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ABSTRACT

A survey was conducted to obtain a systematic profile of activities currently being undertaken by kindergarten through grade 12 educators in telecommunications technology. Based on the responses of 550 educators from 48 states, selected because of their involvement with computer technology, this survey represents the first large-scale description of educators' telecommunications practices. Benefits and obstacles to using telecommunications effectively as a professional resource and a learning tool are described; findings suggest that telecommunications serve as a valuable resource for both of these purposes for educators who responded. These educators represent a specialized group of highly educated and experienced teachers, who are knowledgeable about computer technology and who have been using a range of computer-based applications in classrooms for several years. Computer and library media specialists are generally the leaders in telecommunications practices, serving as a resource for other teachers. Most respondents are self-taught, and their responses highlight the lack of training in telecommunications for teachers. Implications of findings for improving the educational uses of telecommunications are discussed. Ten tables and 49 figures present survey findings. Appendix A is an annotated bibliography that lists 55 educational telecommunications services and regional Internet providers, and Appendix B lists the computer networks respondents used. (Contains 21 references.) (SLD)

Telecommunications and K-12 Educators: Findings from a National Survey

Margaret Honey
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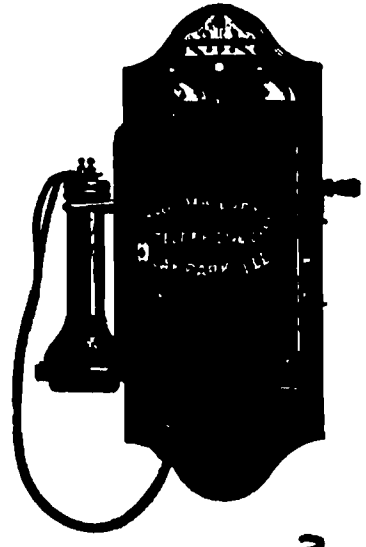

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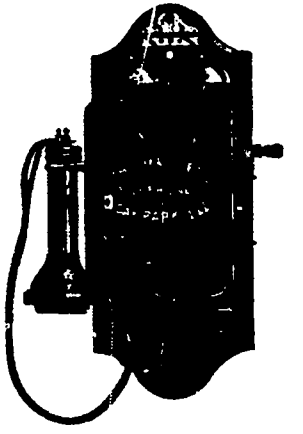

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Margaret Honey and Andrés Henriquez

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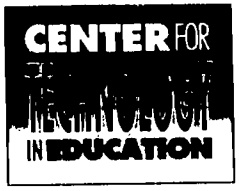

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Harvard University
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National Center on Education
and the Economy

Acknowledgments

There are many people whose hard work and thoughtful comments went into the design of the survey instrument, the analysis of the findings, and the preparation of this report. First, we would like to thank our colleagues at the Center for Technology in Education and the Center for Children and Technology. Martha Hadley, Jan Hawkins, Katie McMillan, Babette Moeller, Denis Newman, and Julie Thomoson provided advice and help throughout all phases of this project. We would also like to thank David Sabino for his work on constructing the database of teachers on which the sample is based. We would like to thank Paul Tepas of KRC, Inc. for his help in data processing and analysis. And we would like to thank Ruth Kolbe of Bank Street College for her patient and creative help in designing the survey and this report.

We are grateful to the many organizations who helped us locate the telecommunicating educators represented here. The FrEdMail Foundation, the International Society for Technology in Education, NYSERNET, and Learning Initiatives were kind enough to let us make use of their mailing lists. PSINet distributed information about the survey in their newsletter. We thank the many networks --local, national, private, not-for-profit, and state-run—which posted online announcements of the survey study.* And we would like to acknowledge all the individuals in the many state departments of education who helped us locate telecommunicating educators.

There are also many people who reviewed drafts of the survey instrument. They include members of the Center for Technology in Education Advisory Board, individuals who have been working for many years on issues related to K-12 education and telecommunications, and many other colleagues. These individuals contributed significant amounts of time to reviewing drafts of the survey, and their thoughtful advice helped to make the survey an instrument that reflected a broad range of concerns and interests. We thank Chris Clark, John Clement, Matthew Forsyth, Marcia Harrington, Donald Holznagel, Peter Hutcher, Steve Klein, Bobbie Kurshan, Cecilia Lenk, Jim Levin, Dina Luciano, Shirley Malcom, Frank McKeown, James Mitchell, Gail Morse, Richard Murnane, Gary Obermeyer, Frank Odasz, Ellen Rappaport, Paul Reese, Rob Reilly, Margaret Riel, Linda Roberts, Al Rodgers, Mary Rollefson, Andee Rubin, Dick Ruopp, Karen Sheingold, Ram Singh, Gwen Solomon, Kathy Spoehr, Bob Speilvogel, Jim Squire, Karen Warner, and Kirk Winters.

Finally, we would like to thank the teachers and educators who invested their time in completing a very lengthy survey. We hope this report reflects their stories and will be instrumental in moving forward the telecommunications practices they have been pioneering in their schools and districts.

This research was supported by the Center for Technology in Education under Grant No. R117F80011 from the Office of Educational Research and Improvement, U.S. Department of Education, to Bank Street College of Education.

*A resource list of different telecommunications networks is provided in Appendix A.

Contents

Introduction

Background

Providing educators with access to basic telecommunications technology – computers, modems, and phone lines – is currently being discussed as an essential component of the educational reform agenda (Hunter, 1992; Lavin & Hohn, 1990). Teachers can use networks to access a wealth of information, ranging from reports on educational research to curriculum sources and lesson activities. The conferencing capabilities of bulletin boards and networks are a promising means for teachers to exchange ideas with colleagues (Merseth, 1991; Weir, 1992). Many networks now feature discussion centers and teacher forums on a wide range of topics including school-based management, alternative assessment, and equity and education issues. Anecdotal reports have long suggested that collaborations that take place over telecommunications networks help to ease experiences of professional isolation common among teachers.

In addition, there is widespread agreement that telecommunications can enhance the range and scope of what students learn in the classroom (Brienne & Goldman, 1988; Cohen & Riel, 1986; Levin & Cohen, 1985; Newman et al., 1988; Riel, 1985; Riel & Levin, 1990; Ruopp, 1993; Waugh & Levin, 1989). With the aid of creative teachers, students are using telecommunications systems to gather and exchange scientific data, to carry out creative writing projects, and to exchange cultural and social information (Foster, Julyan, & Mokros, 1988; Riel, 1987; Rogers 1992). In the last five years, the use of telecommunications in the classroom has moved beyond the research and development phase and become a widespread component of numerous technology integration efforts.

While there exists a wealth of descriptive information on the kinds of projects that are being carried out, there has been no systematic analysis of the range and type of telecommunications activities being conducted by teachers for either professional development or student learning. As a result, in 1992 the National Center for Technology in Education at Bank Street College decided to undertake a nationwide survey of K-12 educators' use of telecommunications systems for two principal purposes: professional development (i.e., communicating with colleagues, downloading curriculum materials, on-line research activities), and student learning (i.e., classroom exchange projects, on-line research activities). For the purposes of this study, we defined telecommunications as computer-based information systems utilizing modems hooked up to computers, which allow communication to take place over telephone lines.

The survey was designed to gather a systematic profile of the range of activities currently being undertaken by K-12 educators in order to adequately inform school officials, policy makers, service providers, and educators themselves about strategies for the creative use of this technology. Based on the responses of 550 educators from 48 states, this survey represents the first systematic and large-scale profile of educators' telecommunications practices. The survey also documents both the benefits of and obstacles to using telecommunications effectively as a professional resource and learning tool.

Developing the Questionnaire

Our goal in developing the survey instrument was to create a questionnaire that would adequately reflect and capture the array of experiences that are relevant to educators who are actively involved in telecommunications. Using our network of professional contacts, we put together a total of five focus groups with teachers, administrators, and computer and media specialists from the New York metropolitan area who were using a range of telecommunications networks for professional and student learning purposes.

The focus groups addressed a broad range of topics that we wanted to cover in the survey. We asked educators how and why they first became involved with telecommunications, the kinds of training they received, and what their own individual learning curves looked like. We asked them to describe what they used network services for, including the kinds of professional collaborations they were involved in, as well as their student based projects. We asked them about the pros and cons of networking and whether telecommunications had had an impact on their teaching and their students' learning. And we discussed the factors that make telecommunications activities successful, as well as the barriers that prevent the effective use of this technology.

Out of these discussions, we developed a twenty-seven page questionnaire to investigate the following questions:

- Who are telecommunicating educators, and what kinds of schools are they working and teaching in?
- What is their experience with and training in general computer-based technologies?
- What motivates their use of telecommunications, and what is their experience with and training in this technology?
- What kinds of professional development activities are educators using telecommunications for, and what are the perceived effects of using telecommunications for professional purposes?
- What kinds of student learning activities are educators using telecommunications for, and what are the perceived effects of these activities on students' learning?
- What kinds of telecommunications services are used, and what factors influence the selection of network services?
- How are telecommunications and related technologies configured and distributed in these educators' schools?
- What are the barriers to the effective use of telecommunications technology in schools?

Developing the Sample of Respondents

Because we were interested in learning about educators who were actively involved in using telecommunications, we developed the survey sample by posting on-line announcements on more than fifty educational, commercial, and state-run telecommunications networks within the United States.* The announcement read as follows:

> The National Center for Technology in Education at Bank Street College will be conducting, in 1992, a nationwide survey of teachers who use telecommunications systems for professional development and student learning. We are interested in surveying K-12 teachers who use bulletin boards, on-line commercial services, or on-line education services for a range of activities

We also solicited respondents through mailing lists (FrEdMail, ISTE, K12Net, Learning Initiatives, NYSERNET), conferences, state education departments, and professional contacts. As a result, all of the educators who responded to the survey volunteered to participate. Fifty percent of the educators who volunteered to be part of this study returned the questionnaire (550 of 1100).

Interpretation of the Findings

Because this is the first extensive study to be undertaken on the use of telecommunications among K-12 educators within the United States, there are no comparable data with which to compare our findings. Where appropriate, we have chosen to contextualize and interpret our findings in relation to three sets of data: the National Center for Education Statistics' survey *Schools and Staffing in the United States: A Statistical Profile, 1987-88*, and their *Digest of Education Statistics, 1991*; and the Center for Technology in Education's *Accomplished Teachers: Integrating Computers into Classroom Practice*, a nationwide survey that examined the practices of accomplished technology-using teachers (Sheingold & Hadley, 1990).

This report presents a summary of all the major findings from the sample as a whole. Subsequent reports will examine how variables such as grade level, subject area, and school and teacher demographics affect the use of telecommunications for professional development and student learning activities.

It is the hope of the Center for Technology in Education that the information contained in this report will be useful to the K-12 education community, and will contribute to our understanding of what it takes to make telecommunications a viable and effective resource for K-12 educators.

*Many of the networks on which we posted announcements are global in their reach, and we did receive responses from individuals living in other countries who wanted to be included in the survey sample. For reasons of coherence, time, and expense, we decided to limit the focus of the survey to telecommunications activities within the United States.

Profile of Respondents' Schools

- **Across size, type of school, and ethnic and economic representation, the schools in which these educators work are similar to national averages.**
- **There is a trend toward more suburban schools, but not more affluent schools in this sample.**
- **These educators' schools are concentrated in the mid-Atlantic and Pacific regions of the country.**

In order to understand how our voluntary sample is similar to and different from our nation's schools and the teachers who teach in them, we compared the demographics of our sample to national averages collected by the Center for Education Statistics. We found that across size, type of school, and ethnic and economic representation, the schools in our sample are comparable to national averages (NCES, 1992). Although there is a trend toward more suburban schools in our sample than is the case nationally, our economic data suggest that our sample does not represent more affluent communities. In fact, the percentage of schools which report that their students receive free or reduced-price lunches is slightly greater in our sample than is the case nationally.

The geographic location of the schools in our sample does differ from the national school profile. The schools in our survey are concentrated in the mid-Atlantic (New York, New Jersey, Pennsylvania) and Pacific (California, Oregon, Washington, Alaska, Hawaii) regions, and underrepresentative of the East South Central (Kentucky, Tennessee, Alabama, Mississippi), West South Central (Arkansas, Louisiana, Oklahoma, Texas*), and South Atlantic (Delaware, Maryland, District of Columbia, Virginia, West Virginia, North Carolina, South Carolina, Georgia, Florida) regions of the country. While this trend may reflect a bias in our sampling techniques, it may also indicate that at the time of the survey much of the nation's telecommunications activities were concentrated in the mid-Atlantic and Pacific regions of the country.

*At the time the survey was conducted, TENET (the Texas State-run telecommunications network) was just getting under way. TENET now reports a total of 19,800 users.

Figure 1
Type of School

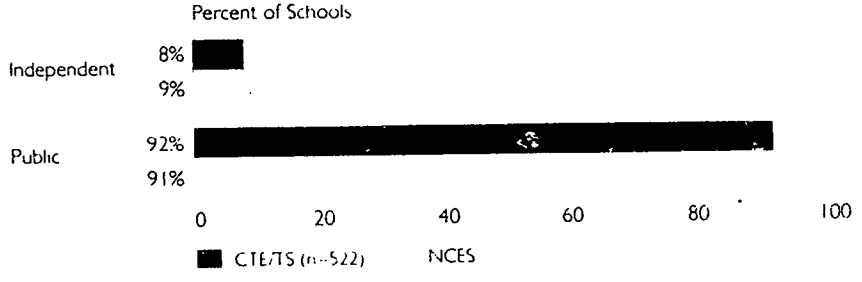


Figure 2
Size of School

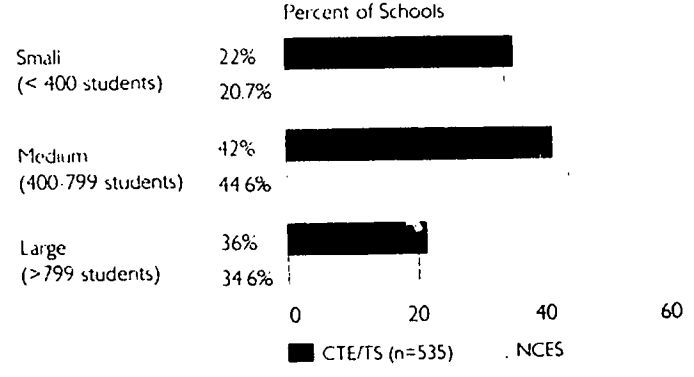


Figure 3
Communities in which Schools are Located

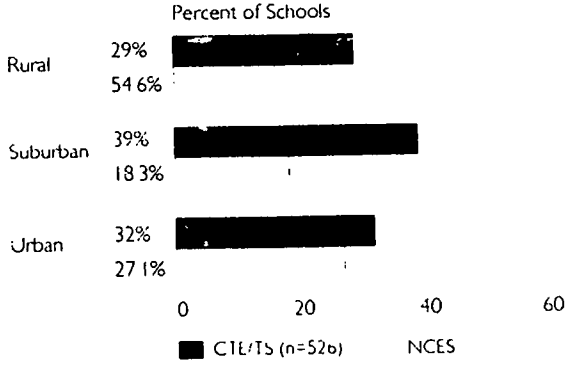


Figure 4
Percentage of Students Receiving Free or Reduced Price Lunch

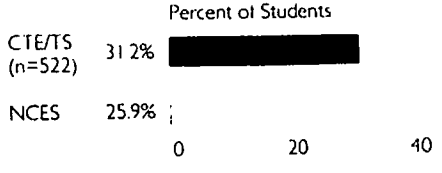


Figure 5
Student Ethnic Group Representation within Schools

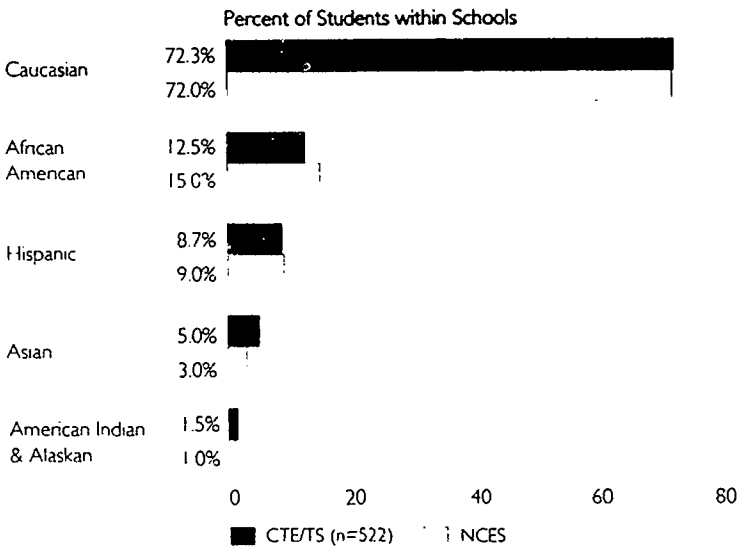
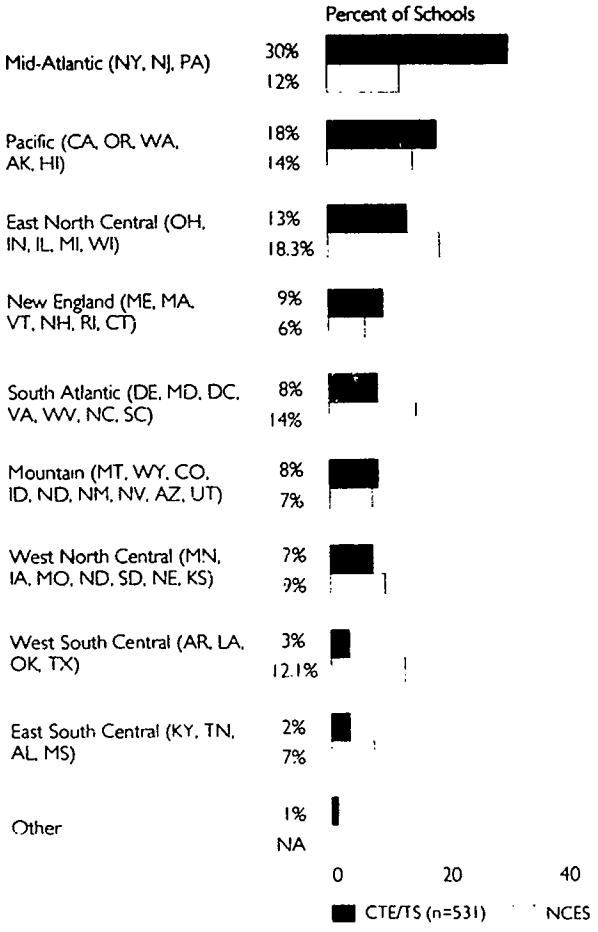


Figure 6
Regional Distribution of Schools



Sources

Figure 1
CTE Telecommunications Survey (CTE/TS) question 62; NCES (July 1992), p. 6, Table 2.1.

