C. Joint decision making process for setting usage and site priorities

There are any number of education needs for which the proposed program could be helpful. Certainly wiring or connecting school classrooms and public libraries to the NII is a top priority and one of the areas where the program could be applied. In a few states or school regions, however, wiring is not a significant problem and in those cases, it might well be that new tariff structures or more equipment to connect to the NII would be more useful. These are examples of what the proposed program could be used for; and in the supplemental notice of rulemaking we have suggested, questions like these could be addressed. Attached to these Reply Comments is a brief description of the special telecommunications needs of education from the perspective of each of the present Commenters.

D. Considerations for including independent companies

We understand that price caps primarily affect only the larger LECs and not the hundreds of smaller LECs. We do believe the program we are suggesting needs to be adopted nationwide; however, the sovereignty of each small LEC not participating in price caps needs to be preserved, and they have to be accountable for their decision to participate and how to participate independent of any other company.

E. One part of the solution

We also recognize that our proposed program is only one step towards the goal of ensuring that education and libraries are

integral parts of the NII. The need is enormous. More decisive Congressional action, as well as other FCC proceedings such as the Universal Service review that will likely take place later this year, also contain elements that need to be considered as part of a strategy to ensure that education fully benefits from technological innovations.

F. Allow Cable Companies the same opportunity

We also are aware that other industries, such as the cable industry, are subject to oversight by the FCC. We understand that cable companies are subject to a form of regulation that is similar, in some respects, to the price caps system used to regulate LECs. We see no reason why these ideas would not be applicable to the cable industry, and we would certainly welcome investments in education and libraries from cable and other segments of the communications industry. If the FCC decides to adopt the proposal we have offered, we urge it to give serious consideration to implementing a similar system for cable companies.

III. Conclusion

We are excited by the potential we believe is contained in the reforms we have outlined. We believe that if the FCC moves in the direction we are suggesting, it will confirm its leadership in promoting the NII. Further, we feel that the ideas we are suggesting are fully consistent with the intent of the communications legislation now moving through Congress, and we are

pleased that Congress has focused attention on the relationship of the NII to education.

Respectfully submitted,

THE AMERICAN LIBRARY ASSOCIATION,
THE COUNCIL OF CHIEF STATE SCHOOL OFFICERS,
THE NATIONAL ASSOCIATION OF SECONDARY SCHOOL PRINCIPALS,
NATIONAL EDUCATION ASSOCIATION, and
NATIONAL SCHOOL BOARDS ASSOCIATION

by: Henry M. Rivera

Henry M. Rivera
GINSBURG, FELDMAN AND BRESS, CHTD.
1250 Connecticut Avenue, N.W.
Washington, D.C. 20036
(202) 637-9012

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THE LIBRARY MISSION AND NII INFRASTRUCTURE NEEDS

The American Library Association is a nonprofit educational organization of nearly 57,000 librarians, library educators, library trustees, and friends of libraries dedicated to the improvement of library and information services for all the American people. In recent (May 25, 1994) testimony before the Senate Committee on Commerce, Science and Transportation concerning telecommunications legislation, ALA identified the library mission, the library role in the NII, the barriers and costs libraries face, and gave examples of how the combination of libraries and technology changes lives.

The library mission -- to ensure public access to a diversity of information sources and viewpoints, regardless of a user's socioeconomic status or information seeking skills -- requires affordable access to a ubiquitous, interoperable, fully interactive, high-capacity, telecommunications and information infrastructure.

Libraries work in partnership with governments in support of educations and research, and serve as public access and assistance points for government information through the federal depository library program. Approximately 1,400 congressionally designated libraries throughout the United States have accepted the responsibility to make available free public access to the federal government information provided through the program. An increasing amount of government information is available in electronic formats.

BARRIERS TO LIBRARY ROLE

Significant new costs are involved if libraries are to make their fullest contribution. The costs involved include:

- Communications capability costs. Broadband service to rural areas presents the most difficulty since the current tariffs are distance dependent. Aggregation of school and library demand through cooperatives and networks could help share costs of high speed lines to rural nodes.

The Virginia Library and Information Network provides local calling access via ports on the midlevel backbone, VERnet, the Virginia Education and Research Network. VLIN access for libraries in rural areas in which local area dial-up to VERnet is not available has been supported by the installation of 14 toll-free 800 number lines connected to a central terminal server at the Virginia State Library.

The cost for rural libraries is definitely higher. A VERnet port cost approximately $1,200 and represents a capital investment, while the 800 number access requires per-minute charges. The 800-service phone bill last November was approximately $700; in March with these additional libraries connected, it was $10,000. Use grows daily; three months ago VLIN averaged 180 logins per day, while logins on a recent day in mid-May were up to 440 by 6:15 p.m. The cost is approximately $.18 per minute during business hours, and about $.11 at night and on weekends.

- Equipment costs. Each library will need additional computers and associated equipment, as well as routers and other capabilities for network library facilities. The investment is at least a few thousand dollars for each station.

- Middle layer costs, such as technical support, development of easy-to-use access tools, servers for mounting library databases, etc.

- Information content costs, such as libraries purchasing or licensing use of commercial information services and databases for use by their campus or local communities. A subscription to a database can range from several dollars per hour to thousands of dollars for a site license.

- Training costs. Librarians and educators providing help to the public must be trained, and must help to train the public to use the new technology, the access tools, and to find and evaluate the best information solution in the sea of information option.

A recent study of a sample of public libraries conducted by Charles McClure and his colleagues for the U.S. National Commission on Libraries and Information Science found that 21 percent of public libraries have Internet/NII connections. However, only 12.8 percent provide public access terminals. Internet connectivity was 77 percent for public libraries serving a population base of more than one million, but declined to 13.3 percent for libraries serving less than 5,000. Telecommunications costs were the most important factor affecting public library involvement with the Internet/NII. The message from public libraries in the study to the federal government was clear; libraries must be provided with the basics first, such as equipment and continued support for connectivity charges. The full report will be released soon.

