tools and resources that they will need to be effective citizens, workers, thinkers, and social beings. I do not mean to suggest that education must warmly embrace every invention, technology, strategy and product. Above all, educators must be critics, but critics with a vision of the structure and processes of a changing society. Precisely how we as an education community will connect to the infrastructure and use information resources and tools to further the cause of effective teaching and learning is not crystal clear. What is certain is that we must be an active player in the game—the outcome is too important for us to watch from the sidelines.

Dennis D. Gooler is Professor and Chair, Department of Curriculum and Instruction, College of Education, Northern Illinois University. Dennis has worked for many years on problems pertaining to technology applications in education and on the study of the effects and consequences of technology uses. Dr. Gooler has written on technology planning and assessment issues, has served in a consulting capacity to numerous agencies and institutions involved with technology applications, and has participated in the development of technology legislation. In his current capacity, Dr. Gooler is particularly interested in preparing teachers to use technology effectively in and out of the classroom.

Regional Actions and Agendas

Illinois

Local Efforts

An Educational Service Center (ESC) survey of its directors and technology specialists was conducted to determine the extent and manner of Illinois school districts' use of technology to obtain sufficient information on which to base policy direction. Because ESCs provide a variety of technology-related services to local school districts, their staff seemed a reasonable source for this information.

The results of this survey tend to confirm national data suggesting that slow progress is being made in integrating technology into education. The averages reported by ESC personnel indicate the following:

- Less than 10% of Illinois school districts are making use of multiple technologies as part of an overall plan for restructuring their schools.
- The use of technology as part of the total curriculum has not yet begun in 76.4% of Illinois districts.
- For 44.6% of the districts in Illinois, technology is, at best, a resource for teachers and students.
- As much as 15.9% of Illinois school districts are making very little use of technology in any form.
- A significantly higher percentage of districts uses technology for management purposes than for teaching and learning—the most common applications of technology in Illinois schools are accounting, student record keeping, and budgeting.

Analysis of ESC data shows significant variation among ESC areas. For example, in three ESC areas, 75% or more of the districts either are making little use of technology or have only begun to use technology as a resource for teaching and learning. Other ESCs report that more than 75% of their districts are making extensive use of technology as part of a technology and/or restructuring plan.

After the survey was completed, conversations with ESC representatives suggested that their responses had been generous and that the overall level of technology use in Illinois school districts is actually lower than the data would indicate. ESC personnel suggested that a substantial number of districts "haven't even gotten off the bus and into the dugout."

A similarly gloomy picture appeared in the September 1992 issue of *Macworld* magazine. Using data from Quality Education Data (QED) in Denver, Colorado, the magazine reported that Illinois ranks in the bottom 10% of states in the ratio of computers to students.

Although the number of computers per student cannot adequately measure how well districts are making use of technology, QED's information does indicate a lack of meaningful access to technology in Illinois schools.

It was clear in the survey and in subsequent discussions with ESC personnel and others that every part of the state has a few local districts that are models for the effective use of technology. Many of these districts were featured in last spring's "Tech 2000" demonstration, which allowed legislators and others to view the technology initiatives of more than 100 local schools and school districts. However, it would be misleading to believe that these districts represent the status of technology use in Illinois schools.

State Efforts

To fulfill its commitment to the availability and effective use of technology in Illinois schools, the State Board of Education needed to find out what would be necessary to achieve this end. Board staff were asked to conduct a policy study to answer the general question: What should be the appropriate role of the State Board in ensuring access to technology and proficiency in its use for students and educators?

This study involved two separate but related sets of activities. The first was aimed at developing a common base of information and perspective among board members and staff. Activities toward this objective included the following:

- Preparation of a briefing notebook of relevant technology materials
- Observation of local school district technology programs
- A long-range planning seminar with Dr. Karen Sheingold, former director of the Bank Street Center for Technology in Education, and four Illinois educators: Siri Hartsfield, a teacher in Springfield; Walter Warfield, then superintendent of the Decatur school district; Ron Fortunato, technology coordinator for Glenbrook South High School; and Perry Soldwedel, assistant superintendent for the Pekin elementary school district
- A demonstration of IDEAnet, Indiana's statewide telecommunication network for education
- A long-range planning seminar with Alan November, technology coordinator for Glenbrook North High School and a nationally known consultant on technology and education

The second set of activities was aimed at answering the following study questions:

- What are the appropriate and effective uses of technology in the schools?
- To what extent do Illinois school districts now make effective use of technology as a resource to support student learning and improve operational efficiency?
- What initiatives promote and what barriers limit the effective use of technology by Illinois school districts?
- What is the appropriate role for the State of Illinois/State Board of Education in removing these barriers and promoting effective technology use in Illinois schools?

To answer these questions, the staff study team conducted a review of the literature; compiled information specifically relevant to Illinois, including a variety of previous reports; conducted surveys of ESC personnel and staff at the colleges of teacher education; visited local school district and university technology programs; met with representatives of local school districts and other state agencies; interviewed agency staff; attended relevant meetings and conferences; and explored a variety of legal and technical issues.

This study did not use any single definition of technology, but kept in mind the broad array of electronic, mechanical, and other devices that already exist and that may be introduced in the future. The study was not limited to computers.

With the implementation of the new school recognition/improvement process, the agency is concentrating its resources on building a database that gives staff access to a full profile of district information and allows school districts to identify, through telecommunications, a variety of resources that may support their school improvement efforts.

Recommendations aimed at helping schools use technology more effectively to support learning and improve their operation are ready for implementation following their adoption by the State Board of Education. These recommendations, based on research and a policy study by agency staff, call for the State Board to take the following actions:

1. Establish a formal coalition of business leaders, technology providers, local district educators, and representatives of various aspects of state government to provide a forum for technology planning, communication, collaboration, and advocacy.
2. With the assistance and support of this coalition, develop a vision for the use of technology in Illinois education and a state-level strategic plan for achieving that vision.

3. Identify and appropriately modify the laws, policies, rules, and practices that inhibit the use of technology as a resource and catalyst for improving student learning.
4. Develop a statewide telecommunications system serving elementary and secondary schools.
5. Continue efforts to incorporate technology into the operation of the state education agency and the administration of its programs.
6. Support federal actions that supplement and support the state's technology initiatives.

One of the major issues associated with the variations in access and use of technology in Illinois school districts is equity. Under the right conditions, technology can bring human and data resources to students who might otherwise never be able to access such resources, bridging traditional gaps of wealth and location.

Financial Aspects

With the implementation of the new school recognition/improvement process, the agency is concentrating its resources on building a database that gives staff access to a full profile of district information and allows school districts to identify, through telecommunications, a variety of resources that may support their school improvement efforts.

The State Board's FY93 budget made technology capacity-building a priority, and funds are now being used for the following major initiatives:

- Purchase a state education license for communications software that will allow all school districts to communicate by telephone lines with the State Board and with one another
- Identify standards for electronic submission of local school district financial data
- Develop data systems to support the new school accountability process
- Develop a new administrative accounting system

The FY94 budget recommendations call for continuation of these initiatives and new funding to support automation of the process where possible.