Figure 2
CTE/TS question 60; NCES (1991), p. 101, Table 91.

Figure 3
CTE/TS question 66; NCES (July, 1992), p. 6, Table 2.1.

Figure 4
CTE/TS question 64; NCES (1991), p. 370, Table 350.

Figure 5
CTE/TS question 63; NCES (July 1992), p. 12, Table 2.4.

Figure 6
CTE/TS question 67; NCES (July 1992), p. 7, Table 2.2.

Profile of Respondents

- **These educators are experienced and highly educated teachers.**
- **These educators are older than the national average, and almost entirely Caucasian.**
- **When compared to national demographics, there are almost twice as many men and a third less women among this group of educators.**
- **Although these educators work with students spanning the K-12 age groups, they are concentrated in jobs that are directly related to using technology in instruction.**

When compared to profiles of our nation's teachers, the educators represented in this study have been teaching longer and have completed more advanced degrees. The majority have taught for ten or more years, and most of the respondents have done graduate work at or beyond the master's level.

Our sample is, on average, older than the nation's teachers as a whole (44.9 vs. 40.2), and almost entirely Caucasian. There are also many more men in our sample than are represented in national averages.

Our respondents work with students spanning the K-12 age groups. Approximately one-quarter are elementary school teachers, suggesting that educators are finding that telecommunications can support a range of activities that are meaningful for teachers who work with younger children as well as older students. Twenty-three percent of the respondents identified their primary teaching assignment as general computer-based instruction (as distinct from computer science); and 14% listed their primary teaching assignment as library/media specialists--a new and growing specialty in which technology and telecommunications activities are taking place.

The sciences—including biology, chemistry, physics, earth science, and geology—represented the largest content-specific discipline for these telecommunicating educators. This was followed by math and computer science, other special areas (art, music, reading, health, physical education, industrial arts, business education), English/language arts, social studies/social sciences, gifted education, special education, vocational education, foreign language, bilingual/ESL, and basic skills.

When these figures are compared to national averages compiled by the Center for Education Statistics, it becomes clear that our sample of telecommunicating educators is heavily concentrated in jobs that are directly related to using technology in instruction.

Figure 7
Number of Years Teaching

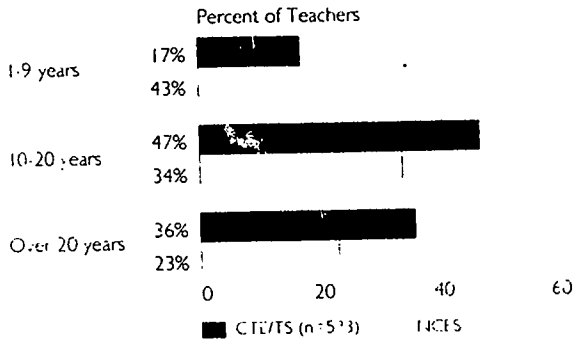


Figure 8
Highest Degree Earned

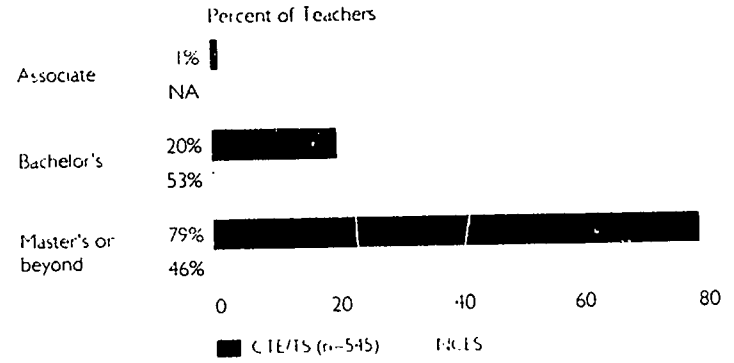


Figure 9
Age of Respondents

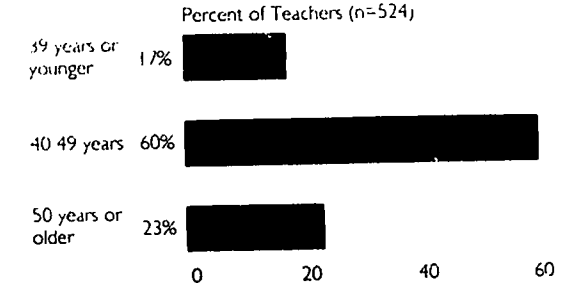


Figure 10
Ethnic Group Representation

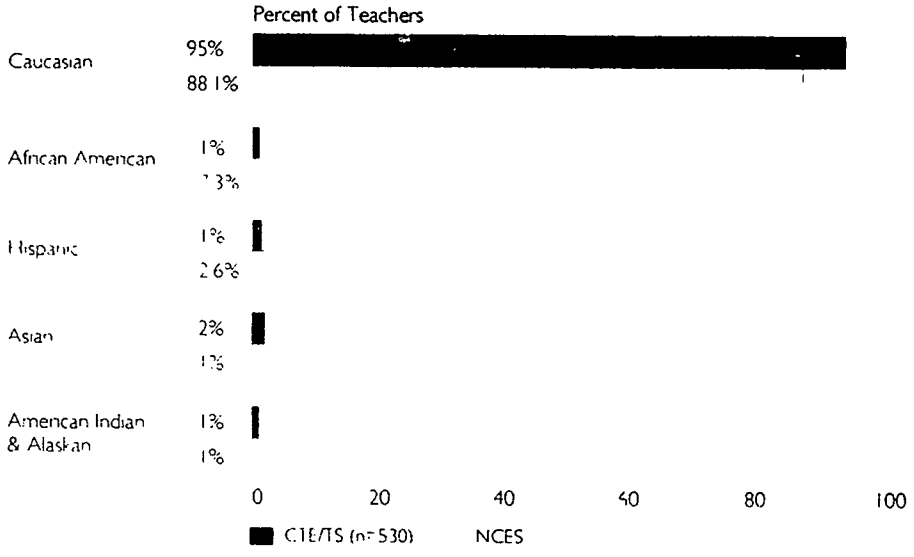


Figure 11
Sex

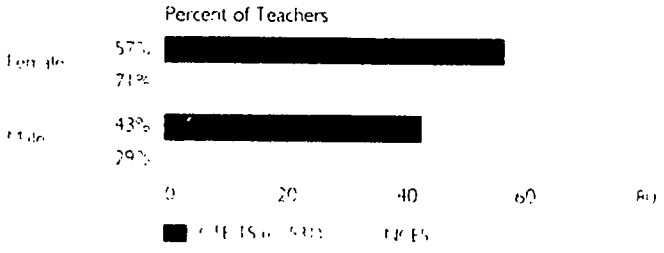
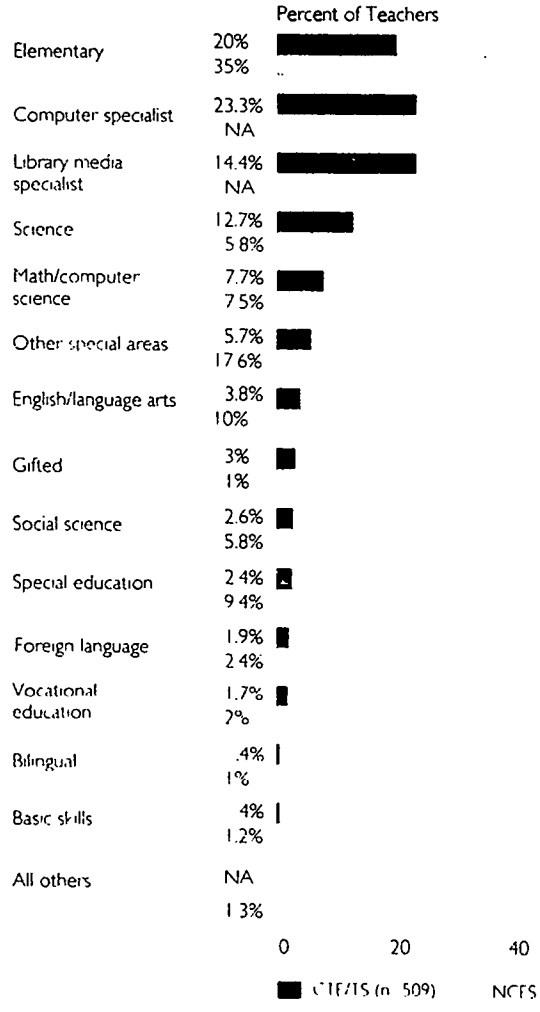


Figure 12
Primary Teaching Assignment



Sources

Figure 7
CTE/TS question 2; NCES (July 1992), p. 12, Table 2.4.

Figure 8
CTE/TS question 6; NCES (July 1992), p. 45, Figure 3.7.

Figure 9
CTE/TS question 68.

Figure 10
CTE/TS question 69; NCES (July 1992), p. 37, Figure 3.6.

Figure 11
CTE/TS question 68; NCES (July 1992), p. 36, Figure 3.5.

Figure 12
CTE/TS question 3; NCES (July 1992), p. 62, Table 4.4.

Respondents' Experience and Training with Computers

- **These educators are very experienced computer users. Nearly half of these teachers have been using computers for more than nine years; the majority have been using computers for more than five years.**
- **These educators are involved in a wide range of instructional computer practices, from word processing to robotics.**
- **When it comes to learning about computer technology, this is a highly motivated group of educators; the majority are self-taught and attend conferences and workshops on their own time.**
- **Nearly all of these educators have access to computers at home.**

In 1990, the Center for Technology in Education carried out a national survey of teachers nominated as accomplished users of educational technology (Sheingold & Hadley, 1990). This survey queried more than 600 educators who were selected because of their involvement and accomplishments in integrating computers into their teaching. According to teachers' descriptions of their practices and the amount of time they had been using technologies in their teaching, we were able to determine that it takes, on average, *five to seven years* for a teacher to become a comfortable, confident user of educational technology. By the fifth year, use of drill and practice and tutorial software dropped, and teachers started expanding the number and kinds of technologies they used in their classrooms.

The majority of the educators in our telecommunications survey are indeed experienced computer users. In fact, this sample of telecommunicating educators has been using computers significantly longer than the teachers represented in the *Accomplished Teachers* survey. Nearly half (43%) of our respondents report using computers for nine or more years, in contrast to the 20% reported in the earlier CTE study.

These telecommunicating educators also report a much lower level of use of drill and practice and tutorial software than the teachers in the *Accomplished Teachers* survey. In addition, our sample may well reflect a shift in the kinds of programming languages that computer-sophisticated educators are using with their students. Basic and LOGO are taught much less frequently, while HyperTalk is taught much more often by this group of educators than those in the earlier study. The use of videodisc and multimedia production tools is also more prevalent among this group. Some of these trends may reflect changes in schools' hardware and software purchasing decisions and increases in the availability of advanced tool-based technologies. These data also suggest that educators who are active users of telecommunications technology are also educators who are likely to integrate general tool-based and multimedia applications into their teaching practices, rather than relying on tutorial or drill-and-practice programs.

Almost all of these respondents have access to computers and modems at home. Although the majority of these educators report that they are self-taught computer users, and many attend conferences and workshops on their own time, they have also taken advantage of a range of other computer training activities at both the school and district level.

Figure 13
Access to Computer at Home

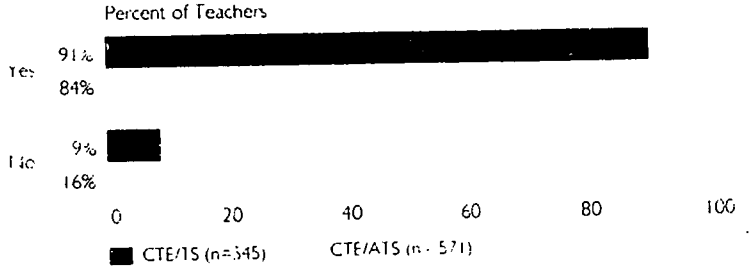


Figure 14
Respondents' Training in Computer Use

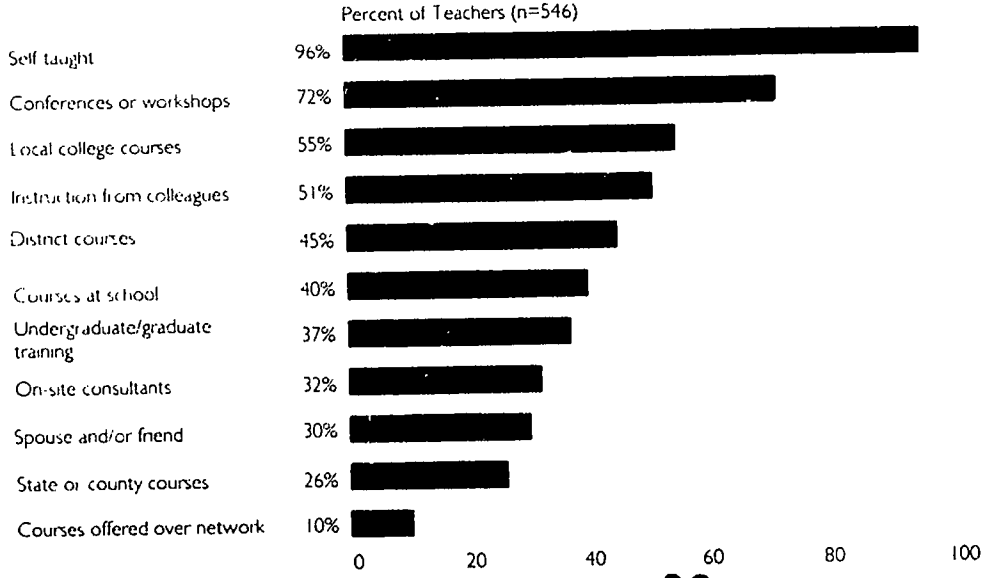


Figure 15
Years Using Computers in Teaching

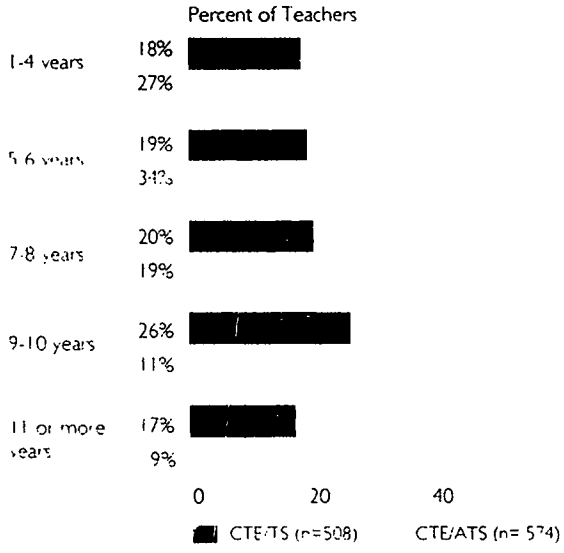
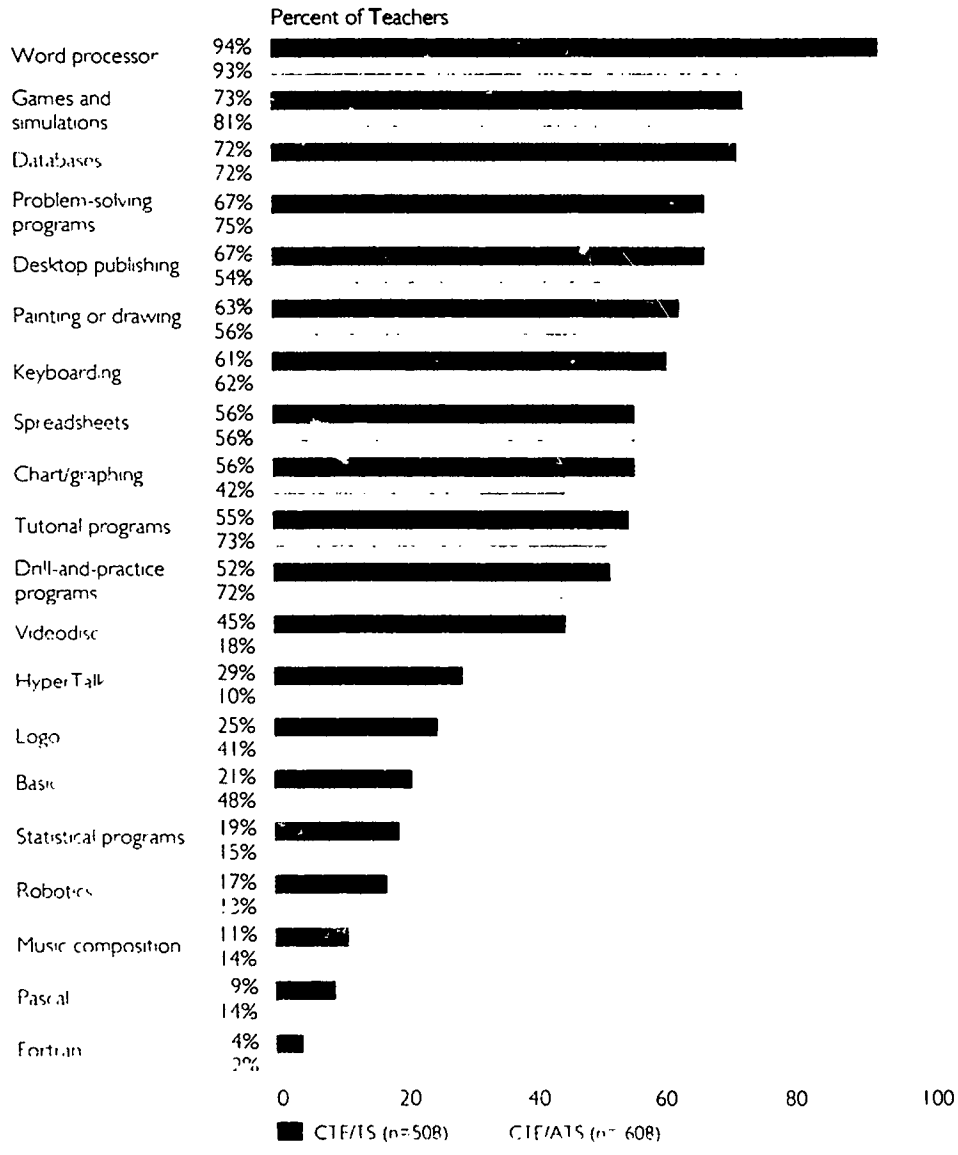


Figure 16
Experience with Computer Applications



Sources

Figure 13
CTE/TS question 10; CTE/ATS, p. 30, Table 2.