A pilot project in New York State, Project GAIN, used foundation and other funding to demonstrate that if rural librarians were given the tools and training to use networked information resources, they could do so effectively and improve the quality of service they offered their patrons. Very small libraries successfully demonstrated the effectiveness of linking rural communities, previously without access to networked

electronic information, to the rich and extensive global information environment of the Internet. However, with project funds ending, some of these libraries are struggling to continue to afford their electronic connection.

The cost of rural access is cited by librarians throughout the country as a major barrier, often because they must make a long-distance call to access a high-speed node. However, providing network access over a large city area is also extremely expensive. The Cleveland Public Library and its associated institutions (CLEVENET) have been using Internet connectivity to deliver information services directly to patrons since 1989. The CLEVENET system currently includes 18 public libraries in seven Northern Ohio counties, including urban, suburban, and rural populations. Ongoing telecommunications costs are the single greatest deterrent to the fullest use.

THE COMBINATION OF LIBRARIES AND TECHNOLOGY CHANGES LIVES

Library needs should be met, because electronic networking technology is a powerful stimulus to the already demonstrated ability of libraries to change lives for the better. ALA has been collecting anecdotes about how libraries change lives, and many of these involve the use of information technology through libraries. Here are just a few examples from ALA's campaign, from Project GAIN in New York, or from previous hearings:

- "At age 77 I was introduced to the computer housed at my public library...I love it!

- An unemployed woman learned computer skills through the local library computer club, and secured a job in the county purchasing department.

- A mother used a medical database on the library computer to locate several medical journal studies pertinent to her daughter's chronic ear condition. That information enabled the parents to discuss the situation with the doctor from a more knowledgeable viewpoint, giving them the confidence to not elect surgery.

- A homeless person, after learning to use computer and networked information resources at the Seattle Public Library, found a job at a local computer store.

- A teenage boy was roused from a coma using techniques his parents learned about in a library book located through an online library catalog.

- An adult literacy student, finding no support group on the Internet for new adult readers, started one and became an online mentor to others.

- A small, steel-town public library's workplace center equipped with online jobs databases and resume preparation help, enabled a user making a career change to find a job as a cable-TV station manager.

- During one week in April, the Emporia (Kansas) Public Library provided information to an investment group about opportunities in Puerto Rico, tracked state legislative action through an online database, helped 26 people find employment opportunities through a national job database, helped a paint manager find an executive search firm in Chicago to fill an opening in her company, helped a sixth grade student learn "everything he needed to know about dinosaurs", enabled a woman who has recently undergone surgery for breast cancer to obtain information about chemotherapy, assisted local governments with their information needs, and answered several hundred other questions. This is the information needed to make life decisions.

COUNCIL OF CHIEF STATE SCHOOL OFFICERS

Goals 2000: Educate America encourages states to develop technology plans as an integral part of their overall plan for systemic educational reform. The Council's records indicate that 38 states have at this time developed technology plans. Iowa already has an extensive and well developed operational program with 126 miles of fiber optics and a point of presence in all 99 counties. Other states are in the initial stages of development. CCSSO assumes that all states will eventually develop technology plans. However, a major limitation to full implementation of the President and Vice President's vision of a window on the world for all students through connection of all classrooms to the National Information Infrastructure by the year 2000 is costs. Cost for both the wiring of classrooms and the rate of service charges required after full installation of a broadband service.

Regardless of tight fiscal restraints, as a nation we cannot afford to fail to provide all learners everywhere with primary access to NII. It is imperative that all communities develop plans that include broadband telecommunications services and that service providers develop affordable and equitable educational rates. Such services are central to educational management, instruction, and assessment if all children are to achieve all that they can achieve and the nation is to meet the National Education Goals.

One step in a series of steps to make universal educational service available in all learning settings is the proposed use of the price cap regulation. The suggestions here develop a working arrangement between the private sector and the schools. This action should provide a strong incentive to the Local Exchange Carriers to invest in the education marketplace. The connection of the NII to classrooms is essential to the reaching of the National Education Goals.