Key Groups in Education Technology

The following are examples of promotion and support for technology use:

- The Educational Service Centers are responsible by law for providing services related to achievement of computer literacy and high-tech competency.
- The Illinois State Board of Education and Western Illinois University collaborate on the WIU/ISBE network.
- State and federally funded programs integrate college preparatory coursework with rigorous technical education concentration.
- Since 1989, a total of $39.7 million in state funds has been appropriated for improving the mathematics, science, and technological literacy of Illinois students and teachers.
- A recently developed partnership with eleven public television stations and the State's larger school districts, known as the Illinois Cooperative Group Buy, involves the pooling of resources for more cost-effective purchasing of quality video programming.
- ISBE staff have begun working with Central Management Services to pursue the building of "electronic highways" in Illinois, and another staff group is working to identify the databases that would be accessible through telecommunications networks.
- Development of a new administrative accounting system

Educational Equity

One of the major issues associated with the variations in access and use of technology in Illinois school districts is equity. Under the right conditions, technology can bring human and data resources to students who might otherwise never be able to access such resources, bridging traditional gaps of wealth and location.

Unfortunately, variations in the use of technology tend to widen the gap between rich and poor, rather than close it. In the September 1992 edition of *Macworld*, Charles Piller suggests that the issue is not simply the difference in availability of technology among schools, but that many schools—particularly those in inner-city or rural areas—do not have the skills or funds to train their teachers to use technology effectively or to maintain the equipment once it is acquired. Given the demands of the 21st century, this situation will lead inevitably to what Piller calls "a technological underclass."

The issue of *Macworld* in which Piller wrote his article was dedicated to "America's Shame: How We've Abandoned Our Children's Future." In the same issue, the editors made the following prediction:

> By the year 2000, we may create a schism in American society between have and have-not graduates from our own school systems. If computers are not successfully and widely integrated into primary and secondary education, our society will stratify into those with the knowledge to succeed and those who cannot.

The integration of technology into the schools should be based on a comprehensive plan, carefully developed by each local school board in cooperation with its administrators, faculty, parents, and community.

Building a Technology Infrastructure

The integration of technology into the schools should be based on a comprehensive plan, carefully developed by each local school board in cooperation with its administrators, faculty, parents, and community. However, a substantial number of school boards do not know how to proceed with such a strategic planning activity and/or do not feel comfortable with their ability to handle the technical issues that surely will be raised by the process. These boards and communities need systematic training to provide them with a common approach to this task.

Education Technology Needs

Among the needs for the successful integration of technology in Illinois schools are the following:

- **Vision or Strategic Plan.** The 1991 CCSSO Technology Policy Statement concluded that "[t]he state must communicate a clear and persuasive vision of technology's role in education to ensure that all key persons . . . work toward a common goal for technology use."
- **Coordination and Cooperation.** In the absence of any commonly understood vision or strategic plan for the use of technology in education, most groups and individuals with an interest in this issue have been proceeding more or less independently. This lack of cooperation and coordination can significantly impede progress and lead to enormous waste in time and money. For example, the setting of standards for telecommunication technologies is literally impossible without cooperation among a wide variety of entities.
- **Eliminate Some of the Resistance to Change and to Technology.** Resistance to change is partly a consequence of education's size; education is a huge enterprise, and one innovative project at a time does not have much impact on the entirety. Education is also a product of tradition.

The human tendency to revert to the familiar, lack of involvement in planning for change, implementation pitfalls—all of these problems have meant that the basic structure of schools and schooling has changed very little. This resistance seems to intensify when the issue is technology in schools.

- **A Sufficient Funding Base.** Educational funding is already inadequate in Illinois and does not allow major, new initiatives such as the appropriate and effective implementation of technology in the schools. Because the state's funding system has inherent inequities, the lack of resources for new initiatives is more acute in some districts than in others. This lack of resources can widen the disparity of opportunity that already exists in the public schools.

  Moreover, some factors in the technology equation cannot be adequately or appropriately addressed at the individual district level. This difficulty is particularly true for (1) the creation of the "electronic highways," which will be necessary to connect all districts to one another and to telecommunications resources throughout the world and (2) the provision of training and technical assistance resources. These endeavors require not only coordinated state leadership, but a significant and stable source of funding.

- **Local Planning and Leadership.** For a variety of reasons, most local school boards have not engaged in any systematic planning to integrate technology into the schools. Even districts engaged in long-range strategic planning are paying scant attention to technology as a resource for restructuring the educational system.

- **Teacher Training and Technical Support.** The effective use of technology in the schools is dependent on the teacher's level of knowledge and comfort with technology and his or her ability to use technology to expand and improve the learning process. However, using technology in preparing teachers is, at best, in the very early stages of implementation. At the practitioner level, few districts have any comprehensive or systematic plan for providing either initial or continuing training in the use of technology for teachers already in the classroom.

  A related barrier to the appropriate and effective implementation of technology in the schools is the absence of technical expertise and support.

- **Deal with Mandates, Requirements, and Traditions.** We have barely begun to identify the organizational, policy, and procedural issues that act as barriers to using technology to transform education. However, it seems reasonable to expect that the list of such factors will be long and challenging.

- **Infrastructure.** Illinois school districts in both urban and rural areas are filled with old buildings that do not lend themselves easily to the rewiring necessary for comprehensive implementation of technology. State Board efforts to secure capital funding to address the facilities needs of local districts have been unsuccessful.

  Some parts of the state have an aging or inadequate communications infrastructure, while others do not have access to parts of that infrastructure (e.g., cable).

- **Modeling.** The state education agency has only recently begun to use the newer technologies for its own operation, and we still have a long way to go before that movement becomes fully evident at the local level.

Indiana

The State of Indiana and the Indiana Department of Education (IDOE) have provided vision, leadership, and ongoing support for technology initiatives since 1983.

Local Efforts

Local Education Agencies (LEAs) are responsible for planning, curriculum, staff development, and other issues related to the technology infrastructure. LEAs continue to look for the best resources available to them for planning, staff development, and hardware support, such as computer net-

works, bulletin boards, e-mail, library automation, and voice/video/data systems for classroom, staff development, and administrative needs. These resources include the IDOE, the Indiana Clearinghouse for Educational Technology (ICET), Educational Service Centers (ESCs), vendors, universities, telephone companies, outside experts, and schools.

Since 1983, the State has legislated funds for technology in the areas of training, technical support, and consultants; the Buddy System Project, with computers in homes for fourth, fifth, and sixth graders; the K-1 early childhood reading, writing, and math programs, using computer technology; and grants to K-12 schools.

State Efforts

The Indiana Department of Education provides resources, information, and technical support through its consultants. Other IDOE efforts include:

- The IDOE-funded Indiana Clearinghouse for Educational Technology
- State-sponsored conferences and assistance to other conferences and professional organizations in the state
- Materials and assistance in areas such as districtwide technology, planning, and development of capacity within LEAs
- Dissemination of technology products and training
- Planning for library automation and telecommuni ations
- Leadership training for technology use within the schools for principals, and teams of teachers and library media specialists
- IDEAnet, the Indiana Department of Education Access Network's bulletin board, conference, chat, and database system

Other state efforts include:

- The state-funded ESCs serve as regional consortia for products, training, and other needed services to member LEAs.
- Intelenet, a state commission, manages the statewide, integrated telecommunications network. This fiber optic network is available to state and local governments, schools, the Indiana Higher Education Telecommunication System (IHETS), and colleges and universities.
- The IHETS provides programming for universities and schools through Intelenet, microwave, telephone, computer networks, and satellite.

Financial Aspects

The State of Indiana has legislated a School Technology Advancement Account (STAA), which makes available to LEAs $5 million annually in low-interest loans. The State also gives LEAs access to local building funds for technology purchases. Since 1983, the State has legislated funds for technology in the areas of training, technical support, and consultants; the Buddy System Project, with computers in homes for fourth, fifth, and sixth graders; the K-1 early childhood reading, writing, and math programs, using computer technology; and grants to K-12 schools.