Figure 14
CTE/TS question 9. (Note: Multiple responses were possible.)

Figure 15
CTE/TS question 7; CTE/ATS, p. 30, Table 2.

Figure 16
CTE/TS question 8; CTE/ATS, p. 8, Tables 1-8. (Note: For both surveys, multiple responses were possible.)

Profile of Technology in Respondents' Schools

- **These educators are working in schools that are rich in computer resources, and nearly half of the teachers in their schools use computers in their teaching.**
- **On average, the schools these educators work in have used computers for instructional purposes for more than eight years.**
- **Approximately half of these schools have local area networks that connect computers internally, but of these LANs only a quarter are connected to wide area networks.**
- **Many of these schools are also endowed with other technology resources, including cable television systems, microwave hookups, satellites, and broadcast technologies.**

In order to understand the situations in which telecommunications activities are taking place, we asked our respondents about general computer-based activities in their schools.

The schools in our sample are well endowed with computers and have been using them for an average of 8.4 years. The average number of computers in these schools, 66.5, is more than double the average of 27 reported in a random survey of U.S. schools (Anderson, 1992). Computers are most likely to be found in computer labs and classrooms, but they are also prevalent in administrative offices and libraries. Not only are these technology-rich environments, but respondents report that almost half (44.8%) of the teachers in their schools use computers in their teaching. This finding is significant insofar as Becker's (1993) research demonstrated that exemplary computer-using teachers are more likely to be found practicing in schools where there are other competent technology users.

Slightly more than half of the schools' computers are connected through local area networks. Almost half of these LANs, however, are grouped in single rooms and are connected by AppleTalk or Novell networks, suggesting that they are being used primarily for printing and accessing software. The majority of these LANs do, however, have file servers, while only about half have electronic mail capabilities. Even fewer—only about a quarter of the LANs—are connected to a wide area network.

Many of these schools also have a range of distance learning technologies available to them, including cable television systems, microwave hookups, satellites, and broadcast technologies.

Figure 17
Type of Computers in Respondents' Schools

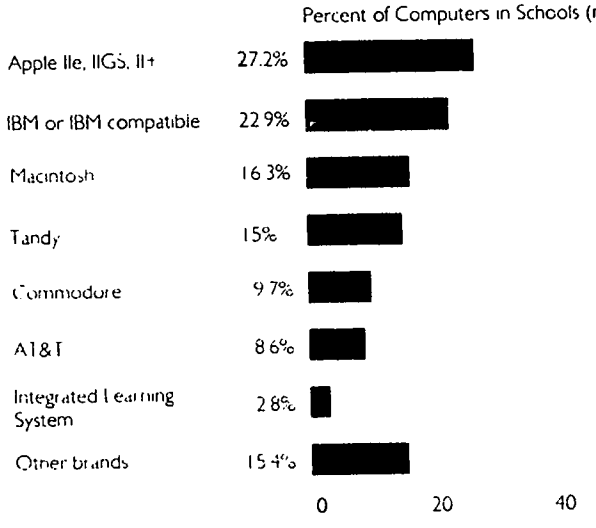


Figure 18
Location of Schools' Computers

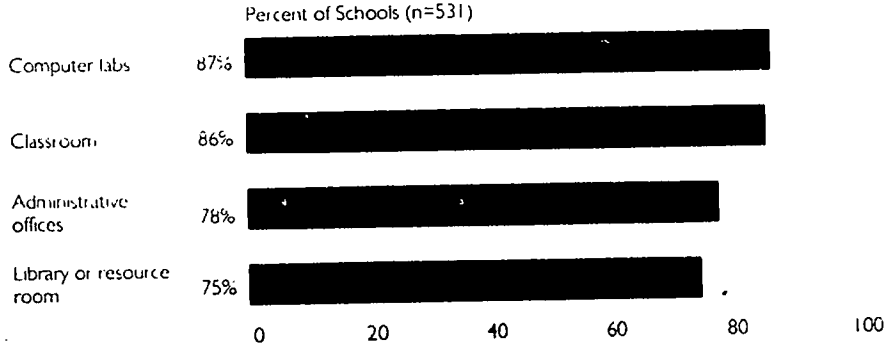


Figure 19
Schools with Local Area Networks

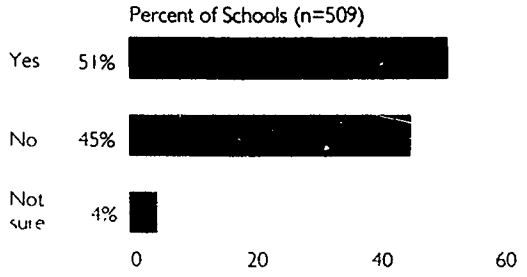


Figure 20
Type of Local Area Network

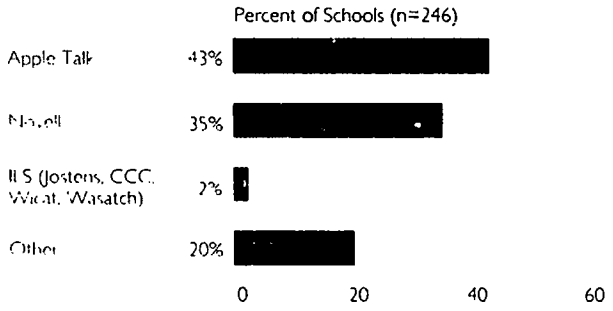


Figure 21
Location of Schools' Local Area Networks

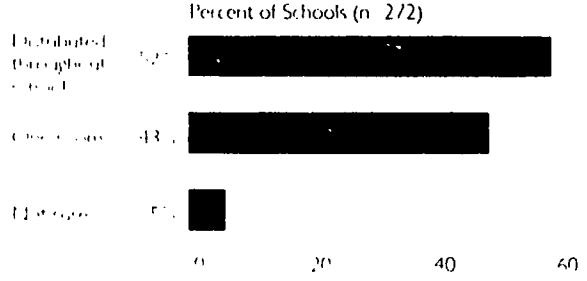


Figure 22
Services Available on Schools' Local Area Network

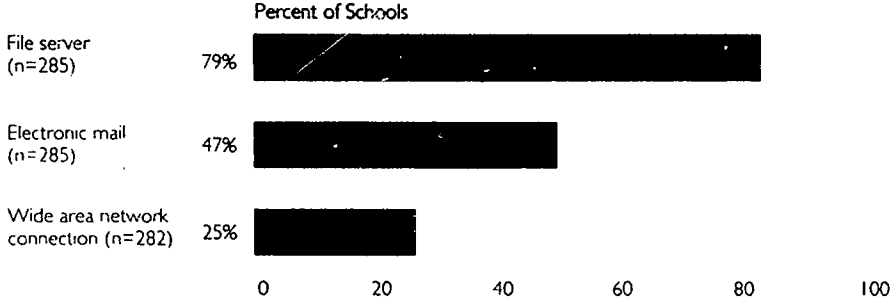
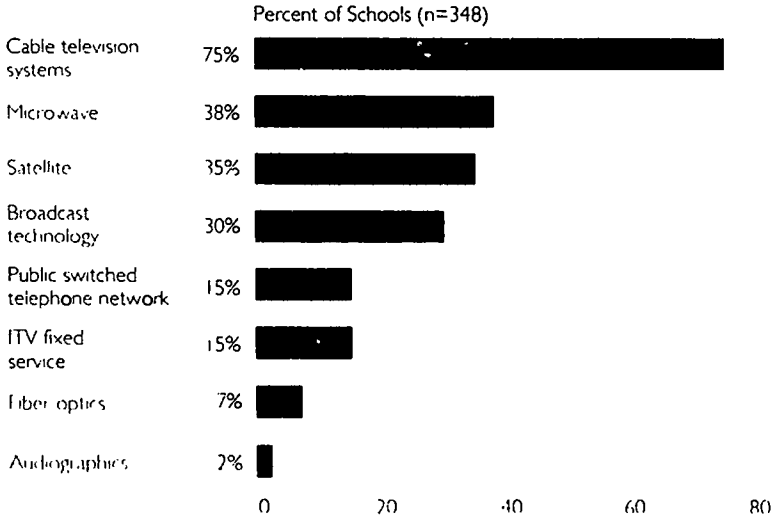


Figure 23
Distance Learning Technologies Available in Respondents' Schools



Sources

Figure 17
CTE/TS question 53; (Note: Multiple responses were possible.)

Figure 18
CTE/TS question 56; (Note: Multiple responses were possible.)

Figure 19
CTE/TS question 54a.

Figure 20
CTE/TS question 59b.

Figure 21
CTE/TS question 54f.

Figure 22
CTE/TS question 54c, d & e. (Note: Multiple responses were possible.)

Figure 23
CTE/TS question 59. (Note: Multiple responses were possible.)

Telecommunications: Motivation, Experience, and Training

- **On average, these educators have been using telecommunications for professional development purposes for more than four years, and for student learning activities for more than three years.**
- **The majority of these educators describe themselves as "intermediate" or "very knowledgeable" in their understanding of telecommunications technology.**
- **For these educators, their use of telecommunications has been driven by personal interest and motivation, rather than by school or district initiatives.**
- **In contrast to training in basic computer applications, there is very little support for telecommunications activities at the school or district level.**

When it comes to using telecommunications technology, this is a very experienced and highly motivated group of users. The majority of these telecommunicating educators are self-taught, and most describe themselves as having an intermediate or very knowledgeable level of understanding of the technology. On average, they have been telecommunicating for professional reasons for more than four years and have used telecommunications for student activities for more than three years.

For this group of educators, telecommunications use has been driven largely by personal interest rather than by school or district initiatives. The majority of the sample reported that they were "personally intrigued by the technology," and that this is why they initially got involved with telecommunications. The survey results strongly suggest that support for telecommunications activities at the school and district level is virtually nonexistent. In the absence of organized school-based support, a high degree of self-motivation appears to be a necessary attribute for undertaking telecommunications activities.

While there is support available in our respondents' schools for training in general *computer-based* activities, there is a notable absence of such support (on either a district or school level) for telecommunications. Only 13% of the respondents report taking district-sponsored courses to learn basic telecommunications skills, and only 8% have taken telecommunications courses at their schools.

Instead, respondents report that they mainly learn about telecommunications activities on their own and by attending workshops and conferences. While conferences are the most widely used information resource, teaching and technology magazines, knowledgeable friends and colleagues, and other people online are also important sources of information for both professional and student learning activities.

Figure 24

Level of Expertise with Telecommunications

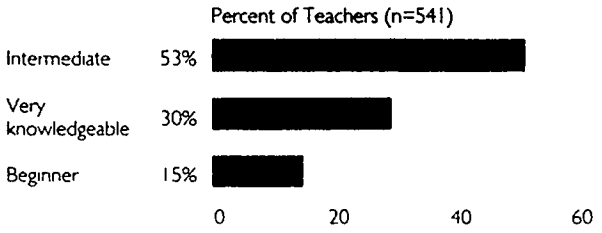


Figure 25

Initial Motivation or Catalyst for Involvement with Telecommunications

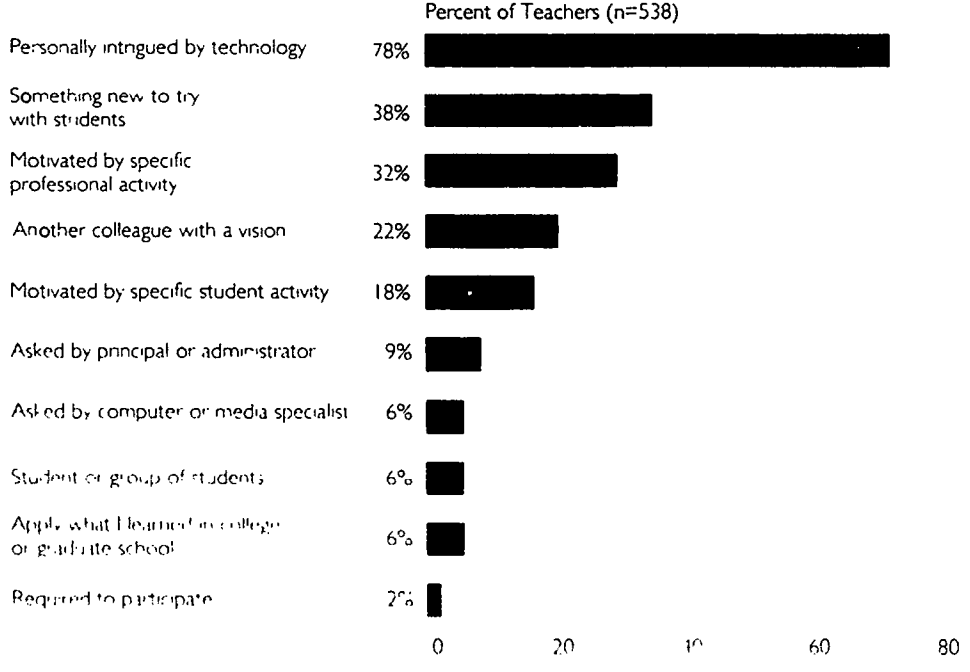


Figure 26

Mean Number of Years Using Telecommunications for Professional and Student Learning Activities

Figure 27

Training in Telecommunications

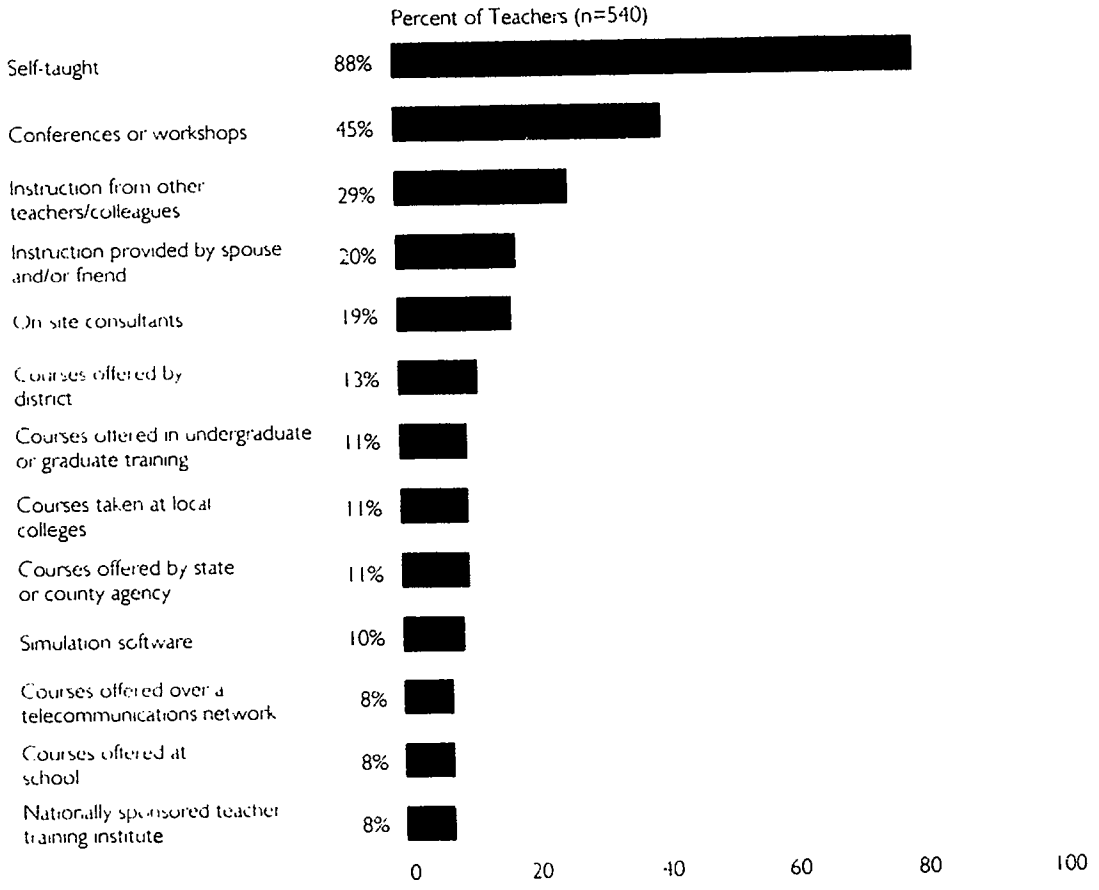
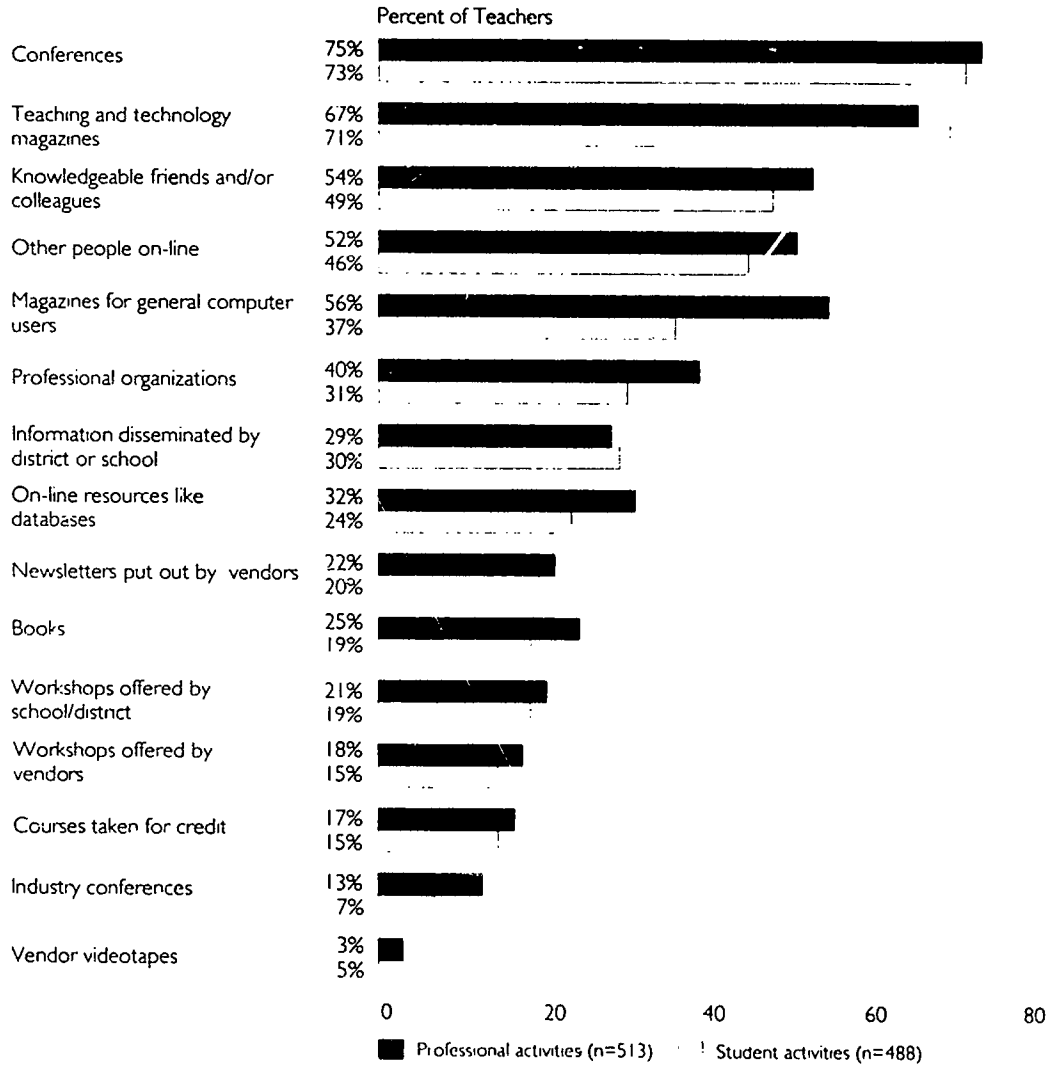