EDUCATIONAL TECHNOLOGY

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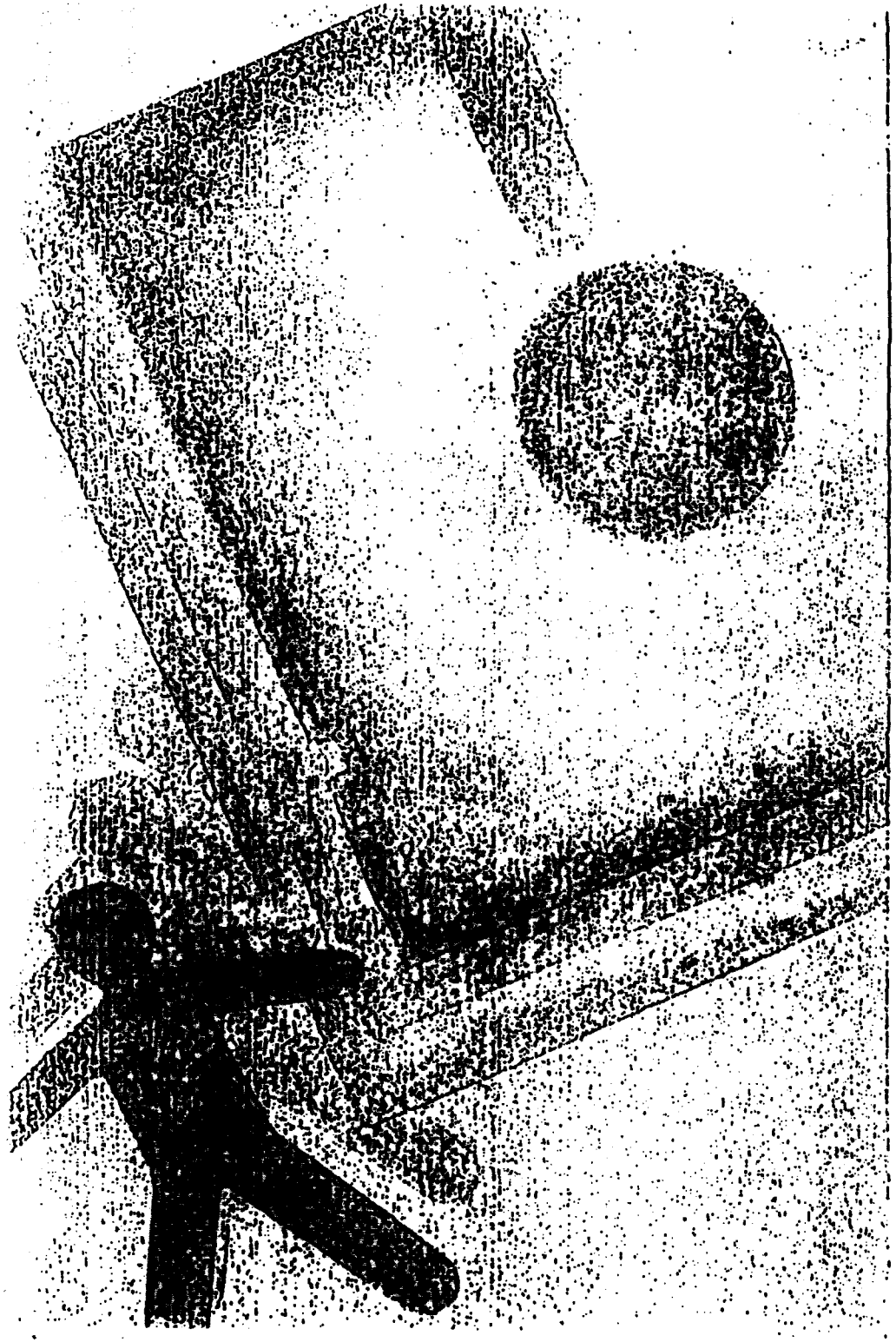
NEA SPECIAL COMMITTEE REPORT



Technology And Change

The public schools of America of the late 1980s are in an era of change. Change is occurring in all forms and coming from all directions.

The student is changing. Family patterns are dramatically different from those of just a few years ago. The population is graying while young people become poorer, more heterogeneous, and more likely to be side-tracked by drugs, dropout problems, teenage pregnancy, and other social dysfunctions.

The teacher is changing. The typical teacher is acquiring higher levels of training and becoming more experienced. At the same time low pay and uninspiring working conditions are discouraging teachers and creating shortages in a growing number of areas.

The school structure is changing. Reform programs, innovative projects, and restructuring proposals abound. The education reform movement that began in the early 1980s surges on, but the direction is changing, from the early emphasis on top-down efforts to further standardize and regulate to more recent efforts to decentralize, individualize, and provide more flexibility.

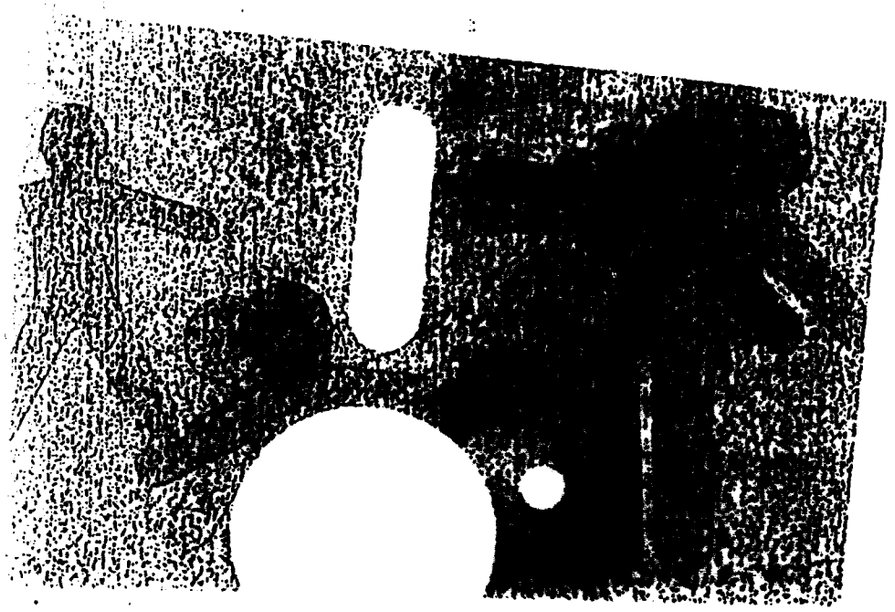
The American economy is changing. The shift from an industrial to an information and service economy signals a profound need to reexamine the school curriculum and pedagogical methods. The analytical, collaborative, innovative, problem-solving American workers needed for

industry and business will require a different education from that required by an individual expected to do standardized routine work in a factory.

Some observers are advocating the expanded use of technological innovations as *the* method to respond to these many changes. While that may be too narrow a viewpoint, these changes provide an excellent opportunity to examine the potential benefits of integrating technology into the schools of America.

The 1987 National Education Association Representative Assembly approved the creation of the Special Committee on Educational Technology. In authorizing the committee, the Representative Assembly directed it to build on the work of the recently completed United Kingdom/United States project on microelectronics in education, technology projects of state affiliates, and various reports commissioned by the NEA and other organizations.

The specific charge given the committee was to review the status of technology in the public schools and make recommendations for appropriate NEA policy and programmatic activities.