The federal government through the State also provides grants under programs such as Chapter II and Title II.

Key Groups in Educational Technology

Advocates for educational technology initiatives in Indiana include:

- Dr. Suellen Reed, IDOE Superintendent of Public Instruction, and the Indiana School Technology Enterprise Council (ISTEC), an appointed body with members from business, industry, and education and legislators that advise the state superintendent
- Marvin Bailey, President and CEO of the state-legislated Corporation for Educational Technology, which serves 20 schools in the Buddy System Project and seeks legislation to fund the project throughout the state
- Dr. Howard Mehlinger, Director, Center for Excellence in Education at Indiana University, which explores ways to use technology to improve education at all levels

- State Representative Philip Warner, Indiana General Assembly
- Art Linderman, Director, IHETS

Education Equity

Nondiscrimination and equity are policies of IDOE and the State Board of Education. Advanced Placement courses must be implemented by LEAs in 1994. Meanwhile, various LEAs have filed a class action suit to compel the State to provide equity in funding for Indiana public schools.

Building a Technology Infrastructure

Efforts and activities that help build the technology infrastructure include:

- The Indiana Department of Education's leadership, initiatives, and resources (teleconferences, conferences, training, grants, materials, expertise, referrals, network, clearinghouse, publications)
- LEA, state, and corporate partnerships, such as the Buddy System Project
- The state-legislated Indiana Library and Historical Board's library automation standards for public libraries and library services authorities, expending funds for library automation, effective July 1, 1993
- Partnershare, an example of a school, university, and business resource sharing group
- LEAs using local funding to remodel and build new facilities for incorporation of telecommunications and computer-related networks, which in some cases includes the use of Channel One installation for other in-house purposes, such as connecting to a steerable satellite dish

Education Technology Needs

In order to continue to expand the vision of technology planning and infrastructure, as well as ongoing staff development, Indiana's technology needs include equity for all groups and equity in funding, planning, and telecommunications.

Iowa

Local Efforts

Iowa's education standards require the board of education in each LEA to "adopt a plan for the efficient and effective use of technology in the instructional program." This plan "shall provide for the understanding and use of current technology by staff and students and shall include a procedure to review the district's utilization of technology as a teaching and learning tool." Technical assistance in the development of these plans is generally provided by the educational services and media personnel of Iowa's intermediate education agency, the AEA—Area Education Agency.

State Efforts

At the state level, the following efforts are being made:

1. The State Board of Education's "strategic plan" includes an objective addressing "instructional technology," which declares that "the power of technology will be harnessed in Iowa schools and community colleges to help students learn."
2. The Department of Education has appointed a technology commission to develop "a clear and compelling vision for using technology to transform the education system at the building, district, area, and state levels to support the teaching and learning process." This commission will conduct policy and practice analyses and provide a forum for addressing issues in technology.
3. The state's general assembly legislated the development and construction of the Iowa Communications Network (ICN), a statewide, fiber optic, two-way interactive telecommunications network connecting the Regents' universities, the community colleges, and a point of presence in each of Iowa's 99 counties.
4. Legislation was passed this year directing the governor to establish an educational technology consortium to develop a plan for computer use by children in Iowa. The ultimate goal is to provide a computer for each student and teacher in the state for school and home use.

Financial Aspects

Approximately $30 million was appropriated over a six-year period to begin paying for the construction of the Iowa Communications Network. Certificates of Participation also were sold to cover a major portion of the cost of construction. The voice and data traffic of state government will be transferred to this system over time, and the fees generated by that activity also are expected to help finance the system. In addition, educational users will support the system through an hourly access fee.

Iowa also was awarded a $4 million Star Schools demonstration grant that will support staff development activity, the development of regional partnerships that include area education agency, community college, and local education agency interests, and point of presence send/receive classroom equipment.

Expenditures for "technology" at the local level are at the discretion of and funded by the LEA. Cooperative purchasing by consortia of LEAs and/or the area education agencies is commonplace.

Key Groups in Education Technology

As such a comprehensive and expensive endeavor, "technology" must involve all sectors—higher education, including community colleges, area education agencies, the state education agency, the local school districts, and private enterprise. In addition, several professional organizations, particularly the Iowa Computer Using Educators and the Iowa Educational Media Association, are key players in the promotion, staff development, and nurturing aspects of advancing the technology agenda.

Key roles include: higher education—preservice and inservice education and modeling behaviors; community colleges—hubs for ICN and management of regional distance learning networks; AEAs—inservice and technical expertise from both the media and educational services divisions; LEAs—facilitating the teaching and learning process with the power of instructional technology.

The role of the SEA is to develop the vision of technology's impact on the transformation of education in Iowa and to advance its implementation through leadership, partnership, and legislative initiative. Furthermore, the SEA must promote equity of educational opportunity and define technology's role in achieving that goal. The technology commission initiated by the Department of Education is designed primarily to realize the technology mission of the SEA.

Education Equity

Equity of learning opportunity has been a major impetus in the development of the Iowa Communications Network. When complete, the ICN will bring equal access to information and instructional offerings to Iowa's smallest and most rural districts.

The Iowa Computer Initiative described previously is a further attempt to bring equity. At present, computers and associated access to information are available only to students whose districts or parents have made them a priority and can afford to make them available.

Recommendations advanced by the Technology Commission will undoubtedly address the issues of equitable access to technology, information, and education.

Building a Technology Infrastructure

The Iowa Communications Network and the proposed Iowa Computer Initiative both affect the state's technology infrastructure significantly.

As LEAs and other educational institutions replace or add instructional facilities, the wiring and other physical needs of today's and tomorrow's instructional and communications technologies must be incorporated. In addition, Iowa needs a funding mechanism built into the school finance formula to support technology.

Education Technology Needs

1. Statewide coordination of technology initiatives, policies, and practices
2. Technology's role in the transformation of education
3. Funding
4. Equity and other policy/practice issues

Michigan

In *Education: Where the Next Century Begins* (1990), the State Board of Education identified 14 goals as priorities for action. One of the goals called for the development of a comprehensive, five-year state technology plan to coordinate existing and emerging technology in four major areas: investments, integration, technical assistance, and professional training programs. Michigan's *State Technology Plan: 1992-97*, containing 22 recommendations, was adopted by the State Board of Education and establishes a framework for action for the development and implementation of technology systems and services in Michigan. The recommendations are organized into five major themes: school reform and restructuring, statewide telecommunication systems, professional development, technology investments, and copyright and fair use.

Local Efforts

In Michigan, all schools, colleges, and universities are focusing on teaching essential skills more effectively. Through Public Act 25 of 1990, known as the Quality Issues package, a model core curriculum that includes technology outcomes for K-12 education was established. Through P.A. 25, schools are in the process of planning for and implementing these technology outcomes for all students. An estimated 34 percent of Michigan school districts have reported progress in implementing the technology outcomes.

State Efforts

In response to the State Board's directive, *Michigan's State Technology Plan: 1992-97* was developed to assist local, regional, and state agencies in planning and utilizing technology to achieve broad educational outcomes. The five-year plan includes information about current services and systems that involve computers, electronic bulletin board systems, videodiscs, read-only compact discs, two-way interactive television systems, satellite and cable television programming, integrated learning systems, and multimedia. The State Technology Plan addresses technology issues concerning all learners receiving services from local and intermediate school districts, post-secondary institutions including teacher preparation programs, and adult education programs.