Figure 28
Sources Used to Gather Information about Telecommunications for Professional and Student Learning Activities



Sources

Figure 24
CTE/TS question 13.

Figure 25
CTE/TS question 14. (Note: Multiple responses were possible.)

Figure 26
CTE/TS question 11.

Figure 27
CTE/TS question 12. (Note: Multiple responses were possible.)

Figure 28
CTE/TS question 21a & b. (Note: Multiple responses were possible.)

Telecommunications and Professional Development

- **Sending e-mail to colleagues, exchanging information on forums and bulletin boards, and accessing databases containing information relevant to students are the most widely used and effective professional development activities.**
- **Telecommunications is used less frequently for administrative tasks, such as reporting on students' progress or sending minutes of meetings.**
- **Communicating with other educators, accessing information, and combating professional isolation are the most highly rated incentives for using telecommunications as a professional resource.**
- **The majority of these educators have a modem at home and are using information services and/or conducting collegial exchanges on an average of once a week or more.**

I have a wide group of professionals who I can and do use as "resource" people for my teaching. Several specific class activities originated from FrEdMail, K12Net, and Internet projects. But most important, I no longer feel isolated behind my closed classroom doors. (High school science teacher)*

Working as the only computer specialist in the school and district, it is invaluable to me to have contact with other professionals using computers in new and innovative ways. Informal questions can be asked. Help can be received in an inexpensive way. Discussions on software, equipment, and programs can be generated. (District computer specialist)

I have been able to meet and work and learn with such a variety (geographically and background) of education professionals that it is rather like being in continuous attendance at a large international conference. (High school science teacher)

The educators in our sample are actively involved in using telecommunications for a number of professional activities. Collegial exchanges, including sending e-mail to colleagues and posting questions or exchanging ideas on forums and bulletin boards, are the services most frequently used for professional purposes. Information retrieval services are also widely used, including databases that contain information relevant to students and databases of educational research. In contrast, networks are used less frequently for administrative tasks such as planning, scheduling, or reporting on meetings, student progress, and attendance. The network services that are used most frequently for professional purposes are also rated as the most effective.

These educators report a range of incentives for using telecommunications as a professional resource. Networking activities play a critical role in combating the isolation that is a familiar experience for many teaching professionals. Our respondents view the opportunity to communicate with other educators and share ideas as one of the major benefits of this technology. Obtaining rapid feedback on curricular issues and other topics of professional interest, and keeping current on subject matter, pedagogy, and technology trends are also important incentives.

These educators do not feel that telecommunications is too time-consuming to function effectively as a professional resource. In fact, the majority of the respondents are using information services and conducting collegial exchanges on an average of once a week or more. Further, the majority are conducting professional networking activities from their own homes, suggesting that much of their telecommunications work is now done on their own time, at their own expense, and with a high level of personal commitment. Nearly three-quarters of the sample have a modem in their homes.

*All quotations are taken from respondents' answers to open-ended survey questions.

Figure 29a
Professional Development Activities: Collegial Exchanges

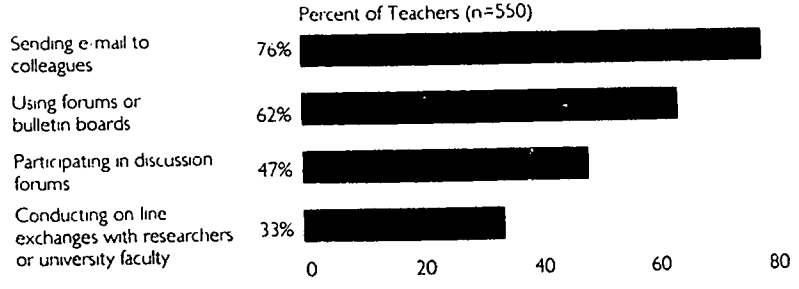


Figure 29b
Professional Development Activities: Information Retrieval Using Services and Databases

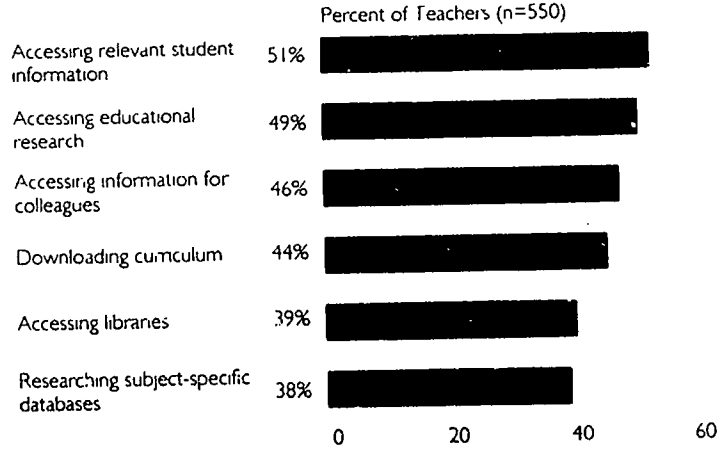


Figure 29c
Professional Development Activities:
Administrative Tasks

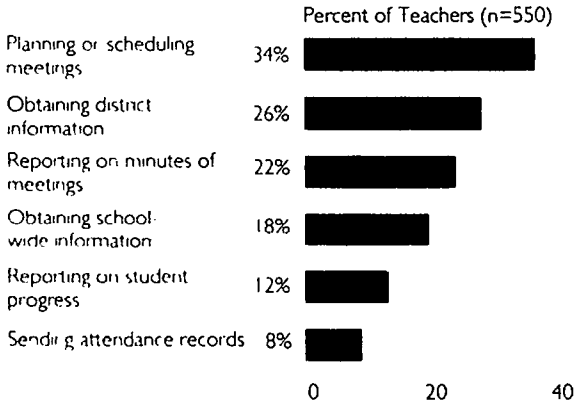


Table 1
Perceived Effectiveness of
Professional Development Activities

Activities	Mean
Collegial exchanges	
Sending e-mail to colleagues (n=456)	5.3
Using forums or bulletin boards to post questions or exchange ideas (n=418)	5.0
Participating in discussion forums on educational issues (n=368)	4.7
Conducting on-line exchanges with researchers or university faculty about educational issues (n=278)	4.5
Information retrieval using services and databases	
Accessing relevant student information (n-369)	5.0
Accessing educational research (n=372)	4.9
Researching subject-specific databases (n=329)	4.9
Accessing information for colleagues (n=332)	4.7
Downloading curriculum (n=372)	4.7
Accessing libraries (n=353)	4.7
Administrative tasks	
Planning or scheduling meetings (n=248)	4.3
Obtaining districtwide information (n=176)	4.1
Reporting on or sending minutes of meetings (n=201)	4.1
Obtaining schoolwide information (n=176)	3.8
Reporting on student progress (n=144)	3.6
Sending attendance records (n=117)	3.5

Table 2

Incentives for Using Telecommunications as a Professional Resource

Incentives	Mean Ratings of Agreement
The opportunity to communicate with other educators, share ideas, obtain information, and get feedback is valuable (n=507)	5.4
Telecommunications affords me access to information that would otherwise be difficult to get my hands on (n=486)	5.1
Telecommunications is an effective tool for combating isolation that so many educators experience as part of their jobs (n=495)	4.9
By using telecommunications, I am able to get rapid feedback on curriculum issues, professional topics, and related questions (n=493)	4.8
By accessing on-line information, I am able to keep up to date on issues concerning subject matter, pedagogy, and technology (n=489)	4.8
Telecommunications greatly facilitates many administrative tasks I have to perform (n=406)	3.0
Telecommunications is too time-consuming to work effectively as a professional resource (n=495)	1.8

Figure 30

Access to Modem at Home

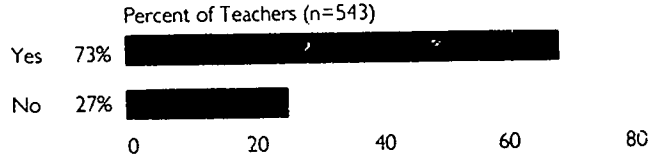


Figure 31

Where Respondents Conduct Professional Telecommunications Activities From

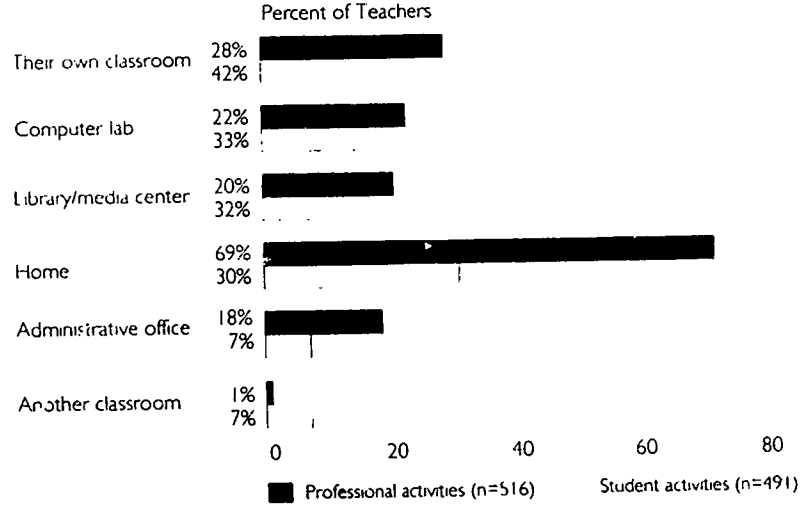
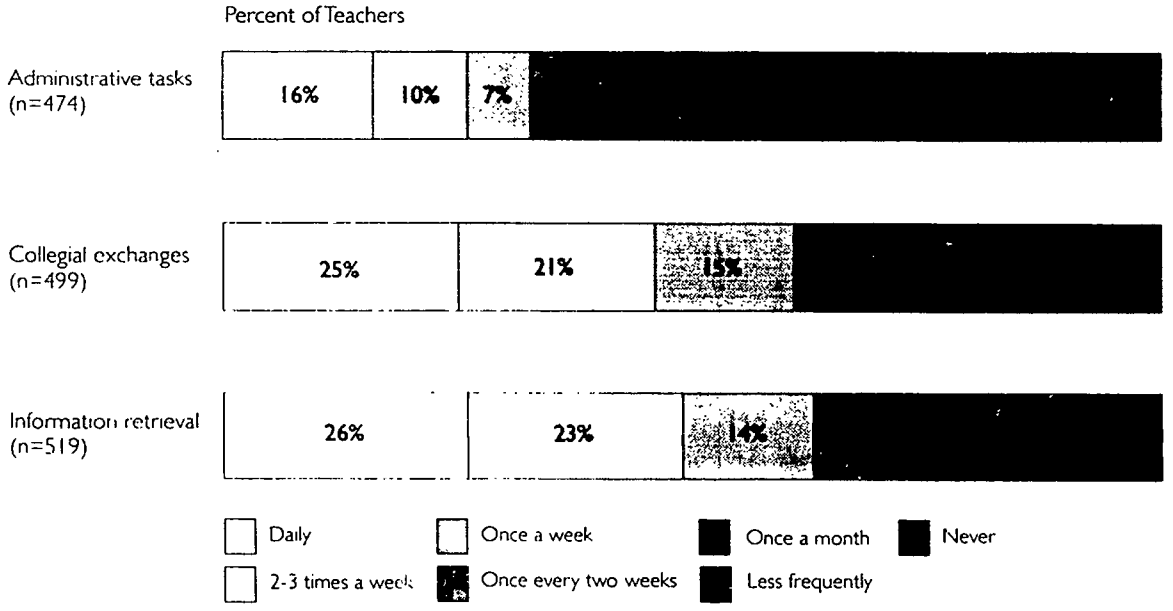


Figure 32

Time Spent Using Telecommunications for Professional Activities



Sources

Figure 29a
CTE/TS question 40h-k.
(Note: Multiple responses were possible.)

Figure 29b
CTE/TS question 40a-f.
(Note: Multiple responses were possible.)

Figure 29c
CTE/TS question 40m-r.
(Note: Multiple responses were possible.)

Table 1
CTE/TS question 41a-r. (Note: Mean is based on a 6-point rating scale in which 1 = not effective, and 6 = highly effective.)

Table 2
CTE/TS question 44a-h. (Note: Mean is based on a 6-point rating scale in which 1 = strongly disagree, and 6 = strongly agree.)

Figure 30
CTE/TS question 15a.

Figure 31
CTE/TS question 22a.
(Note: Multiple responses were possible.)

Figure 32
CTE/TS question 42a-c.

Telecommunications and Student Learning

- **Science, social awareness, and cultural exchange projects are perceived to be the most effective telecommunications activities to do with students.**
- **News services and scientific databases are rated as the most useful information retrieval activities for use with students.**
- **The most highly rated incentives for using telecommunications with students include expanding students' awareness about the world, accessing information that would otherwise be difficult to obtain, and increasing students' inquiry-based and analytical skills.**
- **The key factors that influence the success of any *shared* learning activity influence activities mediated by telecommunications: planning, cooperation, and well-defined and relevant project goals.**

My students have learned to think more about the world as classroom—we are able to visualize the children of other nations as students just like ourselves. I've not been able to get this idea across effectively before. (Elementary school computer coordinator)

It allows me to do real science with others who choose to do real work, and allows students the chance to have a real role in global affairs while doing scientific work that matters. (High school science teacher)

Students are more actively involved, question more, contribute more, work cooperatively, initiate learning. (Middle school media specialist)

Penpal exchanges, scientific data collection, and social awareness and opinion exchanges represent the telecommunications activities most frequently done as classroom exchange projects. When students are conducting research projects, encyclopedias, news retrieval services, weather information, and educational databases are the resources they use most frequently.

Despite their popularity, penpal exchanges are not rated by these educators as highly effective learning tools. They prefer science and social awareness projects, which they rate as the most effective classroom exchange activities. They also feel that the most useful information resources to use with students are news retrieval services, scientific databases, encyclopedias, ERIC, and social studies databases.

In contrast to the frequency with which telecommunications is used as a professional resource, student learning activities happen with much less regularity. Much of the telecommunications activity done with students takes place in the educator's classroom, but these respondents also telecommunicate from computer labs, library media centers, and their own homes.

Respondents report a number of benefits to using telecommunications technology with their students. These include expanding students' awareness about the world in general, accessing information that would be difficult to get otherwise, enabling students to gain familiarity with basic computer applications, helping students to feel successful, and allowing students to undertake more collaborative group-based activities.

Respondents also report that one of the most important benefits of using this technology for instructional purposes is its impact on their students' higher order thinking skills, suggesting that inquiry-based analytical skills—like critical thinking, data analysis, problem solving, and independent thinking—develop when students use a technology that supports research, communication, and analysis. In contrast, these educators report that students' involvement with telecommunications does not directly help to improve their performances on state- or city-mandated tests. This finding suggests that there is a gap between what teachers *know* the creative use of telecommunications can do for their students, and what traditional measures of assessment *actually* account for.