General Principles

The committee believes that computers, facsimile machines, multimedia technology, interactive video, telecommunications, hypermedia, and other technological advances can hold real promise for support and enrichment of classroom instruction and classroom management. *The committee shares the hope that when conceived and implemented appropriately, technological innovation can contribute significantly to the improvement of educational opportunity, to managing the increasing knowledge base, and to improving the quality of work life for school employees.*

Restructured environment

Educators and other school employees have a unique need and opportunity to plan for the inevitable inclusion of technology in the American schools. *The committee believes that the integration of technology should be conceived in terms of a restructured school environment, not as piecemeal appendages grafted onto the current school structure and curriculum.* To the extent that resources are devoted to the research and development of the technology, similar efforts must also be devoted to matching the sophisticated technology with a sophisticated pedagogy and curriculum designed to educate Americans for the 21st century.

Indeed, the committee expresses the strong opinion that the *schools must focus the uses of technology not on more routinized standardization of the learning environment but on the opportunities to enrich instructional lessons, to individualize instructional objectives for students, to extend the shift from a centralized to a decentralized learning environment, and to support the teacher by easing the classroom management burden of reports and paperwork, thus allowing the teacher to spend more time with students.*

The teacher is central

The committee recognizes and confirms the important conclusion of the Office of Technology Assessment (OTA) in its recent report, *Power On!*,[1] that *the teacher is central to the full development of technology's use in the schools.* Technology cannot be an end in itself. The use of computers and other technologies should be seen as an integral part of the whole school curriculum, aiding and abetting the best instructional practices and curricular designs. If the implementation of the new technology is conceived improperly, one more passing fancy can be added to the unfulfilled promises of schools without walls, the discovery method, behavioral objectives, the new math, team teaching, TV courses, and many other discarded hopes for change.

[1] U.S. Congress. Office of Technology Assessment. *Power On! New Tools for Teaching and Learning*. OTA-SET-379. Washington, DC. September 1988.

Schools And Technology

Two separate and distinct visions of the future potential of technology permeate the literature. One vision sees technology's use as a substitute or remediation for workers. This vision is based on the assumption that high quality technology can be more efficient and probably less expensive than human capital.

Technology = value added

The other vision sees technology's use to enrich human capital. This "value-added" perspective visualizes using technology to expand the employees' scope in handling and sorting information, in allowing modeling and other creative scenario building, in relieving employees from reports and other administrative burdens, and in serving as a tool that expands their discretion rather than further simplifies their jobs.

One example of the value-added approach is referenced by a noted economist in a recent report for the NEA. The report states:

> One of the key lessons to emerge from the General Motors-Toyota joint venture in California is that the Japanese automaker does not rely on automation and technology to replace workers in the plant. In fact, human workers still occupy the most critical jobs—those where judgment and evaluation are essential. Instead, Toyota uses technology to allow workers to focus on those important tasks where choices have to be made. Under this approach, technology gives workers the chance to use their imagination and their insight on behalf of the company.[2]

The committee embraces the value-added vision as the model for the expanded use of technology in education. As the OTA report notes, "Educational technologies are not self-implementing, and they do not replace the teacher."[3] The acceptance of the value-added approach is the foundation for the general principles cited above.

[2] Robert B. Reich, *Education and the Next Economy*, National Education Association, Washington, DC, 1988, p. 16.

[3] U.S. Congress, p. 16.

New teacher roles

The committee also recognizes that as schools utilize multiple technologies and restructure programs and curriculum, the roles of teachers and other educational personnel will change. The Christa McAuliffe Educators[4] devoted significant time to the examination of the question, "What are the most appropriate roles of teachers as technology becomes more available and sophisticated?" The emerging roles identified by the Educators are as follows:

1. Collaborator—initiates and nurtures relationships that expand the boundaries of the classroom and shares knowledge with colleagues. A collaborator fully participates in establishing the standards and educational climate of the school.
2. Mentor/Mentee—teaches and learns from his/her students, community, and colleagues.
3. Planner—creates a vision of the future, develops methods to achieve that vision, and structures the learning environment.
4. Researcher—accesses, analyzes, and organizes information. A researcher guides students in understanding problem-solving strategies and developing discovery and learning skills.
5. Seeker—ventures outside of the classroom to import ideas and resources.

Indeed, the concept of restructured schools (where educational decisions are decentralized and shared, where programs are tailored to meet the individual educational needs of the student, and where the principles of collegiality, cooperative learning, and creativity are nurtured) fits hand-in-glove with the value-added approach to integration of technology into the schools.

The concept of a computer lab down the hall utilized by a few teachers just doesn't cut it any more. For example, the real concern of the schools is student writing

[4] The Christa McAuliffe Institute for Educational Pioneering is designed to stimulate exploration by teachers into the state of the art and science of teaching. The Institute is a program of the National Foundation for the Improvement of Education created by the National Education Association. Each year five educators are selected to research and teach. The 1988 Educators focused on integrating technology into schools and the roles required of teachers.

skills, not word processing. The schools should not put the teacher into the electronic box. The technology can serve as a tool, a resource, a support, a supplement, an enrichment, but the teacher/student relationship is still at the heart of the process. In fact, the introduction of technology into education can enhance that relationship by creating new and additional options for learning and by giving time back to the teacher from the growing burden of nonteaching duties.

Long distance learning

One technology receiving considerable attention is the telecommunications technology of "long distance learning." This technology exemplifies the contrasting pedagogical choices.

Long distance learning has several distinct advantages when conceived and implemented appropriately. Long distance learning can broaden a classroom's horizons by channeling unique experiences from other sites through electronic field trips or live participation in historic or scientific events. It can provide opportunities for isolated rural areas to receive curricular offerings normally unavailable or impractical. Long distance learning can indeed serve as a resource, a supplement, and an enrichment.

The down side of the pedagogical choice is the option of replacing the personal student/teacher relationship with a teacher in the electronic box. An everyday replacement diet of this latter option will likely be limited by the practical problems of inflexible schedules, lack of attention to unique student needs in distant locations, and boredom from "talking heads" methodologies.