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Financial Aspects

The educational community views technology—computers, bulletin board systems, videodiscs, CD-ROMs, two-way interactive television systems, satellite dishes, and cable television programming—as a means to achieve the national and state education goals. Yet, the financing of technology for educational programming is still seen by many to be cost-prohibitive. Michigan continues to be faced with difficult decisions when considering the financing of statewide technology initiatives. In times of severe budget reductions, local districts are finding it necessary to explore innovative programs and strategic purchases. The *State Technology Plan* calls for the installment of computers, networks, satellite

dishes, and the other major technologies at the classroom and building sites.

In August 1993, the Michigan Legislature and the Governor enacted legislation that eliminated $6.3 billion in property tax support for public schools effective January 1, 1994. The legislature is preparing an education reform and school finance package to replace this revenue. Due to the fiscal climate in the state, it is difficult to estimate the level of funding that will be available over the next five years for implementation of specific recommendations. The Department continues to seek funding to implement the *State Technology Plan's* recommendations. State funds to support technology projects are still very limited. The primary state-funded technology program for the past two years has been TEC-CHOICES, which provides intermediate school districts with support for pilot technology projects.

Michigan continues to be faced with difficult decisions when considering the financing of statewide technology initiatives. In times of severe budget reductions, local districts are finding it necessary to explore innovative programs and strategic purchases.

In January 1993, the Michigan Public Service Commission (MPSC) ruled that Michigan Bell Telephone Company could either refund to its customers excess earnings of $10.5 million or provide a voluntary matching contribution so that approximately $21 million could be used to support educational telecommunications projects. In February, Michigan Bell agreed to provide a match if funds could be used by Michigan Bell to support telecommunications projects intended to make progress toward establishing an integrated statewide network. The MPSC's original order indicated that the Commission would make the final determination regarding what projects would be funded. Governor Engler appointed a Michigan Council on Telecommunication Services for Public Education, a three-member body that will allocate excess earning funds for distance learning projects.

Key Groups in Education Technology

The Department of Education realizes that those responsible for the educational enterprise—the governor and the legislature, the State Board/Department of Education and other state agencies, local and intermediate school districts, community colleges, four-year colleges and universities, professional associations, business and industry, parents, and students—must jointly plan for the technology initiatives to be implemented for the next five years.

More than 40 statewide organizations serve on the Superintendent's Technology and Telecommunications Planning and Advisory Group (TTPAG). This broadly representative Advisory Group will make recommendations on policy issues related to educational technology and telecommunications over the next two years. The TTPAG will advise the Department on implementation strategies for *Michigan's State Technology Plan: 1992-97* and work closely with the governor's office to support the creation of the Michigan Information Network. This advisory group will examine the impact of the plan on integration and restructuring, provide input regarding the organizational structure of an ongoing technology advisory committee to the Department, and address the need for affordable access to information, communication, and broadcast services for educational institutions. The group has been meeting since June 1993.

The Technology Training Team was established in 1992 to examine the use of various technologies, including interactive video, teleconferencing, and other telecommunications delivery systems for state government. The Department of Education is working with representatives from 18 state agencies to develop strategies that state government can use to deliver services to its employees and clients more effectively.

The Department of Education continues to meet with representatives from the major

information, communication, and broadcast services in the state, including the Telephone Association of Michigan, Michigan Cable Television Association, Michigan Public Broadcasting, satellite programming providers, and telecommunications and computer vendors, to discuss implementation strategies for the plan.

Since 1989, the Library Media Program Advisory Committee (LMPAC) has developed recommendations and strategies to maintain effective library media centers and programs for the State Board of Education. Public Act 141 of 1988, known as the Library Media Program Act, created this statewide committee. The LMPAC has developed a series of recommendations concerning library media programs and has presented these recommendations to the State Board in annual reports for 1991 and 1992. More recently, LMPAC has published an Information Processing Skills curriculum to support the technology component of the Model Core Curriculum.

In the governor's October 1993 message to the Legislature to reform Michigan schools, Governor Engler renewed his call for a Michigan Information Network that will "create a virtual statewide network that offers interactive data and video connectivity to every educational entity in Michigan."

The Michigan Information Technology Network (MITN) was formed in 1988 by the State of Michigan to strengthen the state's economic competitiveness through the application of distance learning technology. The MITN Board of Directors is seeking $15 million for a satellite transponder. The goal of this initiative is to reduce uplink costs and expand video programming options through a multi-channel broadcast capability. The State Superintendent serves on the MITN Board of Directors and is an advocate for a close working relationship between this organization and the educational community.

Educational Equity

Technological systems need to focus on equal access for all learners to educational content and human resources, regardless of the source or provider and the age of the learner. Michigan must guard against creating a society of information haves and have nots. Equity without regard to gender, race, ethnicity, socioeconomic status, mental or physical limitations, or geographic location must be guaranteed. The Department is engaged in several initiatives that promote equitable access to technology and information for educational institutions in the state.

A series of Policy Seminars is being sponsored by the Department to address important telecommunications and technology policy issues facing Michigan's educational system. The Policy Seminars are intended to raise the technological awareness of organizations, institutions, and persons responsible for the educational system.

It is estimated that 93 percent of the state's K-12 school districts have access to cable television services. In 1993, the Board of Directors of the Michigan Cable Television Association approved the Michigan Cable Television Integrated Network, A Vision Statement. This vision statement calls for the interconnection of more than 350 cable television systems serving more than 1,600 Michigan communities with fiber optic technology.

The number of satellite dishes located at educational institutions in Michigan is rapidly increasing. The Department estimates that nearly 60% of the state's K-12 school districts can be reached via satellite technology. Every community college in Michigan has satellite reception capability, as do most of the public universities, intermediate school districts (ISDs), and Regional Educational Media Centers (REMCs). The Department also has developed a regional downlink facility for educators and state employees for video programs and services broadcast via satellite.

Building a Technology Infrastructure

The successful operation of schools, colleges, and universities has become increasingly dependent on the efficient exchange of voice data and video signals. In the governor's October 1993 message to the Legislature to reform Michigan schools, Governor Engler renewed his call for a Michigan Information Network that will "create a virtual statewide network that offers interactive data and video connectivity to every educational entity in Michigan."

The Department has updated the State Board of Education's Inventory of Instructional Telecommunications Systems in Michigan, which describes telecommunications projects in Michigan and serves as baseline information in planning and developing distance learning systems. State government's use of telecommunication services is expanding, yet without an overall strategy. Over the past year, the State Board of Education and the Department have been involved in numerous telecommunications and technology initiatives, policy discussions, and planning strategies.

The Office of Grants and Technology provides information and technical assistance for public and private sector groups involved in the planning and implementation of technology-based programs.

The Department also is exploring the establishment of a statewide computer network infrastructure for the purposes of teacher-to-teacher communication, transmission of administrative records between local, intermediate, and state agencies, and connection to information sources from national and international networks. MichNet, operated by Merit Network, Inc., in Ann Arbor, provides a data network infrastructure in Michigan or "common gateway" that is used by Michigan's universities and colleges to access computer networks and databases through the state and across the nation. Community colleges, businesses, K-12 school districts and intermediate school districts, and government can use MichNet's infrastructure to connect to the National Science Foundation Network (NSFNET), which serves as the heart of the Internet. The Department of Education has become an affiliate member of MichNet (Merit Network, Inc).