There are a number of factors that these educators believe influence the success of student-based telecommunications activities. When teachers are using networks to carry out classroom exchange projects, advanced planning and full cooperation of all participating teachers is viewed as important to the project's success. The scope and content of the activity also need to be well defined, as do the project goals and objectives. As with any technology project that is designed to support and enhance the curriculum, the relevance of the telecommunications activity to the teacher's ongoing curriculum is important. In addition, timelines that specify when data will be collected and transmitted or when stories will be written and exchanged are viewed by these educators as critical to the success of classroom exchange projects, as is ongoing technical support to ensure that the project runs smoothly.

While important, preparing participating students in the use of telecommunications skills and having students perform the mechanics of telecommunications by logging-on, uploading, and downloading information are factors that received a lower rating of importance than those mentioned above.

These findings suggest that central factors that influence the success of any shared learning activity are important to the success of a telecommunications project: planning, cooperation, and well-defined and relevant project goals.

Figure 33a

Student Learning Activities: Classroom Exchange Projects

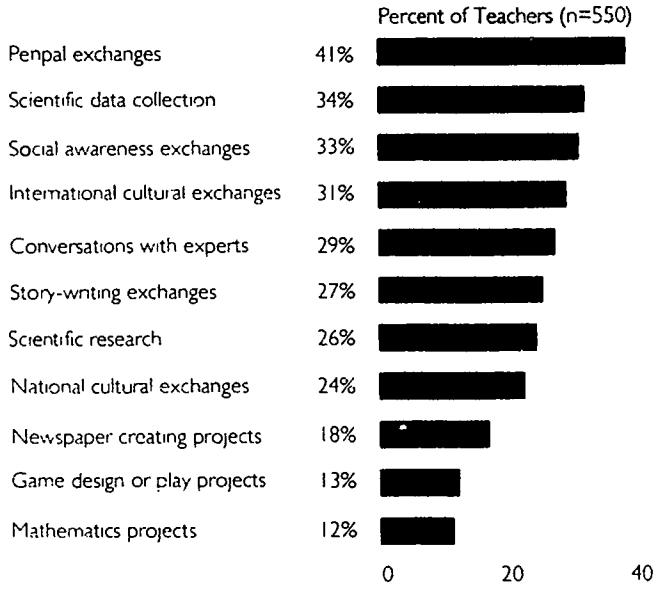


Figure 33b

Student Learning Activities: Services and Databases

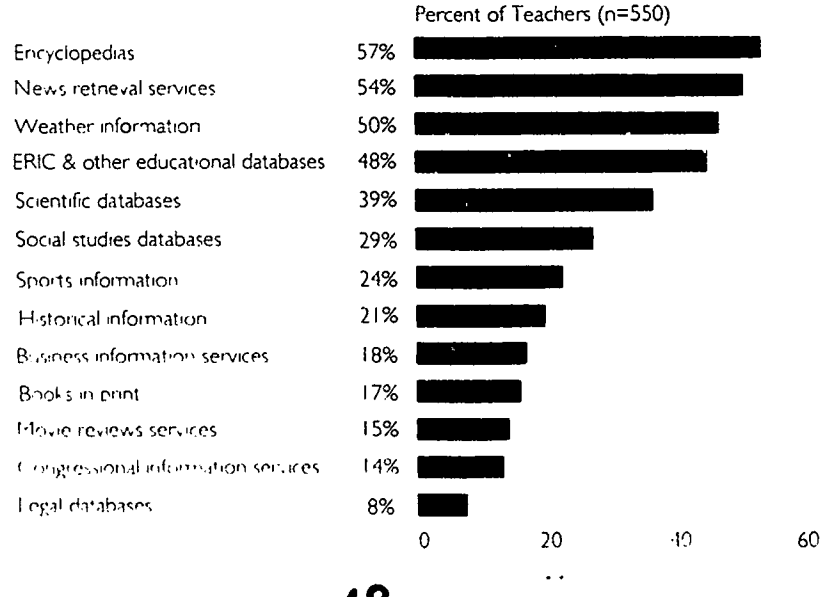


Table 3

Perceived Effectiveness of Student Activities: Classroom Exchange Projects

Exchange Projects	Mean
Scientific data collection (n=268)	4.9
Scientific research/design (n=197)	4.7
Social awareness (n=253)	4.7
National cultural exchanges (n=205)	4.6
International cultural exchanges (n=232)	4.5
Story writing exchanges (n=238)	4.5
Penpal exchanges (n=335)	4.4
Newspaper projects (n=178)	4.4
Conversations with experts (n=264)	4.4
Mathematical projects (n=144)	3.9
Game design or play projects (n=149)	3.6

Table 4
Perceived Usefulness of Student Activities: Services and Databases

Services/Databases	Mean
News retrieval services (n=267)	50
Scientific databases (n=194)	48
Encyclopedia (n=293)	47
ERIC and other educational databases (n=296)	47
Social studies database (n=157)	47
Historical databases (n=130)	46
Weather information (n=257)	44
Books in print (n=127)	41
Medical information services (n=96)	40
Legal databases (n=61)	38
Business information (n=124)	37
Congressional information (n=75)	37
Sports information (n=144)	36
Movie review services (n=119)	34

Figure 34
Time Spent Using Telecommunications for Student Learning

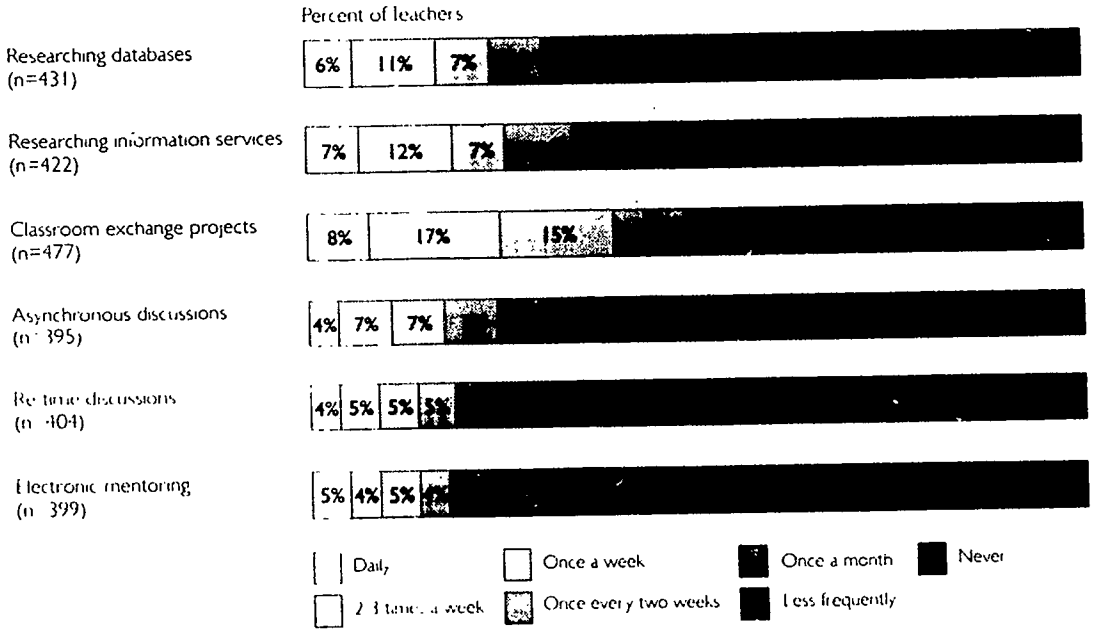


Figure 35
Where Respondents Conduct Student Learning Activities From

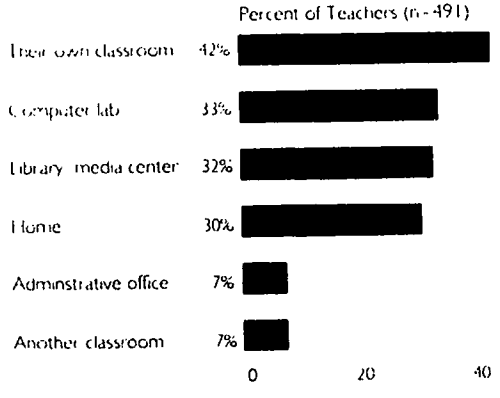


Table 5
Incentives for Conducting Student Learning Activities

Incentives	Mean Ratings of Agreement
Opens up the world for students (n=503)	5.5
Students get information they couldn't otherwise get (n=508)	5.3
Increases students' inquiry-based analytical skills (n=501)	5.0
Students gain familiarity with basic computer applications (n=507)	4.9
Allows students to feel successful (n=506)	4.9
More collaborative group-based activities (n=503)	4.8
Motivates students through access to real advisors and experts (n=488)	4.6
Improves students' understanding of scientific concepts (n=480)	4.5
Increases opportunities for students to work on their own (n=502)	4.3
Effective for working with small groups of students (n=503)	4.3
Improves students' performances on state/city-mandated tests (n=413)	2.9
Difficult to implement with low-achieving students (n=496)	2.2

Table 6
Factors that Influence the Success of Student Learning Activities

Factors	Mean Ratings of Importance
Advance planning (n=490)	5.3
Full cooperation of participating teachers (n=480)	5.3
Well-defined project goals (n=488)	5.2
Relevance of activity to curriculum (n=489)	5.2
Specific timeline (classroom exchange projects) (n=466)	5.0
Ongoing technical support (n=489)	5.0
Preparation of students in use of telecommunications skills (n=492)	4.5
Students having direct access to network (n=493)	4.3
Teachers have previous experience (n=488)	3.6

Sources

Figure 33a
CTE/TS question 29b.
(Note: Multiple responses were possible.)

Figure 33b
CTE/TS question 31b.
(Note: Multiple responses were possible.)

Table 3
CTE /TS question 30. (Note: Mean is based on a 6-point rating scale in which 1 = not effective, and 6 = highly effective.)

Table 4
CTE/TS question 32. (Note: Mean is based on a 6-point rating scale in which 1 = not useful, and 6 = highly useful.)

Figure 34
CTE/TS question 33a-f.

Figure 35
CTE/TS question 22.
(Note: Multiple responses were possible.)

Table 5
CTE/TS question 36a. (Note: Mean is based on a 6-point rating scale in which 1 = strongly disagree, and 6 = strongly agree.)

Table 6
CTE/TS question 35. (Note: Mean is based on a 6-point rating scale in which 1 = not at all important, and 6 = very important.)

Telecommunications' Impact on Teaching

- **More than two thirds of these educators report that integrating telecommunications into their teaching has made a real difference in how they teach.**
- **Conducting telecommunications activities with students enables teachers to spend more time with individual students, less time lecturing to the whole class, and allows students to carry out more independent work.**

I have grown professionally by having others to collaborate and communicate with. This has helped me to be a better teacher. Having the global view keeps my classroom exciting. (K-12 computer coordinator)

I am the "coach" while the students think through a problem in small groups and then work independently at the computers. (High school social studies teacher)

Telecommunications has given me the opportunity to work closely with students and to help them develop critical thinking skills and become more independent in their learning. (High school library media specialist)

Slightly more than two thirds of these educators feel that integrating telecommunications activities into their teaching has made a real difference in how they teach. However, when compared to the difference that integrating computers into teaching made for educators in our earlier *Accomplished Teachers* study, the impact of telecommunications on *how* teachers teach is less pronounced. In our earlier study, 88% of the sample indicated that computers made a difference in their teaching, compared to 68% in the telecommunications survey. While it is clear that telecommunications has had a significant impact on teachers' professional lives and on their students' learning, the direct effect on their pedagogical style is less evident.

In the *Accomplished Teachers* study, the majority of respondents reported that computer technology had an impact on multiple aspects of their teaching. Teachers' expectations of their students' ability to pursue independent work increased; they spent more time working with individual students; and they were more comfortable with students' working independently. In addition, these teachers reported that computers allowed them to present more complex material to their students and tailor students' work to their individual needs. When these same questions were posed to educators in the telecommunications survey, the impact of this technology on their teaching practices was significantly different from the *Accomplished Teachers* study. There are at least two possible explanations for this difference.

One explanation is that educators' use of telecommunications technology directly affects what students learn as well as the quality of teachers' professional lives, and does not affect as *directly* teachers' pedagogical practices. And indeed, the most highly rated incentives for using telecommunications for student learning and professional development support this assertion. Telecommunications broadens students' perspective on the world, and provides access to information that would not otherwise be available in classrooms, professionally, it provides educators with access to a larger world of colleagues and resources. Telecommunications has an impact on *what* teachers teach, not necessarily *how* they teach. As one of our respondents wrote:

[Your question] asks for changes in how I teach telecommunications; telecommunications has changed what I teach. Topics are of a more global significance. I require students to apply higher level thinking skills of analysis and synthesis. (High school business teacher)

A second explanation centers on these telecommunicating educators' sophistication with computer technology in general. The majority of these respondents have been using computers in their teaching for an average of eight years. In light of the *Accomplished Teachers* findings, this suggests that these educators may have already undergone significant changes in the way they teach as a result of their involvement with general computer-based applications. To the extent that they have taken place, changes in these educators' pedagogical practices came with the integration of computers into their teaching

Figure 36
Telecommunications Results in Changed Teaching Practices

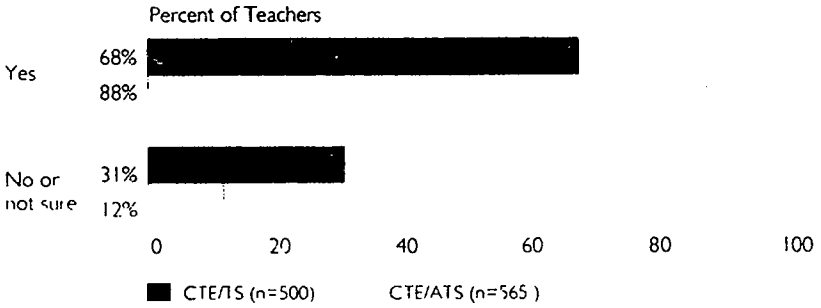
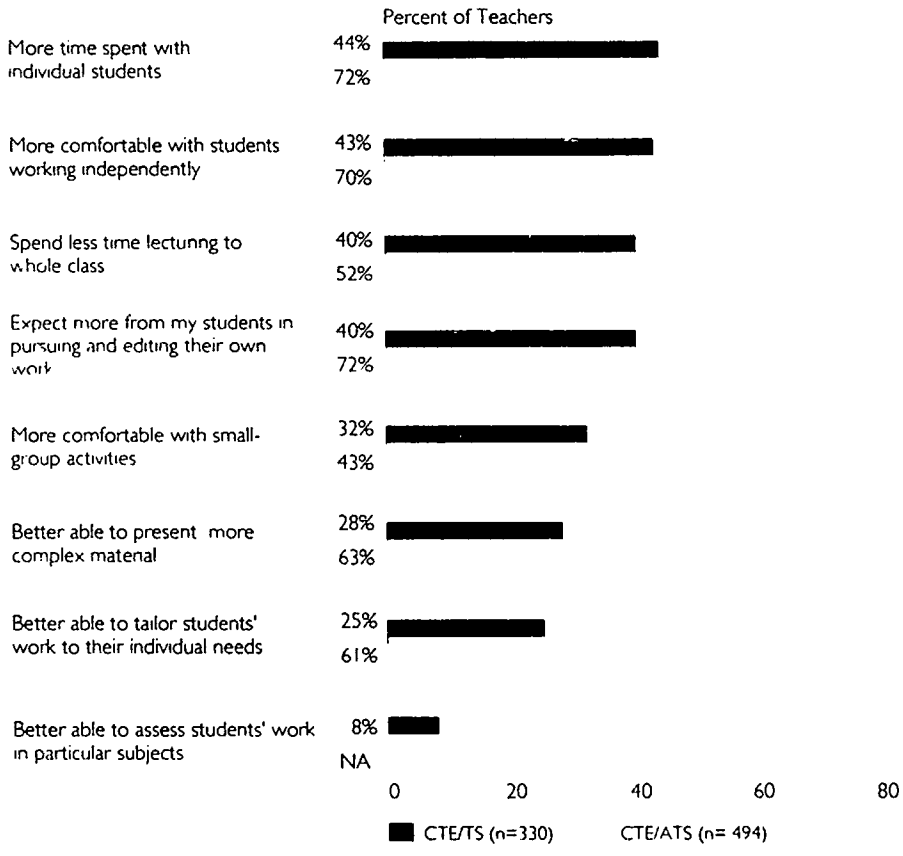


Figure 37
How Telecommunications Changes Teaching



Sources

Figure 36
CTE/TS question 37a; CTE/ATS, p. 14.

Figure 37
CTE/TS question 37a; CTE/ATS, p. 14. (Note: For both surveys, multiple responses were possible.)

Profile of Telecommunications Activities at Respondents' Schools

- These educators are taking the initiative for telecommunications activities in their schools, acting as facilitators and resource people for their colleagues.
- In the majority of cases, these educators were the principal catalysts for their schools' involvement with telecommunications.
- Approximately half of these educators report that there is continued on-site support for telecommunications activities in their schools. This support tends to come from school or district computer and media specialists, or from other teachers.
- Financial support for telecommunications tends to come from either school or district funds.

In order to find out about the culture of telecommunications activities at the respondents' schools, we asked our respondents about the roles they play in relation to their colleagues, how telecommunications activities first got under way in their schools, and how their schools support the use of telecommunications.

More than a third of these educators report serving as resource people and facilitators for their colleagues who are interested in telecommunications activities. Approximately one quarter report that they are the sole users of telecommunications in their schools, and another quarter report that several teachers in their schools use telecommunications but that their activities are unconnected. Only a tenth of our respondents report collaborating with other colleagues on telecommunications activities.

More than half of the respondents describe themselves as the principal catalyst for their schools' telecommunications activities, suggesting, once again, that many of these teachers are taking the initiative and setting the direction for their schools' involvement with telecommunications.