The crucial yardstick differentiating between the two choices is the availability of a licensed teacher in the receiving classroom to introduce the instructional material, monitor the presentation, answer questions of and interact with each student, evaluate the progress of the learning activity, and make adjustments for each student as necessary. Quality teaching is a matrix of professional decision making, which requires on-site attention.

The committee believes that *the Association and its affiliates should be involved in the planning, implementation, and evaluation of long distance learning proposals and programs to provide students the highest quality learning experience.*

Teachers And Technolo

The OTA report presents several findings of importance to understanding the relationship between teachers and technology.[5] While most teachers report a desire to use technology in their teaching, only half of the nation's teachers report that they have used computers in instruction despite the presence of computers in almost all K-12 schools nationwide. The report comments, "Teachers are not the problem, and without them there can be no solution. Most teachers want to use technology, but few have found ways to exploit its full potential."

There are real and substantial reasons for the above circumstances. It is true that quality and technical problems exist, but of critical importance is the fact that schools are not doing enough to help teachers become familiar and comfortable with computers.[6]

To learn to play a piano, one must have an instrument personally available and quality time to practice. Using a computer is no different. The policies of priority placement of computers for student use and minimal training opportunities for teachers will not produce computer-using teachers. OTA reports that only about one-third of

[5] U.S. Congress, pp. 87-88, 114.

[6] Henry Kepner, "What Ever Happened to the Computer Revolution?", *NEA Today*, October 1988.

all K-12 teachers have had even 10 hours of computer training.[7]

One author described the lack of teacher access to computer technology as disrespectful. He stated, "Truth be known, almost all of us have so far been deeply disrespectful to teachers, in our failure to give them personal access to the developing microcomputer technology.... Increasingly, we expect to see computers on the desks of business people, scientists, engineers, doctors, lawyers, social scientists, writers, even some artists and composers. In short, we have come to expect computers on the desks of everyone outside of school who's most intensely involved in the literate activity that school is supposed to teach and promote. Yet we have not stood up and shouted that computers should also be on the desks of teachers, to use as their own personal machines."[8]

If the teacher is essential to the integration of the technological potential in education, the critical elements for the teacher are access, training, and time. The committee supports the following:

1. *All schools should develop and implement a plan to install a computer with adequate software on the desk of each teacher by 1991.* In addition to educational software the teacher may be using with students, the teacher should have access to a word processor, a database management program, and other productivity tools such as test creators, gradebooks, and worksheet generators. Only when teachers begin using computers on a personal basis will schools experience an upsurge in the use of technology.

   The committee visited a recently constructed high school where computers were installed on each teacher's classroom desk as well as in each academic department office, where all teachers had a private desk and study area. The computers were linked together on a network and also linked with the student computer labs. Every teacher had access from both the classroom and the office to all student work and records as well as a full menu of applications programs. While exceptional today, this configuration should become the norm.

2. *Classroom management software designed for teacher use to manage the instructional process (e.g., word processing, gradebooks, attendance records, test development, and so forth) should be made available for all teachers and be compatible throughout the school district.* Approximately 40 percent of a teacher's time is spent on nonteaching duties. In the 1986 NEA survey of K-12 teachers, the aspect of teaching with which teachers were most dissatisfied was the amount of time spent on recordkeeping and clerical duties.[9] An unchallenged benefit of computers is the ability of the machine to handle routine clerical and administrative tasks. This function in education needs higher-priority attention.

3. *The school district and the teacher association should investigate options for teachers to have access to computers in their homes for training, development of instructional materials, and research purposes.* The options could include "take home privileges" and discounted purchase options with employer funding participation.

4. Teacher-planned training opportunities must be provided for teachers. *Practical, hands-on, and regular training in technological applications for learning and managing should be provided during school hours at the school's expense.* The training should focus on how to use technology to enhance instruction and personal productivity.

5. *Training in the use of technology to enhance instruction and professional productivity must be a part of the preparation of every entry-level teacher.* This expectation will necessitate major changes in the availability of curricular offerings and available hardware and software in colleges of education.

6. *Teachers should be provided encouragement, time, and resources to experiment with and research applications of technology, and to integrate technology into the curriculum.* The focus should be on helping teachers to make up their own recipes rather than following the cookbook. Experimentation and innovation are necessary in such a new and developing area of expertise and knowledge.