Education Technology Needs

Public education is the last major labor-intensive industry to begin to use technology in its day-to-day business. Most of the technology that is available to business and government is unknown in our classrooms. Much of the technology being used in today's classrooms is used to reinforce outmoded, ineffective methods for teaching and learning. It is Michigan's vision to ensure the availability of technology to transform teacher and student roles in the 50,000 classrooms in this state. Technology can immediately help students achieve learning outcomes and provide greater equity in the delivery of educational services. Information technology allows structural changes to be made that will transform education, thereby allowing people to become better educated individuals, effective citizens, and productive workers. The State Board of Education described this individual in the state's Model Core Curriculum in 1991: "The technologically literate person is one who understands the role and impact of technology upon society, accepts the responsibilities associated with living in the technologically oriented Information Age . . . and uses technology as a tool for obtaining, organizing, and manipulating information; and for communication and creative expression."

There are still many issues involved in affordable access to information and broadcast services for Michigan's educational institutions. Major concerns that need to be addressed at the legislative or regulatory level include the following:

- Cost and access to satellite, instructional television fixed services (ITFS), and cable service by educational institutions
- Recognition of educational needs in licensing and legislation for satellite, ITFS, and cable services
- Lack of partnership opportunities to provide satellite, ITFS, and cable services due to regulatory restrictions

- Incentives for telecommunication common carriers to develop special pricing for distance learning projects
- Pricing differentiation for education vs. business for distance-learning services
- Transmission of educational interactive data and voice communications across the state
- Potential for duplication of effort by groups developing public and private telecommunications systems
- Legislative action to reauthorize the Michigan Telecommunications Act, which has a sunset provision effective January 1, 1996

Minnesota

Few concerted efforts at comprehensive education technology planning and/or infrastructure are being made in the state. The Minnesota Department of Education (MDE) is beginning to re-initiate its efforts.

Local Efforts

Each district is responsible for planning. Those with Interactive TV (about 34 co-ops) do work together in long-range planning.

State Efforts

State efforts have focused on the Internet. About 1,000 schools are participating in a two-year demonstration. The MDE also is taking the lead for Mastery/Outcome software. A plan will be ready by August 1994.

Financial Aspects

Few, if any, new dollars are available. The SEA is requesting eight staff positions to help schools plan distance education and computer networks.

Key Groups in Educational Technology

- Higher education has taken the lead in telecommunications networks and lines for data, video, and voice. K-12 will ultimately cooperate with these agencies.
- Senator LeRoy Stumpf of Thief River Falls is the primary legislative person interested in technology. His area of concentration is higher education. Both Senator Stumpf and the MDE want K-12 to piggyback with higher education.
- Technology and Informational Education Services (TIES), a regional cooperative, has taken a leadership role. Dr. Clark Kirkpatrick is the executive director.
- The MDE will set up a statewide technology leadership group soon to promote standards for technology.
- Private enterprise is not very active.
- Mark Manning is responsible for MDE efforts in Minnesota.

Educational Equity

The MDE Internet project is the main project attempting to provide equity between large and small districts.

Building a Technology Infrastructure

- The Cabinet (MDE commissioner and staff) will be asked to approve a statewide leadership committee by February 1, 1994.
- Eight staff positions have been requested from the legislature to address networks, distance education, and the Internet.
- The Internet project attempts to get to each local school building.

Needs to Be Addressed

- The legislature has not acknowledged the need, so no monies are forthcoming.
- The MDE needs to be more active in building a technology infrastructure. Severe budget cuts have hit the MDE, and it needs help to provide leadership.
- Some teachers' attitudes toward technology need to change.

The MDE needs to address the following questions as identified by the Technology Information Educational Service (TIES):

1. Is it the role of the state to provide equitable electronic access for all students throughout Minnesota?

2. Should the state invest in an infrastructure that allows electronic communication for all stakeholders providing public services?
3. Should the expansion of available information resources to K-12 schools be facilitated through funding and enhanced technical resources?
4. Should the state fund the necessary staff resources for consultation, training, and ongoing support to customize Internet resources for K-12 Minnesota schools?
5. Should a capital investment be made for all Minnesota schools to provide the technical infrastructure to each building to accommodate data, video, audio, and telecommunications—i.e., the Information Superhighway?
6. Should the state fund information system software applications to support the implementation of performance-based graduation rule requirements using statewide software and database standards?
7. Should statewide visionary leadership exist as a catalyst to implementing technology in schools?
8. Should the state fund the use of systems architecture standards and acquisition, development, and integration tools that allow for access to cross-agency, student-related data?
9. Should the state provide executive information systems to serve the needs of the state and public?
10. Should the state develop a comprehensive strategic technology plan for K-12?
11. Should the state provide "long-term commitment" of resources to this effort?
12. Should the state establish a system of governance for educational telecommunications that is inter-agency and inter-sector?
13. Should the state support professional development of existing and future staff to ensure technology competence?
14. Should the state develop incentives for staff to develop large- and small-scale efforts in technology innovation?

Ohio

The State Board of Education approved the Statewide Plan for Technology, which was developed by a broad-based advisory committee, in November 1992. The plan describes the goals and objectives for three areas: Administration/Management, Instruction, and Professional Development. Committees are working to develop action plans for each objective to include the steps for implementation, the responsible person or organization, the timeline, and the cost, if known. These action plans will be taken to the State Board this summer.

The Ohio Computer Education Network is nationally recognized for its ability to collect and aggregate data, provide linkages with national and international databases, and provide a variety of administrative functions for schools and districts. We are now working to bring all of the delivery systems together so that each can be used to its fullest, and together they can provide an integrated, connected statewide system.

Other actions will be taken this summer to implement a report from the governor's office that will bring together the users, providers, and state department staff who are most involved in technology.

The Ohio Education Computer Network forms the infrastructure of the Department of Education's electronic connection to the school districts and other agencies. The network uses the microwave system of the state of Ohio as well as advanced telecommunication links to connect to more than 3,000 school buildings in Ohio. The Department of Education depends upon this network for the transmission of much of the data necessary to fulfill statutory requirements of the districts. This strategic data includes financial, staff, and student elements. The recently installed Education Management Information System relies solely on the infrastructure of the network.

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Local consortia have begun to look at ways to develop interactive systems that are compatible and can be used to enhance instruction. Some counties are looking for creative funding mechanisms that will allow all districts to have access to the hardware, software, and professional development necessary to have a comprehensive program.

Local Efforts

Many local efforts are being developed and implemented in Ohio. Several districts have worked closely with Ohio Bell/Ameritech to put into place fiber optics for distance learning projects.

Local consortia have begun to look at ways to develop interactive systems that are compatible and can be used to enhance instruction. Some counties are looking for creative funding mechanisms that will allow all districts to have access to the hardware, software, and professional development necessary to have a comprehensive program.

State Efforts

The state legislature provided funds in the last biennium for the poorest 218 districts in the state to compete through grants for money to implement technology programs that would increase the opportunities of students to take courses not offered in the district. Another purpose was to ensure that students had access to state-of-the-art technology and information. Grants were given to districts for a variety of programs, including distance learning, computers, automated library systems, and learning management systems. A percentage of each grant was required to be set aside for professional development to maximize the use of the technology.

Financial Aspects

The State Board has requested a large increase in expenditure for technology for the next biennium. At this time, the legislature is working on the budget, and it appears that there will be some funds for technology not only for the poorest districts, but also for all districts. There are funds built into the budget for the Computer Education Network.

School Districts continue to look for other funding sources through local businesses, local temporary taxes, and fundraising activities.