Approximately half of these telecommunicating educators report that their schools or districts provide continued on-site support and advice for telecommunications activities. Once again, this figure differs significantly from the level of onsite support and advice for computer activities (77%) reported in our earlier *Accomplished Teachers* survey. This suggests that, unlike general computer-based applications, telecommunications is not yet viewed as an arena in which teachers require substantial support and training.

The vast majority of funding comes from the respondents' schools and districts. Financial support for telecommunications activities is also provided by a variety of sources, including state and federal agencies, corporations and foundations, PTAs, individual donations, and bake sales.

Figure 38
Respondents' Role in Telecommunications at Their School

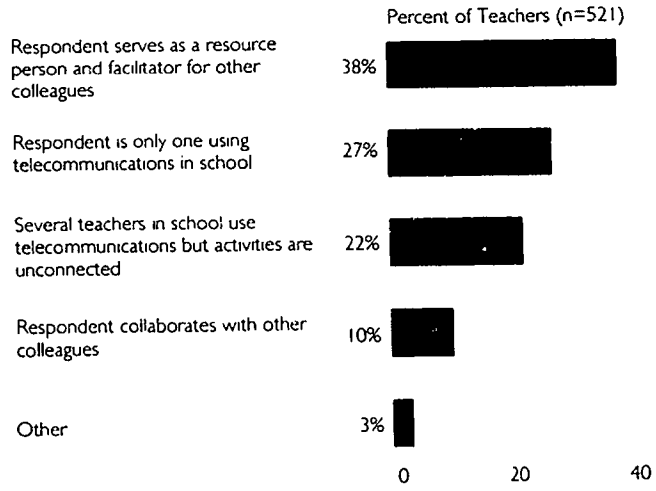


Figure 39
Initial Catalyst for School's Involvement with Telecommunications

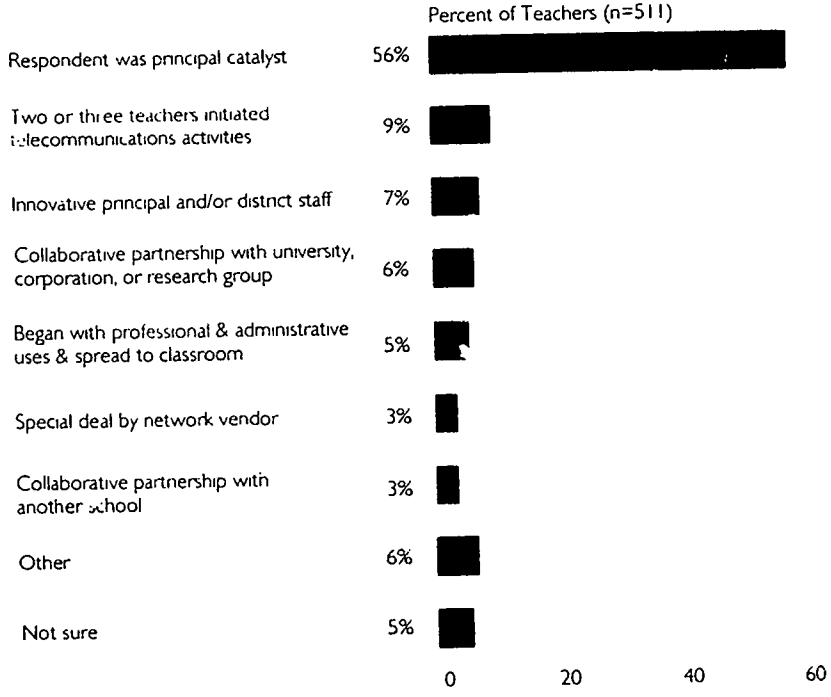


Figure 40
Continued On-site Support and Advice for Using Telecommunications

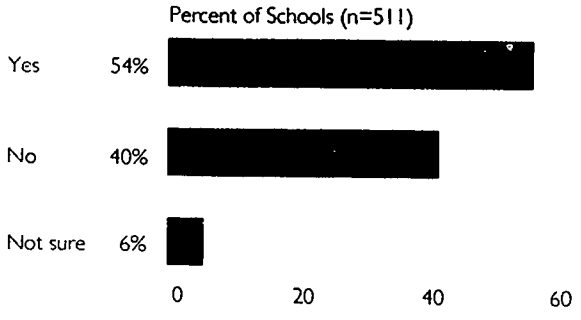


Figure 41
Sources of Support for Telecommunications at Respondents' Schools

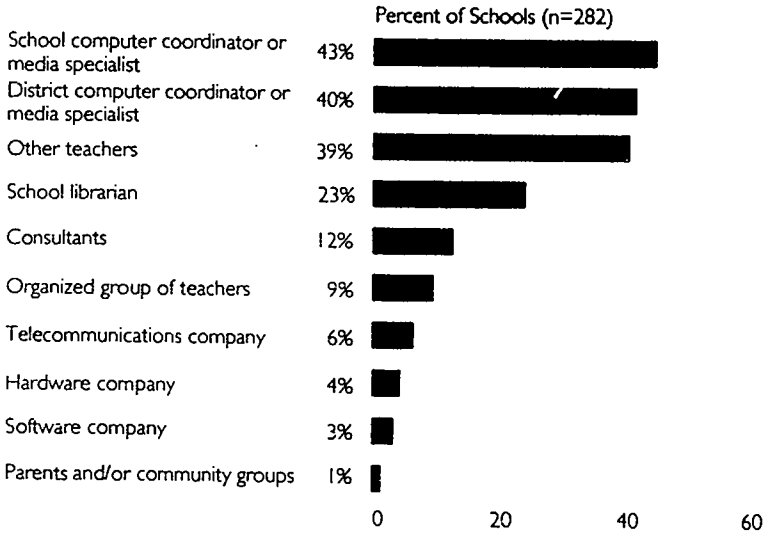
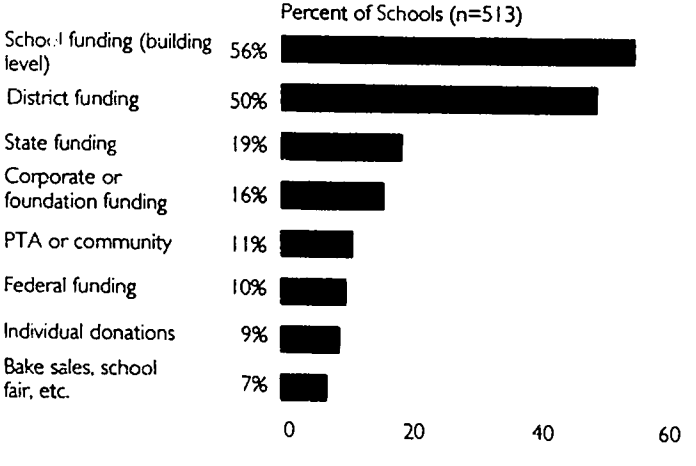


Figure 42
Financial Support for Telecommunications Activities at Respondents' Schools



Sources

Figure 38
CTE/TS question 46.

Figure 39
CTE/TS question 47.

Figure 40
CTE/TS question 50a.

Figure 41
CT/TS question 50b.
(Note: Multiple responses were possible.)

Figure 42
CTE/TS question 49.
(Note: Multiple responses were possible.)

Type and Selection of Telecommunications Services

- **These educators are using multiple networks for both professional and student learning activities, and within their schools they are making the decision about which networks to use.**
- **Service offerings, expense, and ease of use are the three most important factors influencing the selection of telecommunications services.**
- **Networks that are low-cost and provide a combination of teacher resources and student-based activities are most likely to be used for both professional and student learning purposes.**

For both professional and student learning activities, these telecommunicating educators are using multiple networks. For professional purposes, they subscribe to an average of four networks; for student learning activities, they subscribe to an average of three.

For professional activities, such as communicating with colleagues, downloading curriculum materials, and accessing information resources, these educators report that Learning Link, Compuserve, FrEdMail, and Prodigy are the networks they use most frequently. For student learning activities, including classroom exchange projects and on-line research, they most frequently use FrEdMail, Learning Link, NASA Space Link, and National Geographic Kids Network.*

Service offerings, expense, and ease of use are the three most important factors influencing the selection of network services for both professional and student-based telecommunications projects. This suggests that low-cost networks, providing a combination of teacher resources and student-based activities, are most likely to be selected for both professional and classroom work.**

It is not surprising that this highly motivated and technologically knowledgeable group of educators are making their own decisions about which network services to use for both professional and student learning activities. This further suggests that there are few coordinated plans for local or district-level implementation of telecommunications. Instead, telecommunications is driven largely by individual motivation and interest.

*See Appendix B for a complete listing of networks used by respondents for professional and student activities.

**There is no subscription fee for FrEdMail. It is a free educational service in which users are required to pay only the cost of phone calls. Learning Link is free in certain states (e.g., New Jersey) and low cost in others (e.g., New York).

Figure 43
Networks Used Most Frequently for Professional Activities

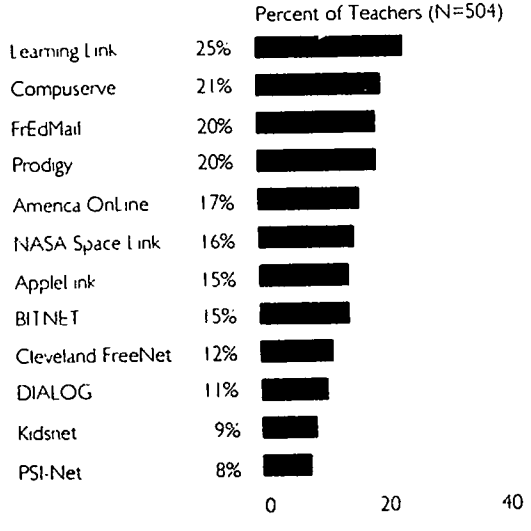


Figure 44
Networks Used Most Frequently for Student Learning Activities

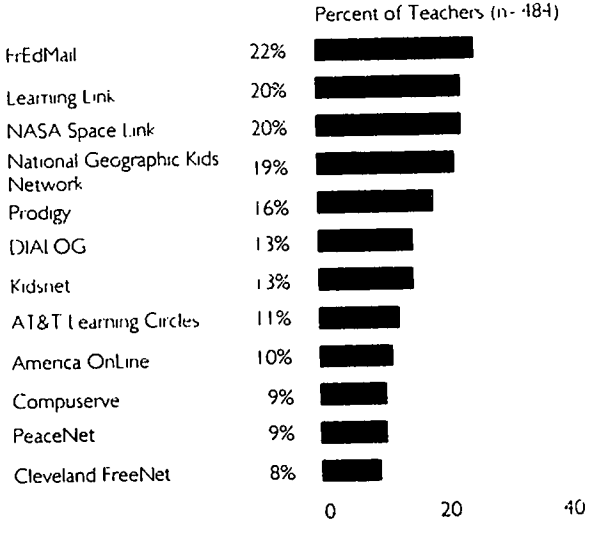


Figure 45
Factors Influencing the Selection of Telecommunications Services

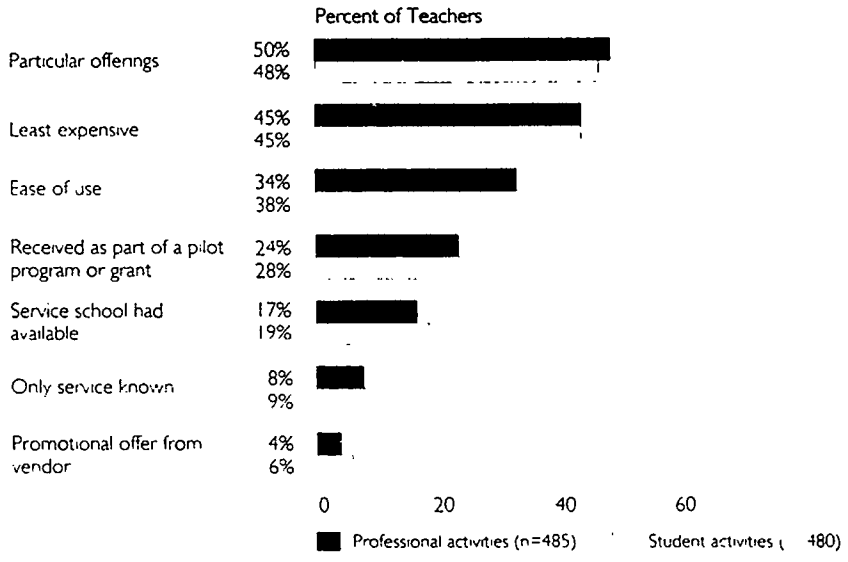
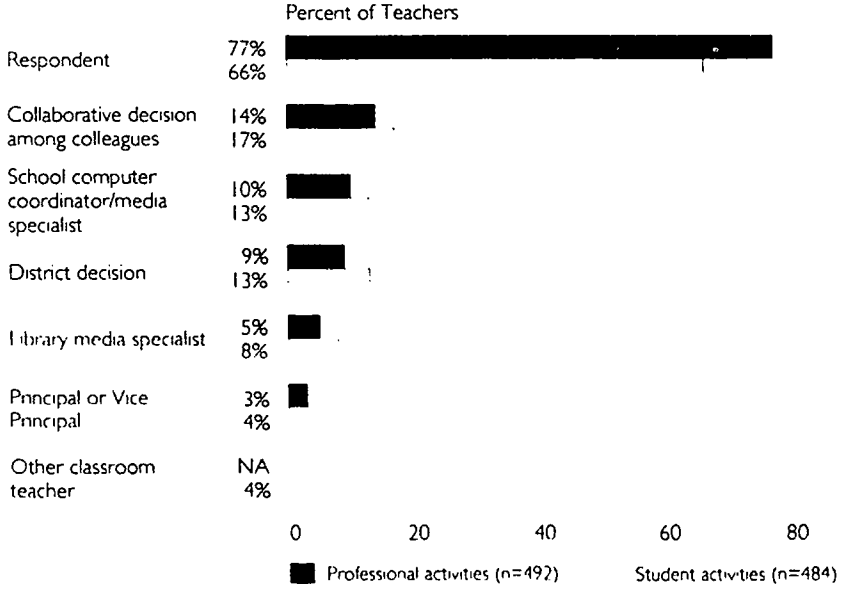


Figure 46
Who Selects Telecommunications Services



Sources

Figure 43
CTE/TS question 16a.
(Note: Multiple responses were possible.)

Figure 44
CTE/TS question 16b.
(Note: Multiple responses were possible.)

Figure 45
CTE/TS question 20a & b.
(Note: Multiple responses were possible.)

Figure 46
CTE/TS question 19a & b.
(Note: Multiple responses were possible.)

Internet Usage

- **Slightly less than half of these educators have access to the Internet, which is supplied most frequently by a university computer or educational service.**
- **Internet services are used almost twice as often for professional activities as for student learning activities.**
- **Sending e-mail is the most common use of the Internet, followed by accessing news and bulletin boards and gaining access to remote computers.**

The Internet serves as the telecommunications infrastructure that provides connectivity among networks throughout the world. The Internet is comprised of many different networks that are technically and organizationally prepared to support communication among a wide array of individuals and communities. It is frequently referred to as an "information highway," a phrase that is meant to analogize the Internet to our national highway system. Like a network of highways, the Internet allows users to travel to computers in remote places, access their resources, and communicate via e-mail with people throughout the world.

And, like our highway system, no one entity or organization owns it.

Historically, the Internet has developed in response to the needs of university and government researchers, and both existing interfaces and the bulk of available resources are geared toward that community. As a resource for K-12 education, the Internet provides a far-reaching infrastructure that could potentially support a wide range of activities. However, to make this infrastructure useful to the K-12 community, new interfaces and appropriate content must become much more widespread.

Increasingly, educational and commercial telecommunications services are providing Internet e-mail capabilities, and some are providing full access to the Internet via dial-up connections. As a result, we decided to query our respondents about their access to and use of Internet services.

Our data indicate that use of the Internet is not yet a widespread or common practice among educators in the K-12 community; only half of our technologically sophisticated respondents report having access to the Internet, supplied most frequently through a university computer or through an educational telecommunications service (e.g., FrEdMail, Learning Link).

In addition, our findings suggest that the Internet is serving as a more effective resource for professional development activities than it is for student learning activities. Among this group of knowledgeable telecommunicating educators, the Internet is used more frequently for professional purposes than for student learning projects. Exchanging e-mail, accessing news and bulletin boards, and gaining remote access to other computers are the most common uses of the Internet:

Figure 47
Access to the Internet

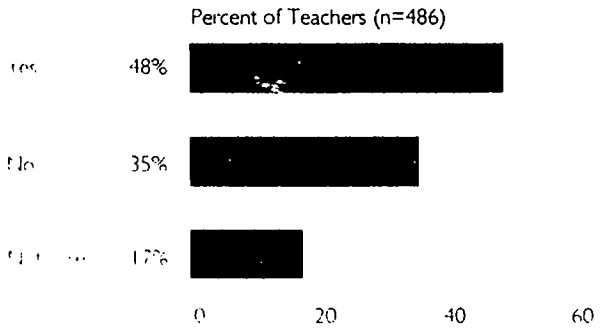


Figure 49
How Access to the Internet is Supplied

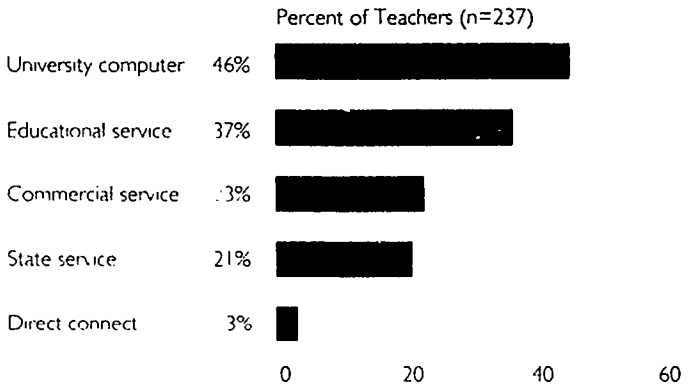
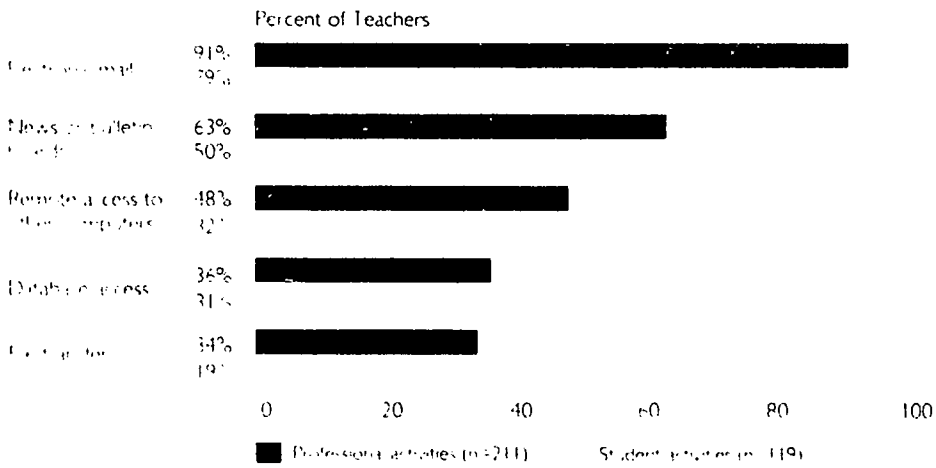


Figure 48
Internet Use



Sources

Figure 47
CTE/TS question 18a.