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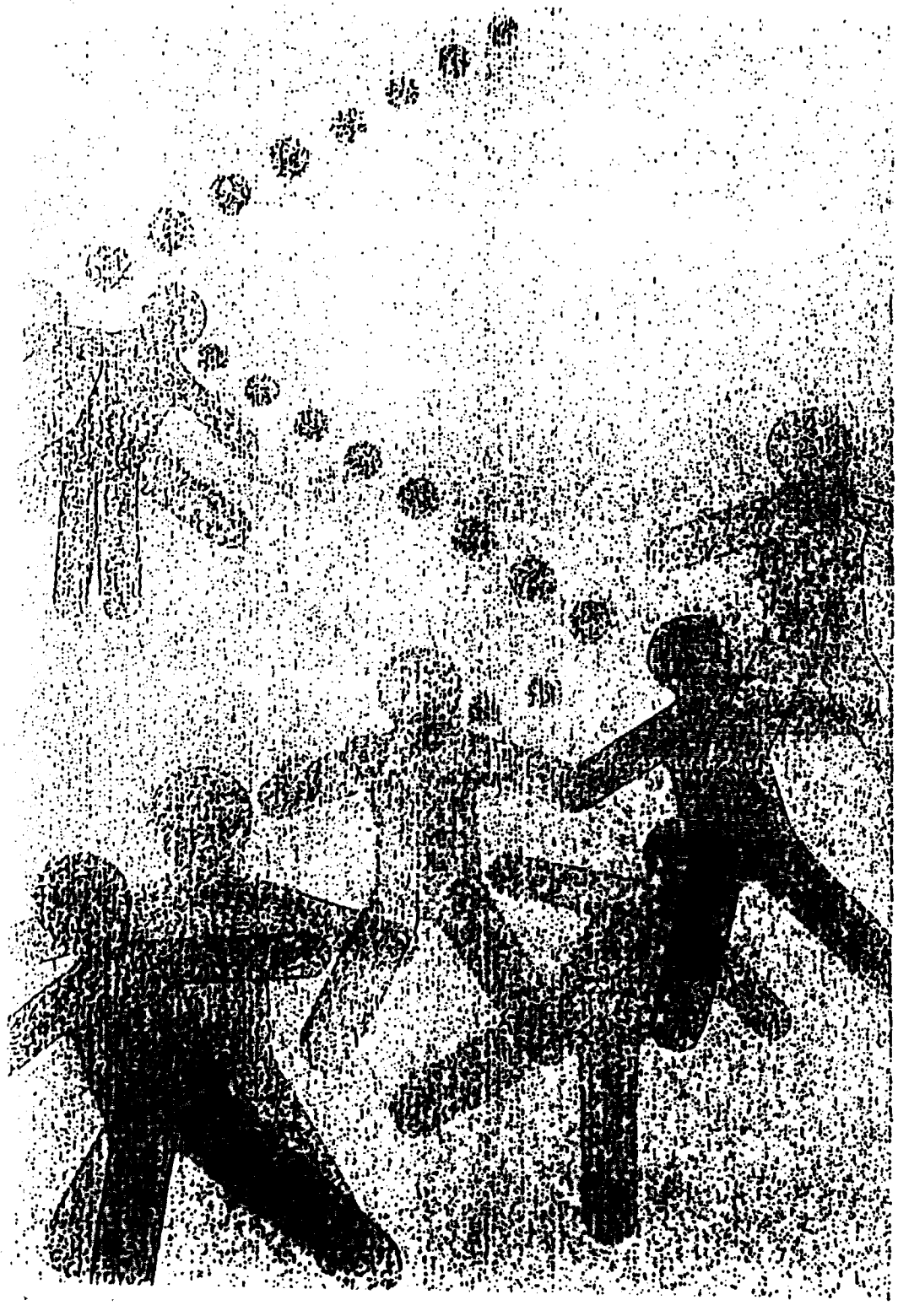
[7] U.S. Congress, p. 98.

[8] David Grady, "Giving Teachers Their Due," *Phi Delta Kappan*, September 1988, p. 31.

[9] National Education Association, *Survey of NEA K-12 Teacher Members 1986*, Research Division, p. 12.



Collaboral And Collegialil

The 1988 NEA Representative Assembly charged the Committee on Educational Technology to study the feasibility of a computer network for NEA locals. This concept is parallel with the committee's thinking on the importance of increasing the collaboration and collegiality among teachers and other school personnel. The sharing of ideas and experience needs to be encouraged. Colleagues have much to learn from each other.

Bulletin board services

In fulfilling the charge, the committee reviewed several networking options. The NEA is already operating two long distance computer networks for NEA leaders and members.

The NEA Instruction and Professional Development (IPD) unit maintains a toll-free electronic bulletin board. The Bulletin Board Service (BBS) operates 24 hours a day. Services available on the BBS include messages, special conferences, bulletins from the NEA, and data files. Files on dozens of education reform issues and policies are available for downloading. Local leaders and members can use the IPD electronic bulletin board for communications and the sharing of ideas. The access number is 1-800-541-0816.

The NEA and the International Business Machines (IBM) Corporation recently established a joint project linking all of the NEA Mastery in Learning Schools together in an experimental computer network. The network also includes several research universities and the federally funded regional educational laboratories. The network is based on a new experimental IBM software package called "People Sharing Information NETwork" (PSInet). PSInet has the technical capability of linking thousands of teachers together on an interconnected system based solely on microcomputers.

Interlinked, nationwide networks

The committee encourages the continued utilization of the IPD Bulletin Board Service and believes it provides an immediate tool for teachers and Association leaders to communicate and share information with each other. Such dialogue is particularly critical because of the traditional isolation among teachers. The committee is also aware that other bulletin boards are being installed by several state and local associations and many school districts. That development should be encouraged.

The committee believes that *the NEA must commence the planning to create interlinked, nationwide interactive networks for teachers.* It is understandable that the full potential of such networks resides several years in the future, but basic development work needs to be done now. The empowering potential for teachers and other educational employees of such networks is worthy of Association advocacy.

There is still a great deal of anxiety expressed by educators about the integration of technology into the school environment. Technophobia is a real and flourishing malady. The committee believes that careful and deliberate planning can constructively advance the uses of technology to improve learning and teaching.

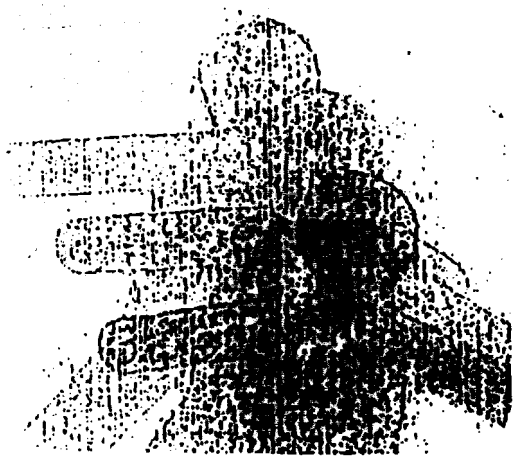
The committee has come to the following conclusions:

1. Understanding our mission is very important. One educator stated our central purpose very clearly. He said, "Will technology transform education? No. That transformation must take place first in education's true workplace—the minds of its decision-makers. It requires a shift in focus from what technology is or does to what it enables educators to do."[10] *The planning focus should be on the individual educational needs of students and how educators meet those needs rather than on the technology.*
2. Educators and other school employees have a unique opportunity to plan for the inevitable inclusion of technology in the American schools. *Policy makers should recognize the inherent value of full participation and collaboration by all involved parties in planning for technology integration into the schools.* Full involvement is valuable not only because it creates ownership but because it can help perfect the quality of the final result.
3. Resource planning has often focused on hardware needs only. *Resources for technology in education must be adequate to provide balanced support for staff development, software, hardware, and research into curriculum integration and development.* It is folly to think that the development of a sophisticated pedagogy to match and utilize the sophisticated technology will come into being without a major investment. The transition to technology-based learning and management will in the short run increase costs to schools. It is a falsehood to assume that the in

10 Lewis A. Rhodes, "We Have Met The System—And It Is Us!", *Delta Kappan*, September 1988, p. 30.

gration of technology can be a budget reduction strategy.

4. The OTA report points out that the very opportunities opened up by the computer can create more work for the teacher, making the job harder initially.[11] *Planners need to understand the changing responsibilities of the instructional staff and provide time, resources, and flexibility for professional development, research, and planning.*
5. *Education planners must make strong efforts to insure that all teachers and students have equitable access to the new technologies.* Equity of computer use means providing comparable educational opportunities for all students to have "hands-on" activities which create an environment that enriches each student's learning style.



[11] U.S. Congress, p. 88.

Policy Recommendations

The Special Committee on Educational Technology recommends the following general principles and policy positions:

General principles

1. When conceived and implemented appropriately, technological innovation can contribute significantly to the improvement of educational opportunity, to managing the increasing knowledge base, and to improving the quality of work life for school employees.
2. The integration of technology should be conceived in terms of a restructured school environment, not as piecemeal appendages grafted onto the current school structure and curriculum.
3. Schools must focus the uses of technology not on more routinized standardization of the learning environment but on the potential enrichment of the teacher's instructional lessons, on the capacity to individualize instructional objectives for students, to extend the shift from a centralized to decentralized learning environment, and to support the teacher by easing the classroom management burden of reports and paperwork, thus allowing the teacher to spend more time with students.
4. The teacher is central to the full development of technology's use in the schools. For the teacher personally the critical elements are access, training, and time.

Policy positions

1. All schools should develop and implement a plan to install a computer with adequate software on the desk of each teacher by 1991.
2. Classroom management software designed for teacher use to manage the instructional process should be made available for all teachers and be compatible throughout the school district.
3. The school district and the teacher association should investigate options for teachers to have access to computers in their homes for training,

development of instructional materials, and research purposes.

4. Practical, hands-on, and regular training in technological applications for learning and managing should be provided during school hours at the school's expense.
5. Training in the use of technology to enhance instruction and professional productivity must be a part of the preparation every entry-level teacher receives.
6. Teachers should be provided encouragement, time, and resources to experiment with and research applications of technology, and to integrate technology into the curriculum.
7. The NEA should commence the planning to create interlinked, nationwide interactive networks for teachers.
8. The planning focus for educational technology should be on the educational needs of students and how educators meet those needs, rather than on the technology.
9. The planning must recognize the inherent value of full participation and collaboration by all involved parties in planning for technology integration into the schools.
10. The Association and its affiliates should be involved in the planning, implementation, and evaluation of long distance learning proposals and programs to provide students the highest quality learning experience.
11. Resources for educational technology must be adequate to provide balanced support for staff development, software, hardware, and research into curriculum integration and development.
12. Planners need to understand the changing responsibilities of the instructional staff and provide time and flexibility for professional development, research, and planning.
13. Education planners must make strong efforts to insure that all teachers and students have equitable access to the new technologies.

Committee Members

E. Scott Brown, *chairperson*
Classroom teacher (secondary)
2177 Rebecca Drive
Hatfield, Pennsylvania 19440

Carolyn L. Anderson
Instructor/Administrator (higher education)
2648 Tantelon Place
Winston-Salem, North Carolina 27127

David D. Bockes
Lead teacher/curriculum coordinator
120 Armory Road
Galax, Virginia 24333

Marilyn B. Cross
Classroom teacher (secondary)
4160 Ruxton Lane
Columbus, Ohio 43220

Leon A. Kurasowicz, Jr.
Classroom teacher (secondary)
80 Starr Street
Leominster, Massachusetts 01453

Joanne E. Lautenschlager
Classroom teacher (secondary)
813 20th Street N.W.
Minot, North Dakota 58701

Damon P. Moore
Classroom teacher (secondary)
Indiana State Teachers Association
150 West Market Street
Indianapolis, Indiana 46204

Emmitt W. Williams
Classroom teacher (middle school)
11010 Studebaker Road
Downey, California 90241

Keith A. Zook
Computer coordinator
18200 Meridian
Grosse Ile, Michigan 48138

Staff Liaison
Gary D. Watts

Staff
Lucille Kincaid

National Education Association
Communications Survey

Report of the Findings

Conducted by:

PRINCETON SURVEY RESEARCH ASSOCIATES

Princeton Survey Research Associates
P. O. BOX 1450
Princeton, NJ 08540

(609) 924-9204

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Technology in the Classroom:
A Teacher Perspective

Introduction

This is a report on the results of a national telephone survey of regular classroom teachers conducted by Princeton Survey Research Associates on behalf of the National Education Association. This is the first study to focus on in-school use of a broad range of technological tools in the same survey. The primary objectives of the study were to both determine the incidence of school-provided technologies and to assess teacher perceptions of their effects on the education process.

The Technical Appendix of this report includes a description of the survey methodology, a definition of the access to technology scale used for analysis, a "top-line" summary of question-by-question results and a copy of the questionnaire.