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Key Groups in Education Technology

The key players in Ohio for technology include:

- **Legislators.** The state education agency (SEA) works closely with the legislature to develop budget, program, and regulation recommendations that will enhance the statewide system.
- **Private business.** The SEA meets regularly with software and hardware vendors to stay current with the latest in technology and ensure that the technology center is up to date.

- **Public utilities.** The telephone and cable companies are working with school districts on special projects and are attempting to receive regulatory relief from the legislature in return for investing in technology for schools.

Education Equity

The legislature has enacted a law that requires a Technology Equity Commission to function with the purpose of determining how the poorest school districts can benefit from technology in meeting the instructional needs of students. Legislators, SEA staff, Ohio Education Broadcasting Commission staff, and representatives of telephone companies, cable companies, instructional television agencies, etc., are members of the Commission.

Funds are in the existing budget and recommended for the next biennial budget for technology for the poorest districts.

Building a Technology Infrastructure

As part of its work, the Technology Equity Commission asked that a survey be conducted of every building's needs for wiring, technology, and professional development. The results of the surveys are being aggregated now for a statewide report, and the local districts are using the results to develop a technology plan. There is a wide continuum of technology needs across the state.

Education Technology Needs

Ohio needs to:

- Ensure that all policy and funding decisions lead toward a statewide infrastructure that promotes integration and connectivity
- Continue striving for equity of opportunity for all students, including technology needs
- Address statewide professional development at all levels to ensure the receptivity of technology and its appropriate use in teaching and learning

Wisconsin

Local Efforts

Many local districts are working on distance learning technology projects in the state. Approximately 22 groups are planning fiber optics-based systems. An additional 20 Instructional Television Fixed Services (ITFS) sites are in operation, and local districts are planning the expansion and operation of several of these sites. The state has decided not to create a state-level, distance learning system or network, but to allow projects to be created at a local or regional level. Then a backbone infrastructure would be created to link these projects.

State Efforts

The Wisconsin Educational Communications Board (ECB), the licensee of six of the state's eight public television stations, coordinates telecommunications planning efforts among state education institutions. ECB works with the University of Wisconsin system, the Department of Public Instruction, and the Vocational, Technical, and Adult Education (VTAE) system.

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In August 1989, the state legislature created a 15-member Information Technology Advisory Board (ITAB) to manage a comprehensive study and make recommendations for improving Wisconsin's data processing and telecommunications systems, including education services. The ITAB published a report in November 1990 entitled Information Technology Management in Wisconsin. One of the report's major recommendations was the formation of a statutory board on information technology under the governance of the Department of Administration. Another priority identified in the ITAB report is the implementation of strategic business and

information technology planning throughout all state agencies. A recommendation affecting education was to provide a centralized support for the independent, regional educational telecommunications initiatives that have been established throughout the state.

A steering committee has been created by the governor to provide direction to a new project for statewide information planning coordination—the Wisconsin Strategic Planning Project (WiSPP). The ECB has contracted with a consultant for a telecommunications planning effort for the educational community.

The governor announced the formation of a telecommunications task force. The purpose of this task force is to make recommendations for creating a comprehensive fiber optic system for the state. This effort is being underwritten by the telephone industry.

Financial Aspects

The ECB contract costs $100,000. The 1993-95 state budget has $400,000 for fiber optics-based systems, and the state received $2.2 million for telecommunications projects from Ameritech. Approximately 50 proposals were submitted to the Department of Administration for these monies. An additional bill for $147,000 to fund the expansion of one ITFS system is in the legislature. This bill may be rewritten to address fiber optics technology in the near future given the emphasis on this technology by the governor's office. Additional monies for distance education technologies may be introduced.

Key Groups in Education Technology

- Department of Administration
- ECB's Distance Education Technology Initiative Committee (DETIC)
- Department of Public Instruction
- State Board of Vocational, Technical and Adult Education
- University of Wisconsin System
- University of Wisconsin Extension
- Access Wisconsin (telephone companies)
- Public Service Commission (PSC) (for fiber regulations)

The State Education Agency (SEA) works with all entities involved in distance learning (except for the PSC) and sits on the DETIC, VTAE's Media Consortium, and the University of Wisconsin System's Media Council and WiscNet (Internet) to coordinate distance learning opportunities with K-12 distance learning needs. The SEA assists the ECB and University of Wisconsin Extension in the coordination and production of satellite-delivered staff development programs using the Satellite Education Resources Consortium (SERC) satellite system. The SEA also coordinates the registration of students taking SERC student courses. The SEA is also represented on a national distance learning conference steering committee held every August in Madison and on the state's education technology conference steering committee held in October.

Education Equity

The Wisconsin Public Television Network broadcasts more than 1,500 instruction television (ITV) programs to every K-12 school district in the state. The broadcast network is used to distribute these enrichment programs equally to small and rural school districts as well as large metropolitan districts in the state. The state has six ITV utilization specialists who assist the districts in using ITV programming in the classroom.

Wisconsin also has been a charter member of the SERC, comprising 24 states that work together to provide student credit courses and professional development programs to every district within their borders. To make the SERC programs available to all interested districts, the state has participated in SERC/NTIA (National Telecommunications and Information Administration) satellite dish grant award programs two years in a row to make affordable satellite dishes available to all districts interested in purchasing them. Wisconsin has produced several staff inservice programs every year and one of two graduate student credit courses offered over the SERC network.

Building a Technology Infrastructure

Several technology infrastructures exist to bring instruction into the classroom in Wisconsin.

- Since 1965, the University of Wisconsin Extension has operated a two-way, audio-only network that reaches into some 200 sites and offers more than 300 programs each year. Although most of these sites are not K-12 classrooms, they do bring instruction into the communities and can be bridged into classrooms depending on the specific program or course content. For example, several schools take Spanish III classes directly from the Extension over this network.
- Until recently, four regional, audio-only networks have brought instruction directly into the classroom. One of these has been replaced by a fiber optic system and one closed-circuit system because of the growth of ITFS and satellite technologies in the region.
- The Extension also has an audiographics network that reaches 13 sites in the University system and runs over the audio-conferencing network. This technology adds interactive computer graphics to the audio interchange.
- The Wisconsin Public Television Network has been providing instructional television programming directly to classrooms over the state broadcast system. More than 1,500 individual enrichment programs are offered during the school year. The Wisconsin Public Radio Network also has brought instruction into classrooms throughout the state over its FM sideband frequencies.
- The ECB has constructed a total of 20 ITFS systems that cover approximately 45% of the K-12 districts in the state. This technology has been recently identified as a "transitional" technology and will not be actively supported by the ECB. The ECB sees technology changing into fiber optics over the next ten years, which is about the life expectancy of an ITFS system.
- The ECB has conducted a major study of distance learning technologies in the state and is in the process of publishing a proposed statewide, infrastructure-based, fiber-optic technology. This technology would eventually link all regional and local distance learning systems as long as they conform to the technical standards identified in the report. The state government has decided not to build a statewide distance learning network, instead allowing these systems to develop locally and regionally. The statewide technology would be the vehicle to link these individual systems across the state.

Education Technology Needs

The following educational technology needs should be addressed in Wisconsin:

- Staff development and inservice programs need to be developed for teachers already in the classroom on how to choose and use technology in instruction and pre-service programs. These programs would train teacher candidates in the instructional use of a wide range of technology in K-12 classrooms.
- What should the K-12 classroom of the 21st century look like technologically and how can the state finance retooling/restructuring?
- What organizational, structural, and licensure issues need to be dealt with as our K-12 classrooms become classrooms without walls and our school districts become organizations without boundaries?
- How do we ensure equal access to educational technology and the opportunities they offer to all students and staff in all districts across the state, regardless of gender, race, equalized valuation, and geographic location?