Figure 48
CTE/TS question 18b.
(Note: Multiple responses were possible.)

Figure 49
CTE/TS question 18c.
(Note: Multiple responses were possible.)

Barriers to the Effective Use of Telecommunications

- **The highest rated existing barriers to effective telecommunications use include:**
  - ∞ **insufficient telephone lines;**
  - ∞ **lack of time in the school schedule;**
  - ∞ **inadequate communication about school and district telecommunications activities;**
  - ∞ **lack of money to cover the cost of network services.**
- **Lack of time in the school schedule and inadequate financial resources are the most persistent barriers over time to effective telecommunications use.**

There should be a computer and phone on every teacher's desk. (A sixth grade teacher)

My limited use has given me a vision of its potential, but because of hardware and budget limitations, we have not yet realized that potential at the elementary level. (An elementary school computer coordinator)

The most important barrier likely to continue and not treatable by individual teacher initiative is the extremely high level of ignorance and apathy about the technology and its applications by administrators at site and district levels. (A high school science teacher)

The barriers to effective use of telecommunications resources that were cited by our sample will sound familiar to most educators who have worked to introduce new technologies into their schools. Primary barriers described in the *Accomplished Teachers* study—insufficient hardware, inflexible access to equipment, lack of administrative support—are still present for teachers working with telecommunications. However, new barriers appear with the advent of telecommunications technology, the most notable and persistent being an insufficient number of telephone lines in the school building.

Other highly rated barriers include lack of time in the school schedule; inadequate communication about telecommunications-related matters throughout school systems; lack of financial support; and inadequate district-level development of goals and plans for use of telecommunications.

Technical barriers related to telecommunications software, including availability of software, ease of use, and compatibility of software with hardware, were three of the lowest rated barriers. In addition, the overall quality of telecommunications services was not experienced by this group of educators as a significant barrier. Neither the design of network interfaces nor "informational overload" (too many choices or complexity of choices) were rated as significant obstacles.

Table 7
Past and Present Barriers to the Effective Use of Telecommunications: Hardware and Peripherals

Hardware/Peripherals	Past (n=451)	Present (n=496)
Insufficient telephone lines in school building	5.0	1.2
Inadequate telecommunications peripherals	4.5	3.4
Not enough computer hardware	4.1	3.1
Outdated or poorly maintained phone system	2.9	2.4
Difficulty keeping hardware in working order	2.1	1.9

Table 8
Past and Present Barriers to the Effective Use of Telecommunications: Software

Software	Past (n=439)	Present (n=485)
Telecommunications software that is too difficult to use	2.5	1.8
Lack of telecommunications software that is compatible with available hardware	2.2	1.7
Telecommunications software not available	2.1	1.5

Table 9

Past and Present Barriers to the Effective Use of Telecommunications: Systems and Networks

Systems/Networks	Past (n=415)	Present (n=458)
Lack of relevant on-line resources (e.g., databases, curricular materials, student activities)	3.1	2.5
Technical difficulties (e.g., on-line garbage, different parameters for different networks, on-line connection getting severed)	2.8	2.4
Lack of standardized interfaces across different networks	2.7	2.4
Information overload in system you use	2.2	1.9
Poorly designed interface in the system you use	2.2	1.8

Table 10

Past and Present Barriers to the Effective Use of Telecommunications: Logistical Obstacles

Logistical Obstacles	Past (n=444)	Present (n=497)
Lack of time in school schedule	4.4	4.2
Inadequate district/school communication about telecommunications-related topics	4.2	4.0
Money not available for network services	4.2	4.0
Inadequate district-level development of goals or plans	4.2	3.9
Inadequate financial support from school or district	4.2	3.9
Phone lines and/or jacks not easily accessible	4.4	3.8
Money not available to pay dial-up costs	3.9	3.6
Not enough training opportunities	4.0	3.5
Computers not easily accessible	3.8	3.3
Lack of support from colleagues	3.7	3.1
Lack of technical support/advice	3.5	2.9
Lack of administrative support or initiative	3.4	2.8
Policies that constrain telecommunications	2.6	2.3
State- or city-mandated tests make it difficult to use telecommunications as part of the ongoing curriculum	2.4	2.2
Not enough help maintaining telecommunications hardware	2.4	2.2

Sources

Table 7
CTE/TS question 51a (a-e). (Note: Mean is based on a 6-point rating scale in which 1 = not a barrier, and 6 = a major barrier.)

Table 8
CTE/TS question 51a (f-h). (Note: Mean is based on a 6-point rating scale in which 1 = not a barrier, and 6 = a major barrier.)

Table 9
CTE/TS question 51a (i-m). (Note: Mean is based on a 6-point rating scale in which 1 = not a barrier, and 6 = a major barrier.)

Table 10
CTE/TS question 51a (n-bb). (Note: Mean is based on a 6-point rating scale in which 1 = not a barrier, and 6 = a major barrier.)

Conclusion

In order for telecommunications to become a widely utilized educational resource, administrators and policy makers must implement the following:

- **teacher training and support;**
- **school and district planning for use of telecommunications in instruction and administration;**
- **time for professional and student learning activities;**
- **effective assessment measures;**
- **financial support;**
- **phone lines or local area networks.**

This report summarizes the results of a nationwide survey of 550 elementary, middle, and high school educators who are active users of telecommunications technology. The findings suggest that for this group of educators telecommunications serves as a valuable resource for both professional and student learning activities. The findings also suggest that these educators represent a very specialized group. They are experienced and highly educated teachers. They are extremely knowledgeable about computer technology and have been using a range of computer-based applications in their classrooms for a number of years. And they are working in schools that are well endowed with computer resources.

Among this group, it is the technologically knowledgeable computer and library media specialists who are taking the lead for telecommunications activities, serving as resource people and facilitators for colleagues in their schools. Our data also suggest that there is *not* widespread administrative support for telecommunications activities on either the district or school level. Although the schools and districts represented in this study have invested in training teachers in general computer-based applications, training in telecommunications is virtually nonexistent. The majority of our respondents are self-taught, and they tend to gather information about telecommunications activities by attending conferences or workshops on their own time.

While their personal motivation for using telecommunications is extremely high, it is suggested by the findings that there are pragmatic incentives that encourage the use of telecommunications for both professional and student learning tasks. Combating isolation, exchanging ideas, and obtaining information are all important factors that motivate the use of telecommunications for professional purposes. Expanding students' awareness, accessing information resources, and increasing students' higher order thinking skills are the factors that make telecommunications a particularly compelling resource to use with students.

While the overall findings of this study speak to the largely beneficial and rewarding aspects of using telecommunications technology, this research also raises an important question. How can this technology be made available to educators who are less technologically sophisticated and perhaps less personally motivated to become technological enthusiasts than the individuals represented in this study? The results suggest that if the use of telecommunications technology is to become as widely based a practice as are general computer-based applications, then certain supports must be put in place.

- Schools and districts must get involved in training teachers in the use of telecommunications. At a minimum, the same level of investment that schools and districts have made in computer-based training needs to be present for training teachers in the use of telecommunications.
- Schools and districts must develop and adopt plans for the use of telecommunications in instruction and administration, and such plans need to take into account the ways in which telecommunications can be used to support educational reforms.
- Respondents' ratings of barriers make it clear that there needs to be more time available in the school schedule if teachers are to effectively integrate telecommunications into their ongoing classroom activities. Research on technology integration efforts shows that typical 40-minute class periods are not adequate for projects that successfully *integrate* computer or multimedia technology into the curriculum (Sheingold & Hadley, 1990).
- In order for teachers to feel confident that student-based telecommunications projects are academically justified, assessment measures must be devised that can adequately capture and account for the kinds of critical thinking and inquiry-based analytical skills that such activities appear to foster.
- There needs to be more financial support available in schools for telecommunications projects (e.g., network fees, telephone lines, support personnel, curriculum development). Because schools are over-extended financially, this support needs to come from other sources, including private corporations and foundations, as well as state and federal funding sources.
- Phone lines need to become much more widely available in schools. Teachers are the only group of professionals who do not have regular access to telephones, often because the cost of installing phone lines in school buildings is prohibitive. Ideally, regional phone companies need to develop pricing structures that encourage schools to invest in this technology for their teachers. Alternatively, schools can also consider installing local area networks – a solution that reduces the need for multiple phone lines in school buildings (Newman, Bernstein, & Reese, 1992).

References

Anderson, R. (1992). *U.S. administration of the 1992 IEA computers and education survey.* Unpublished raw data. University of Minnesota.

Becker, H.J. (in press). How our best computer-using teachers differ from other teachers: Implications for realizing the potential of computers in schools. *Journal of Research on Computing in Education*

Brienne, D., & Goldman, S. (1988). *Collaborative network activities for elementary earth science.* Working paper. New York: Bank Street College of Education, Center for Children and Technology.

Cohen, M., & Reil, M. (1986). *Computer networks: Creating real audiences for students' writing* (Tech. Rep. No. 15). San Diego, CA. University of California, Interactive Technology Laboratory

Foster, J., Julyan, C. L., & Mokros, J. (1988). The National Geographic Kids Network from Technical Education Research Centers, Inc. (TERC). *Science and Children, 25*(8), 38

Hunter, B. (1992) Linking for learning: Computer-and communications network support for nationwide innovation in education, *Journal of Science Education and Technology, 1*(1), 23-34.

Lavin, R. J. & Phillepo, H. (1990). Improve school-based management through intelligent networking. *T.H.E. Journal, 18*(4), 69-71.

Levin, J., & Cohen, M. (1985). The world as an international science laboratory: Electronic networks for science instruction and problem solving *Journal of Computers in Mathematics and Science Teaching, 4*(1), 33-35.

Merseth, K. K. (1991). Supporting beginning teachers with computer networks. *Journal of Teacher Education, 42*(2), 140-147.

National Center for Education Statistics. (1992, July). *Schools and staffing in the United States A statistical profile, 1987-88.* Washington, DC U.S. Department of Education, Office of Research and Improvement

National Center for Education Statistics (1991) *Digest of education statistics.* Washington, DC: U.S. Department of Education, Office of Research and Improvement.

Newman, D., Bernstein, S. L., & Reese, P. A. (1992). *Local infrastructures for school networking: Current models and prospects* (Tech. Rep. No. 22). New York: Bank Street College of Education, Center for Technology in Education.

Newman, D., Brienne, D., Goldman, S., Jackson, I., & Magzamen, S. (1988, April). *Computer mediation of collaborative science investigations.* Revision of a paper presented at the symposium on Socializing Children into Science, American Educational Research Association.

National Center for Education Statistics. (1992). *Schools and staffing in the United States: A statistical profile, 1987-88.* Washington, DC: U.S. Department of Education, Office of Educational Research and Improvement.

Riel, M., & Levin, J. A. (1990). Building electronic communities: Success and failure in computer networking. *Instructional science, 19*, 145-169

Riel, M. (1985). The computer chronicles newswire: A functional learning environment for acquiring literacy skills. *Journal of Educational Computing Research, 1*(3), 317-337.

Riel, M. (1987). The InterCultural Learning Network. *Computing Teacher, 14*(7), 27-30.

Rogers, A. (1992). *Linking teachers and students around the world.* FrEdMail Foundation.

Ruopp, R. R. (1993). *LabNet: Toward a community of practice.* Hillsdale, NJ: Erlbaum.

Sheingold, K., & Hadley, M. (1990). Accomplished teachers: Integrating computers into classroom practice. New York: Bank Street College of Education, Center for Technology in Education.

Weir, S. (1992). *Electronic communities of learners. Fact or fiction* (Working paper 3-92). Cambridge, MA: TERC

Appendix A
Educational Telecommunications Services

America OnLine
8619 Westwood Center Drive
Vienna, VA 22182
Contact: Tom deBoor
(800) 827-6364/703-448-8700
e-mail: edptom@aol.com.

America OnLine is a telecommunications service primarily for the Apple community (MS-DOS users can connect through a service called PC Link). It provides e-mail, encyclopedia services, education programs, weather, world news, business information, live conferencing, and product and technical information. A tut ing center offers study materials and courses. There is a monthly fee and connect charges.

AppleLink
AppeLink K-12 Education Area
93 South Main Street
Middleboro, MA 02346
Contact: Mary Ann Mather, Online Manager
(508) 947-8181
e-mail: mather@applelink.apple.com

AppleLink is Apple Computer's official online service. It offers 24-hour access to Apple information and the global Apple community. The K-12 education area provides a professional resource especially for educators, including online experts who answer individual inquiries, technology-rich curricula, model technology plans, grant information, a software database, a discussion board, disabilities solutions, sources for free and inexpensive materials, education research, and more. For educators who do not have access to a phone line, "AppleLink CD" provides quarterly updates of the information that resides on AppleLink, allowing users to explore and retrieve long documents without incurring online charges.

AT&T Learning Network
AT&T
PO Box 6391
Parsippany, NJ 07054
(800) 367-7225, ext. 4158, (201) 331-4365

AT&T's Learning Network provides curriculum-based projects through "learning circles" of classrooms that exchange and discuss work for a set period of time and publish a report of their own work. Most learning circles last one semester. There is a subscription fee for each unit.

Big Sky Telegraph
Frank Odasz
Box 11
Western Montana College
Dillon, MT 59725-3598
(406) 683-7870
modem: (406) 683-7680
e-mail: franko@bigsky.dillon.mt.us

Big Sky Telegraph was designed especially for Montanans to create an information exchange network for educators, students, business people, communities, and organizations. It features educational online resources such as a lending library of software, electronic newsletters, educational databases, technical and educational support, a children's literature library, and public domain software. It also offers people the chance to create their own online courses. There is a $15.00 Internet access fee. Other than toll calls, the network is free.

BITNET
EDUCOM
1112 Sixteenth Street, NW
Washington, DC 20036
Contact: Amanda Rushing
(202) 872-4200
e-mail: rushing@bitnic.educom.edu

Bitnet links universities, colleges, and research enters in the U.S. It has cooperating network agreements with Canada, Europe, Asia, and South America for the exchange of noncommercial information. Gate-ways allow the exchange of e-mail between BITNET, Internet, and USENET. There are membership fees and connect charges for certain services.

BreadNet
1250 24th Street, NW, Suite 600
Washington, DC 20037
Contact: Brian Curtiss
(202)466-0533
e-mail: curtiss@linknet.com

Organized in 1984 by the Bread Loaf School of English at Middlebury College, this network links teachers and students in isolated areas for educational projects. During the summer months, the BreadNet Staff operates out of the Bread Loaf School of English, Rural Station, Middlebury, VT 05753, (802) 388-7945.

Compuserve
PO Box 20212
Columbus, OH 43220
(800) 848-8199
e-mail: 76003.1134@compuserve.com

Compuserve provides access to news, financial and consumer information, an encyclopedia, e-mail, electronic bulletin boards, travel services, live educational conferences and shopping. There is a sign-up fee and connect charges.

DELPHI
Massachusetts Avenue
Cambridge, MA 02138
(800)544-4005
Contact: Rusty Williams
e-mail: info@delphi.com

DELPHI provides e-mail, encyclopedia, news, games, business and travel information, clubs, a gateway into the DIALOG research database, and access to members from more than 40 countries. DELPHI offers full access to the Internet. There is a monthly fee and connect charges.

DIALOG
DIALOG Information Services Inc.
1901 N. Moore Street, Suite 500
Arlington, VA 22209
(703) 524-8004; Fax: (703) 524-1680
Contact: Ann Caputo

DIALOG, with more than 370 databases, bills itself as the world's largest online "knowledgebank." Some of its features include: DIALINDEX, a master index of all databases; OneSearch, which enables concurrent searching of up to 60 files; First Release, which provides up-to-the-minute news; and DIALORDERS, with which full-text abstracts may be ordered online. DIALOG also offers a low-cost, after-hours alternative called Knowledge Index, which provides access to some of DIALOG's more popular databases, including Classmate for K-12, which accesses 100 databases. It is also a Compuserve gateway. There are startup fees and connect charges.

FrEdMail
PO Box 243
Bonita, CA 91902
(619) 475-1852

FrEdMail is a free, cooperative, educational messaging network that connects bulletin boards all over the country. There are two conferences: Ideas, an exchange for teachers; and Kidswire, a bulletin board for students. Software and connect time are free. Toll calls are necessary if there are no local bulletin boards.

GEnie
GE Information Services
PO Box 6403
Rockville, MD 20850
Contact: Vivian Kelly
(301) 340-4000

GEnie provides information services covering finance, travel, news, reference, shopping, computing, and entertainment. A special interest group on education is available. There is a sign-up fee and hourly connect charges.

GLOBAL LAB
TERC
2067 Massachusetts Avenue
Cambridge, MA 02140
Contact: Gaby King
(617) 547-0430
e-mail: gaby_king@terc.edu

GLOBAL LAB provides international environmental science projects to improve science education in several countries. GLOBAL LAB runs on the EcoNet Network. There are sign-up and monthly fees, plus hourly connect fees.