SURVEY HIGHLIGHTS

- Some forms of technology are now almost universally available to teachers: nearly all have access to photocopiers (97%), televisions (95%) and VCRs (98%) for classroom use at the school site. Roughly nine in ten (88%) have access to computers at school. Other electronic hardware, however, has yet to become standard equipment in schools. Less than half of teachers (43%) are able to use a modem at school, less than a third (28%) have access to a fax machine.

- Computers are installed in about half (52%) of classrooms today. Television sets are found in four in ten classrooms (41%). Unlike most other professionals, however, most teachers lack easy access to a telephone during their work day: only 12% now have phones in their classroom.

- Schools have been slow to replace outmoded technologies. Close to two-thirds of teachers (65%) report that mimeograph or "ditto" machine are still being used in their schools.

- Teachers in affluent and suburban schools are more likely to benefit from a high-tech environment. Schools on the cutting edge in terms of technology typically provide both computers in the classroom and access to modems and fax machines at the school site.

- Worst off in terms of access to technology at school are teachers in urban schools and less affluent school districts. In fact, large city schools are more backward technologically than schools in small town and rural America.

- Schools unable or unwilling to provide teachers with adequate computer technology may be failing to tap a valuable resource: computer skills that teachers have acquired on their own. Fully half of teachers (50%) in low-tech schools say they have a home computer.

- Copying materials for classroom instruction is a struggle for many teachers, especially those in urban areas and less affluent communities. As a result of school restrictions on their paper supply for copying, one-fifth of all teachers (19%) and high proportions of those in large cities (34%) and low-income school districts (28%) have taken heroic measures and used personal resources to meet their classroom duplicating needs.

- In terms of computer technology, access to modems distinguishes the "haves" from the "have-nots". Just over half (53%) of teachers in high-income school districts have access to a modem, compared with fewer than a third (30%) of those in low-income districts. By comparison, these two groups are about equally likely to report having computers in the classroom.

- In the elementary grades, computers tend to be distributed on a one-per-classroom basis and are regarded as an integral part of the learning process. In the higher grades, computers are more often distributed in clusters, and are still regarded as a separate area of instruction.

- TV sets in the classroom are associated with neither high-tech schools nor wealthier schools. In fact, teachers in the suburbs and in high-income communities are less likely than other teachers to say they have a set in their own classroom. In the Southeast and Mid-Atlantic regions, the average teacher has a TV set in the classroom; in other regions, the average teacher must share a set with other teachers.

- The absence of telephones in the classroom makes it difficult for many teachers to have confidential phone conversations with parents or others during the school day. Most of those without a classroom telephone use the phone in the school office for outside calls. Almost half of these teachers (44%) say that the phone they depend on does not allow for private communication.

- On-line computer databases and networks are an emerging technology in the schools. Only about one in five teachers with access to a modem (19%) has access to Prodigy, the most widely used on-line service. Just 10% of all teachers report having used modem or fax technology to exchange instructional information. Still fewer teachers have participated in a learning network (6%) or on-line collaborative teaching/distance learning project (4%) with their students. Only 4% have access to Internet -- the computer "network of networks" -- at school.

- Considering the major categories of computer software and electronic media, teachers make the most use of word-processing software (79%) and graphics software (56%). Less than half of all teachers, but a majority of those teaching math or science, have used spreadsheet software and software to calculate grades. About one in four teachers have used each of the following technologies: instructional laser discs/videodiscs (27%), CD-ROM discs (25%) and hypermedia/multimedia software (23%).

- Teacher perceptions of the importance of various technologies to classroom effectiveness largely reflect the status quo. Only one type of equipment is overwhelmingly thought to be essential: photocopiers with adequate paper supplies (84%). Access to TV/VCR combinations and classroom computers are widely seen as important, but teacher opinion is split on whether they are essential. Access to telephones in the classroom and on-line computer services at school are generally regarded as important, but not essential. Less than half (40%) of teachers believe access to fax machines is important or essential.

- There are sharp differences by generation in attitudes toward the importance putting a computer in every classroom. Six in ten teachers under 35 years of age (59%) believe computers in the classroom are essential. But that figure decreases steadily with age, slipping to 29% among teachers over age 55.

- Sizable proportions of teachers currently lack access to technologies they believe are essential resources. The most widespread unsatisfied technological need is access to a TV/VCR combination (31%) followed by classroom telephones (24%), on-line computer networks (18%) and classroom computers (16%). Most seriously deficient in essential technology are urban schools and schools in low-income communities. Three in ten teachers in large city schools (28%), compared with about one in ten (11%) in suburban schools, identify insufficient access to a photocopier as an unmet technological need.

- More technologically sophisticated schools are associated with a higher quality of education, better parent-teacher communication and greater student interest in learning. In the least technologically sophisticated schools, teachers consider insufficient technology as important an obstacle as inadequate preparation time and overly large class sizes.

- Roughly a third of teachers overall (31%) and half of those in high-tech schools (49%) believe that their own teaching effectiveness has improved "very much" as a result of technology. Only three teachers in ten (28%) do not think technology has made much of a positive impact on their performance in the classroom. Specifically, teachers credit technology with helping them more efficiently carry out routine aspects of their job, such as preparing written materials and record-keeping.

- Budgetary limitations are by far the most serious barrier to teachers' ability to make better use of classroom computer technology. Half of teachers interviewed (46%) cited money as "very much" an obstacle. Other potential obstacles are considered major by only one teacher in five: insufficient wiring in the school building (21%), lack of software (19%), unfamiliarity with computers (18%) and lack of technical support (18%).

- A majority of teachers (63%) believe it is essential that teachers and parents be able to contact each other during the school day. While most teachers do not now regard classroom telephones as essential, a large majority (71%) acknowledge that having a phone in every classroom would improve parent-teacher communication to some extent; more than a third believe it would result in a major improvement in communication.

- Female teachers, younger teachers, those in elementary schools, smaller schools and urban schools are the biggest advocates of telephones in the classroom.