Recent Legislative Initiatives Expected to Affect Educational Technology

by Rafael Ramirez and Rosemary Bell, NCREL

The second session of the 103rd Congress saw action on two major pieces of legislation affecting K-12 education: the Goals 2000: Educate America Act (P.L. 103-227) (108 Stat. 125) and the Improving America's Schools Act (IASA). Both pieces of legislation provide for the development of an educational technology infrastructure to be integrated into federal and state education restructuring plans as a tool for implementing and achieving the National Education Goals.

On March 31, 1994, President Clinton signed into law the Goals 2000 legislation, the cornerstone document for all future federal education legislation from this Administration. President Clinton views Goals 2000 as a way to link national standards to local school reform efforts, focusing particularly on systemic reform in education. The Improving America's Schools Act (IASA), the other major piece of legislation, is the title for the reauthorization of the Elementary and Secondary Education Act (ESEA), first passed in 1965. The House passed its version of IASA on March 24, 1994 (H.R. 6). The Senate Labor and Human Resources Committee marked up its version of IASA (S. 1513) on June 9, 1994.

Throughout the bill, IASA weaves the same theme of systemic education reform found in Goals 2000. For example, in title I of IASA, the program for disadvantaged students, where the greatest amount of money is dedicated, both the House and Senate versions require states to set content and pupil performance standards in order to receive funds. The development of content and student performance standards is a central piece of Goals 2000 in that they provide the linkage between federal, state, and local efforts in implementing systemic reform. However, while the House version calls for these standards in all core subject areas, the Senate version asks for them only in mathematics and reading. Both Goals 2000 and the House and Senate versions of IASA cite the importance of using technology as a tool in the learning process to improve all aspects of education; hence the emphasis on a systemic approach to integrating technology to achieve curricular ends. What becomes apparent is that investment in technology is being seen by more and more policymakers and educators as an effective and efficient tool to help achieve school reform.

The second session of the 103rd Congress saw action on two major pieces of legislation affecting K-12 education: the Goals 2000: Educate America Act (P.L. 103-227) (108 Stat. 125) and the Improving America's Schools Act (IASA). Both pieces of legislation provide for the development of an educational technology infrastructure to be integrated into federal and state education restructuring plans as a tool for implementing and achieving the National Education Goals.

Goals 2000: Educate America Act

Goals 2000: Educate America Act legislates the National Education Goals and outlines a process for establishing national education content, student performance, and opportunity-to-learn standards. The legislation assumes that the development of higher standards for all students will drive education reform and restructuring in a systemic way and lead to higher achievement for all students. One tool for helping all children achieve these higher standards that is evident in Goals 2000 is the use of technology.

Goals 2000 and Educational Technology

Under title II, part C, of Goals 2000, entitled Leadership in Educational Technology, the Secretary must develop a National Long-Range Technology Plan describing how the Secretary will promote the effective use of technology as a tool to help all students achieve the higher standards. The contents of the plan must include information about everything from joint activities with other federal agencies to applying technology to state systemic reform and professional development for teachers. The plan also encourages building partnerships with the private sector. The title authorizes an Office of Educational Technology within the U.S. Department of Education to be headed by the Director of Educational Technology. This office already exists and is administered by Linda Roberts.

Although no money has specifically been appropriated, Secretary of Education Riley has indicated that he will dedicate $500,000 to the Office of Educational Technology for FY 1994. Congress has authorized $5 million for the Office for FY 1995. In addition, $5 million has been appropriated to go to the states for planning grants for educational technology for FY 1994.

H.R. 6 looks upon technology as a means to help students reach higher standards. It provides a national leadership role for the Department of Education and supports a comprehensive system to promote the acquisition and use of technology and technology-enhanced curricula, instruction, and administrative support.

Improving America's Schools Act (IASA)

The Clinton Administration intends to tie the Improving America's Schools Act (IASA) closely to Goals 2000. The House, in H.R. 6, proposed a significant change to title I of this Act in order to achieve this goal, setting up a new rule requiring that, in order to receive funds, states must submit plans indicating how disadvantaged children will be helped to meet high content and pupil performance standards. Since Goals 2000 also provides money for the planning process, it is very likely that states, having to go through the process anyway to receive title I funds under either the House or Senate versions, will participate in Goals 2000 with an eye toward fulfilling title I requirements for IASA.

H.R. 6 looks upon technology as a means to help students reach higher standards. It provides a national leadership role for the Department of Education and supports a comprehensive system to promote the acquisition and use of technology and technology-enhanced curricula, instruction, and administrative support. The main educational technology provisions of H.R. 6 include the following:

- Part B, subpart 1—Assistance to State Education Agencies (SEAs) and Local Education Agencies (LEAs)

This formula grant program supports comprehensive state and local systems for acquiring and using technology, as well as curricula, instruction, and administrative activities that use technology. In order to receive funds, each SEA must file a five-year technology plan that is integrated with the state's Goals 2000 plan. An LEA must submit a three-year plan with its SEA. Seventy percent of the state allocation is for elementary and secondary education programs primarily administered at the LEA level; 20 percent will go to higher education programs that create partnerships between higher education institutions and LEAs, particularly in the area of professional development; 10 percent will support collaborative activities among libraries, literacy programs, and LEAs using technology to share services.

- Part B, subpart 2—Research, Development, and Demonstration of Educational Technology

This subpart, like S. 1040 and Goals 2000, establishes an Office of Educational Technology. It also calls for the Secretary of Education to develop a national, long-range plan for technology use in education and authorizes grants to promote use of technology in education.

- Part B, subpart 3—Star Schools Program

This subpart rewrites the Star Schools program as a new program in the Elementary and Secondary Education Act.

- Part B, subpart 4—Development of Educational Technology Products

This subpart authorizes the Secretary of Education, on a competitive basis, to award grants, enter into contracts, or make loans to eligible consortia for the development, production, and distribution of technology-enhanced instructional resources and programming.

The Technology for Education Act of 1994 (S. 1040) has been incorporated into the Senate's IASA bill (title III of S. 1513). Titles I and II of S. 1040 call for the Secretary of Education to develop a national, long-range plan for technology in education and establish an Office of Educational Technology and a formula grant program for states with reform plans under Goals 2000 that develop systemic state technology plans. These two titles already have been enacted into law as part of Goals 2000. However, should S. 1040 remain intact in the final, conferenced version of IASA, these activities would then fall under that legislation. Additional provisions include the following:

- Title III of S. 1040 authorizes a formula grant program (School Technology Resource Grants) to SEAs for implementation of state systemic plans to address the educational technology needs of LEAs with the highest percentage of poor children and with the greatest need for the technology. Title III also authorizes a competitive grant program for regional educational technology assistance consortia to provide professional development assistance, other technical assistance, and information dissemination. At least 80 percent of each consortium's funding must be spent for professional development.

In order for schools to use technology appropriately and effectively to enhance the curriculum, they need to have access to telecommunications systems and information technologies through electronic networks. However, investment in this type of technology, especially from the school perspective, will involve questions about how telecommunications and information technologies can help achieve curricular expectations.