GTE Education Network
GTE Educational Services Inc.
GTE Place, West Airfields Drive
PO Box 619810
DFW Airport, TX 75261-9810
(800) 927-3000
e-mail: gte.service

GTE Education Network provides access to databases, e-mail, and electronic bulletin boards. It also features special projects such as Special Net, an information exchange on special and other educational topics. They also offer maternal and child health information. Prices vary depending on selected services.

I*EARN
The Copen Family Fund
345 Kear Street
Yorktown Heights, NY 10598
Contact: Edwin Gragert
(914) 962-5864
e-mail: ed1@igc.apc.org

I*EARN (the International Education and Resource Network) is a project sponsored by the Copen Family Fund. It seeks to demonstrate that young people (elementary and secondary age) can work together on projects using low-cost telecommunications. As part of the educa-

tional curriculum. I*EARN participants in 20 countries conduct their work through electronic mail, online conferencing, and video-speaker telephones. There is no fee to participate in I*EARN beyond the telecommunications cost, which is relatively low on the APC network.

IGC Networks
EcoNet, LaborNet, ConflictNet, PeaceNet
Institute for Global Communications
18 DeBoom Street
San Francisco, CA 94107
(415) 442-0220
Contact: Jillaine Smith
e-mail: support@igc.apc.org

These four networks represent the U.S. portion of the APC Network (Association for Progressive Communications), which consists of eleven members worldwide, all of whom cooperate to provide services internationally. The bulletin-board-style networks provide vehicles for world discussions on peace, the environment, human rights, social justice, and conflict resolution. Users have access to e-mail, conferences, databases, and a user directory. There are startup and monthly fees, and connect charges.

Iris
PO Box 29424
Richmond, VA 23229
Contact: Robert Ware
(800) 277-0414
e-mail: robware@tmn.com

Iris is a network created and run by teachers. It provides access to online, curricular-based projects in a variety of content areas and at all grade levels. The teacher center promotes teacher exchanges and collegiality. There are annual subscription and hourly connect fees.

K12Net
3501 County Road 20
Stanley, NY 14561
Contact: Jack Crawford
Council of Coordinators, K12Net founder
(716) 526-6431
e-mail: jack@rochgte.fidonet.org

K12Net is a grassroots "network with training wheels" that provides an ultra low-cost introduction to international telecommunications in a nurturing environment that is specifically oriented to K-12 youngsters, technophobic educators, and taxpaying parents. It consists of a human community of 37 computer-mediated conferences dealing with elementary and secondary school subjects and classroom activities. They are privately "echoed" to hundreds of school-based/oriented networked "BBSs" throughout the world. Every K12Net BBS is locally owned, operated, funded, and oriented to meet the needs of its local school community. E-mail and conferencing exchanges with other networks such as FIDONet, USEnet, and the Internet are feasible and quite common. Freely available offline reader software can even bring the "global village" of K12Net into classrooms where telephones or modems are nonexistent. There are no network affiliation or user fees of any kind– K12Net is "militantly free"!

Kidsnet
6856 Eastern Avenue, NW
Washington, DC 20012
Contact: Karen Jaffee
(202) 291-1400

Kidsnet is a small nonprofit group that serves as a clearinghouse of information geared to children through the media. It maintains an off-line informational database on children's programs that are broadcast over cable, television, instructional television, etc. It can be accessed through America OnLine. There is a monthly fee and connect charges.

LABNET
TERC
2067 Massachusetts Avenue
Cambridge, MA 02140
Contact: Jill Carroll
(617) 547-0430
e-mail: jill_carroll@terc.edu

LABNET networks high school science teachers with other science teachers, as well as students, through conferencing, bulletin boards, and e-mail. It is offered only through America OnLine.

Mathematical Sciences Education Leadership Network
Christy Hunt, MSEL Facilitator
Department of Teacher Education
Miami University
Oxford, OH 45056
(513) 529-1751
e-mail: chunt@nas.edu

The Mathematical Sciences Education Leadership Network (MSELnet) is a computer conferencing network designed to meet special communications needs of state, regional, and national leaders in seven mathematical science organizations. Initiated in June 1991 as a joint study of the Mathematical Sciences Education Board of the National Research Council and IBM Corporation, MSELnet is used to support and coordinate national reform activities in mathematical sciences education within and between these organizations. MSELnet is linked to a network of mathematics and science teachers spread across 40 states. There is no

charge for use of the national network, but access requires special workstation software (PSInet for MS-DOS machines; PSIclone for Macs) at a cost of about $100.

NASA Spacelink
George C. Marshall Space Flight Center
Huntsville, AL 35812
Contact: Flint Wild
(205) 544-6360
e-mail: spacelink@msfc.nasa.gov
Telnet: 192.149.89.61
Modem access: (205) 895-0028

NASA Spacelink offers access to current historical information on NASA aeronautical and space research. Classroom activities incorporate information on NASA projects to teach a number of scientific principles. All data and news are updated daily. Access is free if you are on the Internet; otherwise there are toll charges.

The National Geographic Kids Network
5455 Corp. Drive, Suite 104
Troy, MI 48007
Contact: Sharon Cowley
(800) 342-4460

National Geographic Kids Network projects like "Acid Rain" and "What's in our Water?" encourage older elementary students to do local scientific research and share their results with other students and have brief communications with professional scientists online. There is a subscription fee for each unit.

National Public Telecommunications Network

The National Telecommunications Network (NPTN) is a network of free public access community computer systems similar to National Public Radio or the Public Broadcasting Service on television. Many kinds of services are available on each: The Cleveland FreeNet alone has over 350 distinct information or communications services. Each system, however, is free to the user. There is no cost to register, no cost to use them. Other affiliates in several other states and as far away as New Zealand are in the organizing stages.

NPTN Affiliate Systems

Cleveland FreeNet
Case Western Reserve
319 Wickenden
Cleveland, OH 44106
Contact: Tom Grundner
(216) 368-8737; modem: (216) 368-2733

The Cleveland FreeNet System is available to Cleveland residents or users who have access to the Internet. It is maintained by Case Western Reserve University and provides information on most aspects of community life, including government, administration, schools, medical issues, libraries, and recreation. It is an easy-to-use, menu-driven system. School information and related projects can be found under a menu option entitled "Schoolhouse."

The Youngstown FreeNet
c/o Lou Anschuetz
Youngstown State University
Youngstown, OH 44555

Tristate Online
CBD Inc.
201 East 4th Street
Cincinatti, OH 45202
Contact: Chris Main
(513) 397-5533; modem: (513) 579-1990

The Heartland FreeNet
922 North Glenwood Avenue
Peoria, IL 61606
Contact: Karen Haggert
(309) 677-2544; modem: (309) 674 1100

Lorain County FreeNet
11173 Arrowhead Drive
Griaton, OH 44044
Contact: Paul Boguski,
Executive Director
(216) 748-3733
e-mail: boguski@freenet.lorain.oberlin.edu

Medina County FreeNet
c/o Medina General Hospital
1000 East Washington Street
Medina, OH 44256
Contact: Gary Linden
(216) 725-1000, ext 2550; modem: (216) 723-6732

Newsday Online Education Station
Newsday\New York Newsday
235 Pinelawn Road
Melville, NY 11747-4250
Contact: Maureen McInerney
(516) 843-2445
e-mail: newsday@delphi.com

Newsday educational telecommunications projects include integrated curriculum projects designed by area educators for use in fourth through twelfth grade classrooms. They also run an online students'

magazine featuring creative writing topics for printed publication; a penpal forum; a current events discussion forum; news, weather, and computer updates; and online access and response to Newsday features, as well as access to White House news. The network also includes a stock market game as well as financial information. There are monthly fees and connect charges.

NSFNet
Internic
PO Box 85608
San Diego, CA 92186-9784
(800) 444-4345
e-mail: info@internic.net

NSFNet (The National Science Foundation Network) is a general-purpose network that provides access to scientific computing resources, data, and information. It was initially organized and is partially funded by the National Science Foundation. NSFNet serves as the national U.S. research network by allowing access to NSF-funded computers and other scientific resources.

NYCENet
34-65 192nd Street
Flushing, NY 11358
Contact: Fred Goldberg
(718)461-8756
e-mail: nycenet.nycenet.edu

Bulletin boards, databases, curriculum guides, and computer conferencing are suppled by the New York City Educational Network, which is run by the New York City Board of Education. The network also supports class projects in the New York City schools. The service is provided free of charge for all New York City public school teachers.

PBS LEARNING LINK
1790 Broadway, 16th floor
New York, NY 10019
(212) 708-3056

PBS LEARNING LINK is a computer-based interactive communications system that features a variety of databases and information resources, e-mail, messaging and conferencing utilities, and gateways to remote databases and bulletin boards. The goal of PBS LEARNING LINK is to facilitate educational use of telecomputing through inexpensive, easy-to-use access. The system stresses content and support services for education as its primary thrust. PBS LEARNING LINK systems are locally managed and operated as independent but interconnected hosts by public broadcasting agencies or state education departments. This distributed network is available in 23 states currently, and PBS plans to expand to its full 196 affiliate sites over the next three years. It is offered at no cost in some states and for a low annual subscription rate in other states.

Prodigy
445 Hamilton Ave.
White Plains, NY 10601
Contact: Steve Hein
(914) 993-8789

Prodigy provides information on weather, general news, sports, e-mail, and a children's bulletin board with educational games, quizzes, and contests. They also have Nova and National Geographic monthly features that highlight topics in science and geography. There is a flat monthly fee, no connect time in charges, and local access.

PSI-NET
Center for Teacher Education
Drake University
Des Moines, IA 50311
Contact: Jack Gerlovich
(515) 271-3912

PSI-NET is a telecommunications network for science educators, built and available through IBM. It is organized by subject into conferences. The network is now used by more than 60,000 people, many of them students. All content areas are available in PSI-NET: foreign languages, social studies, etc. The users create the subject matter. Everything is done offline so the cost is only that of a telephone call. There are no join-up or user fees.

The Well
27 Gate Five Road, Suite 65G
Sausalito, CA 94965
(415) 332-4335
e-mail info@well.sf.ca.us

The Well provides informal conferencing that includes an educational conference for teachers to exchange ideas and discuss educational topics. It now has a kids' conference. There is a monthly fee and hourly connect charges.

TechNet
New York Institute of Technology
Central Islip Campus
Building 66, Room 205
Central Islip, NY 11722
Contact: Barbara Zayes
(516) 348-3317; (800) 462-9041

TechNet provides e-mail, conferences, electronic bulletin boards, and online databases such as ERIC and Facts on File. There is an annual subscription rate and connect fees.

Unison Education Network
Unison Telecom Service
4030 Mt. Carmel-Tobasso Road
Cincinnati, OH 45255
Contact: Dean Goramson
(800) 334-6122
e-mail: dgoramson@dcunsn.das.net
Unison provides e-mail, conferencing, network building, Wall Street reports, travel information, and access via e-mail to users on many other networks. There is a sign-up fee, a monthly subscription rate, and connect charges.

Regional Internet Providers

BARRNET
William Yundt
Pine Hall Room 115
Stanford, CA 94305-4122
(415) 723-3104
gd.why@forsythe.stanford.edu
San Francisco area

CERFnet
PO Box 85608
San Diego, CA 92186-9784
(800) 876-2373
help@cerf.net
Southern California

CICnet
ITI Building
2901 Hubbard Drive, Pod G
Ann Arbor, MI 48105
(313) 998-6103
infor@cic.net
Midwest (IL, IA, MN, WI, MI, OH, IN)

Colorado Supernet
CSM Computer Center
Colorado School of Mines
1500 Illinois
Golden, CO 80401
(303) 273-3471
info@csn.org
Colorado

CONCERT
PO Box 12889
3021 Cornwallis Road
Research Triangle Park, NC 27709
(919) 248-1404
jrr@concert.net
North Carolina

JVNCnet
Sergio Heker
6 von Neuman Hall
Princeton University
Princeton, NJ 08544
(609) 258-2400
market@jvnc.net
Northeastern U.S.

Los Nettos
Information Sciences Institute
4676 Admiralty Way
Marina del Rey, CA 90292
(301) 822-1511
los-nettos-request@isi.edu
Los Angeles area

Merit
2200 Bonisteel Boulevard
Ann Arbor, MI 48109-2112
(313) 764-9430
jogden@merit.edu
Michigan

Midnet
29 WESC
University of Nebraska
Lincoln, NE 68588
(402) 472-5032
dmf@westie.unl.edu
Plains States (NE, OK, AR, SD, IA, KA, MO)

MRNet
511 11th Avenue South, Box 212
Minneapolis, MN 55415
(612) 342-2570
info@mr.net
Minnesota

MSEN
628 Brooks Street
Ann Arbor, MI 43103
(313) 998-4562
e-mail: info@msen.com
Michigan

NEARnet
BBN Systems and Technologies
10 Moultin Street
Cambridge, MA 02138
(617) 873-8730
e-mail: nearnet-join@nic.near.net
Northeastern U.S. (ME, NH, VT, CT, RI, MA)

Netcom Online Communications Services
4000 Moorepark Avenue, #209
San Jose, CA 95117
(408) 554-8649
e-mail: ruthann@netcom.com
California

netIllinois
Bradley University
1501 W. Bradley Avenue
Peoria, IL 61625
Contact: Joel Hartman
(309) 677-3100
e-mail: joel@bradley.edu
Illinois

NevadaNet
University of Nevada System
Computing Services
4505 Maryland Parkway
Las Vegas, NV 89154
(702) 739-3557
Nevada

NorthWestNet
2435 233rd Place, NE
Redmond, WA 98053
(206) 562-3000
e-mail: ehood@nwnet.net
Northwestern U.S. (OR, WA, WY, AK, ID, MT, ND)

NYSERNet
200 Elwood Davis Road
Suite 103
Liverpool,. NY 13088-6147
(315) 453-2912
e-mail: info@nysernet.org
New York

OARnet
Ohio Supercomputer Center
1224 Kinnear Road
Columbus, Ohio 43085
(614) 292-9248
e-mail: alison@osc.edu
Ohio

PREPnet
305 S. Craig, 2nd Floor
Pittsburgh, PA 15213
(412) 268-7870
e-mail: twb+@andrew.cmu.edu
Pennsylvania

PSCnet
Pittsburgh Supercomputing Center
305 S. Craig, 2nd Floor
Pittsburgh, PA 15213
(412) 268-4960
e-mail: hastings@psc.edu
Eastern U.S.

Sesquinet
Office of Networking and Computing
Rice University
Houston, TX 77251-1892
(713) 527-4988
e-mail: farrell@rice.edu
Texas

SURAnet
1353 Computer Science Center
8400 Baltimore Boulevard
College Park, MD 20740-2498
(301)982-4600
e-mail: info@sura.net
Southeastern U.S.

THEnet
Texas Higher Education
Network Information Center
Austin, TX 78712
(512) 471-2444
e-mail: info@nic.the.net
Texas

VERnet
Academic Computing Center
Gilmer Hall
University of Virginia
Charlottesville, VA 22903
(804) 924-0616
e-mail: jaj@virginia.edu
Virginia

WESTnet
601 S. Howes, 6th Floor South
Colorado State University
Fort Collins, CO 80523
(303) 491-7260
e-mail:
pburns@yuma.acns.colostate.edu
Western U.S. (AZ, CO, ID, NM, UT, WY)

WiscNet
1210 W. Dayton Street
Madison, WI 53706
(608) 262-8874
e-mail: dorl@macc.wisc.edu
Wisconsin

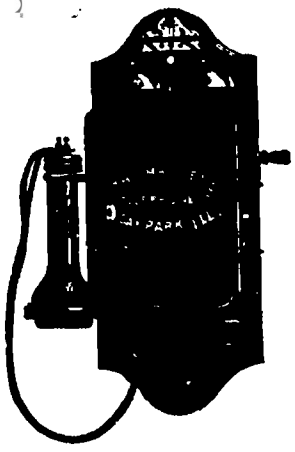
WVnet
837 Chestnut Ridge Road
Morgantown, West Virginia
26505
Contact: Harper Grimm
(304) 293-5192
e-mail:
cc011041@wvnvm.wvnet.edu
West Virginia

Source

Appendix B
CTE/TS questions 16a & b.
(Note: Multiple responses were possible.)

Appendix B
Networks Used by Respondents for Professional and Student Learning Activities

Professional Activities (n=504)		Student Learning Activities (n=504)	
Network	Percent	Network	Percent
Learning Link	25	FrEdMail	22
Compuserve	21	Learning Link	20
FrEdMail	20	NASA Space Link	20
Prodigy	20	National Geographic Kids Network	19
America OnLine	17	Prodigy	16
NASA Space Link	16	DIALOG	13
AppleLink	15	Kidsnet	13
BITNET	15	AT&T Learning Circles	11
Cleveland FreeNet	12	America OnLine	10
DIALOG	11	Compuserve	9
Kidsnet	9	PeaceNet	9
PSI-NET	8	Cleveland FreeNet	8
K12Net	7	BITNET	7
NYCENet	7	I*EARN	7
PeaceNet	7	NYCENet	6
FidoNet	6	K-12 Net	6
GTE Education Network	6	AppleLink	5
I*EARN	6	GTE Education Network	5
GEnie	5	FidoNet	4
DELPHI	4	LABNET	4
LABNET	4	DELPHI	3
AT&T Learning Circles	3	EcoNet	3
Ecc Net	3	Iris	3
National Geographic Kids Network	3	PSI-NET	3
TERC Star Schools Project	3	TERC Star Schools Project	3
Iris	2	Newsday	2
Newsday	2	Computer Pals Across the World	1
NSFNet	2	Campus 2000	1
Computer Pals Across the World	1	GEnie	1
Local bulletin board	44	NSFNet	1
Statewide network	35	Local bulletin board	32
University network	28	Local network	19
Local network	25	Statewide network	19
		University network	13



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Bank Street College of Education
610 West 112th Street
New York, New York 10025