- Title IV of S. 1040 authorizes competitive grants to eligible consortia for the development, production, and distribution of instructional programming that incorporates educational applications of advanced technology. Priority is to be given to programming that, among other things, may be adapted nationally at reasonable costs and is aligned with national standards and state curriculum frameworks. This title also rewrites and extends the Star Schools Program Assistance Act.
- Title V focuses on ensuring that education is a part of the national infrastructure being developed under national policies.
- Title VI authorizes a study of systemic funding alternatives for financing technology in schools.

Title II, part B, of H.R. 6 and title III of S. 1513 seek to coordinate their activities and programs in the area of educational technology with Goals 2000. Both bills would apply technology to education to help all students reach higher standards. In order to implement this goal, the technology provisions in both bills pay substantial attention to the professional development of the teaching force to increase knowledge

about the appropriate use of technology in the classroom and the school, skills in using technology, and expertise in integrating technology into the elementary and secondary school curriculum.

The common thread throughout the discussions of telecommunications and information technologies in these two bills is a concern with applying and integrating technology within the school reform efforts to help teachers and students meet the new, more challenging state content and student performance standards that are called for under Goals 2000.

The National Information Infrastructure (NII) and Educational Technology

While Goals 2000 spurs major education reform in the states, including the development of educational technology, an important issue still being debated in Congress is how best to "wire" classrooms so that they will have access to the electronic networks, particularly the Internet—the "network of networks." In order for schools to use technology appropriately and effectively to enhance the curriculum, they need to have access to telecommunications systems and information technologies through electronic networks. However, investment in this type of technology, especially from the school perspective, will involve questions about how telecommunications and information technologies can help achieve curricular expectations. Designing a system using technology to help meet these expectations directly reflects the systemic education reform effort that Goals 2000 seeks to implement. The Administration's and most states' efforts in implementing systemic education reform based on restructuring of the schools to meet higher standards will be greatly supported through the integrating and networking opportunities that the National Information Infrastructure (NII) will afford.

H.R. 820, title VI, the National Competitiveness Act of 1994, is one bill that specifically mentions education in its discussion of electronic connectivity. For instance, section 206 explicitly authorizes the Secretary of Education to conduct basic and applied research in computational sciences in order to coordinate the efforts of libraries, school facilities, and educational research groups to develop, evaluate, and apply software capabilities in education. In conjunction with other agencies, the Department of Education can develop and implement training programs for teachers, students, and librarians in the use of local and national computer networks. The Department of Education has been authorized $11.9 million for FY 94, $22.1 million for FY 95, and $23 million for FY 96. Another $5 million is authorized to the Department of Education to provide access to networks for school facilities.

In section 603(a)(3)(A)(i), the goal is to "improve education at all levels, from preschool to adult education, including the development of new educational technologies."

Section 604(a)(5) of this legislation requires that the "National Science Foundation (NSF) and the Department of Education, in cooperation with other appropriate agencies, shall provide for the development of advanced computing and networking technology for use in education at all levels." Four hundred four million dollars has been authorized, which includes the development of a digital library networking system.

Section 610 calls for the National Aeronautics and Space Administration (NASA) to establish a Computer Technologies for K-12 Education Project to test and demonstrate educational applications of advanced computer technologies in public school systems that provide precollege education. Competitive grants will be awarded to plan, deploy, manage, and operate advanced educational applications of computer technologies in K-12 public school systems. Eight million dollars is authorized for each of fiscal years 1994 and 1995.

One of the authorized activities called for in this legislation has direct implications for education, because it provides for the funding of pilot projects connecting primary and secondary schools to the National Research Education Network (NREN). NREN is charged with developing high-speed networks and has a mandate to include K-12 schools in this development. However, to this point, very little funding or effort has been exerted to include K-12 schools in the development of the NREN.

Another piece of legislation, H.R. 2639, sponsored by Representative Markey (D-Mass.) on behalf of the Clinton Administration, also would enhance schools' linkages with the information highway. It would support new responsibilities for the National Telecommunications and Information Administration (NTIA), the agency responsible for overseeing the development of the information highway. H.R. 2639 would give NTIA $250 million to help fund projects that enhance access to and use of the Internet by educational institutions, research facilities, libraries, museums, and others. Passed by the House in November 1993, the bill is awaiting action by the Senate Committee on Commerce, Science, and Transportation. There is talk of adding a provision to require telephone companies to make it possible for schools to hook up to the NREN or the Internet or to provide reduced rates for them to connect. Meanwhile, under an appropriations bill (H.R. 2519) covering NTIA, two aspects of H.R. 2639 were given some funding for the 1994 fiscal year: $21 million for broadcast-related hardware purchases related to connecting to information networks and $26 million for computer and software purchases associated with connecting.

Other bills that could have an impact on the integration of technology into education are the following:

- H.R. 89, introduced by Rep. Dale Kildee (D-Mich.), would authorize $500 million in its first year for state grants to promote use of technology in schools.
- H.R. 2268, introduced by Rep. George Brown (D-Cal.), would authorize an unspecified sum for a nationwide telecommunications system for state and local education institutions, agencies, and providers.
- H.R. 3626, introduced by Rep. Jack Brooks (D-Tex.) and Rep. John Dingell (D-Mich.), modifies the "final judgement" that broke up AT&T. Essentially, it eliminates restrictions for the telephone companies with respect to manufacturing and providing information services. It asks that the telephone companies develop separate subsidiaries for these purposes.
- H.R. 3636, introduced by Rep. Markey and Rep. Jack Fields (R-Tex.), opens the way for competition between the telephone companies and the cable companies, allowing telephone companies to provide information services and the cable companies to transmit voice and data.

While it is apparent that many of the legislative efforts underway recognize the provisions that will have to be made in law and regulations to ensure universal access to the NII at an affordable rate, it is equally clear that K-12 education needs to take on a strong role in the process. Constant attention must be paid to the needs of K-12 education, and we must be diligent in ensuring that the activities that fall under these bills are coordinated with the systemic education reform efforts reflected in Goals 2000 and IASA. The ease or difficulty that K-12 education will experience in connecting to the NII depends on decisions made about fees and rate structures under bills that may have no direct connection to K-12 education. It is, therefore, up to K-12 education to insist that legislative provisions be included that are specifically directed to their needs and that will allow easy and affordable access.

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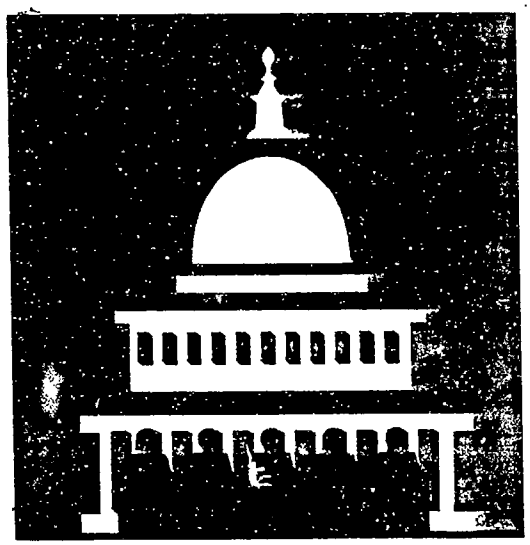
1. The following review of *title II, Part B,* from *H.R.6* is taken from a memo sent by James B. Stedman to the Sente Human Resources Committee, dated April 12, 1994.

2. The following discussion about the remaining titles in *S. 1040* is taken from the same memo from James B. Stedman to the Senate Human Resources Committee referenced in the first endnote.



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