

Chapter 4

The Teacher Link: New Opportunities for the Profession



Photo credit: TI-IN Network

The key to any successful distance learning course is a good teacher.

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The Teacher Link: New Opportunities for the Profession

*While the intellectual and social demands on teachers have escalated at an astonishing rate since this century began, the nature and organization of teachers' work have changed only a little since the middle of the 19th century. We **now** live in an age when many elementary school students have their own microcomputers. These students can put some of the most amazing achievements of modern science and technology to work in support of their learning. Yet their teachers are still working with the same job descriptions that teachers had in the mid-1800s, when McGuffey's Readers and spelling slates were the leading educational technology.'*

INTRODUCTION

Today not every teaching need can be met by applying the traditional classroom model of 1 teacher standing in front of a class of 25 students. In some cases, there may be just a handful of students who need to take a particular course, not enough to justify hiring a teacher. Or a district may be unable to find a fully qualified teacher, especially in specialized or advanced subjects. Because of this mismatch between student needs and fully qualified teachers, many districts are turning to distance learning technologies for help.

Distance learning technologies can bring the teaching profession out of the age of McGuffey's Readers and into the 21st century. The very technologies that can bring better resources into the classroom to help students can also improve the quality of the teaching work force.

Teacher quality is a charged term, subject to debate as to what constitutes teaching excellence. This much is clear, however: we need to find ways to bring into teaching people who are better prepared, and to maintain and upgrade the skills and knowledge of those already in the classroom. We also need to do a better job of utilizing the human resources we already have, to share professional expertise, and to draw on the skills of the most experienced and talented teachers so that their wisdom will be available to others. Distance learning technologies offer a resource for meeting these goals. But to improve teaching via technology, enthusiasm and excitement for technology must be matched with careful attention to three critical factors: involving teachers in the planning and implementation process, accounting for how teach-

ing with technology can change the nature of teaching and the teacher's role, and educating teachers to take advantage of these teaching tools.

FINDINGS

- **A mismatch between student needs and qualified teachers, especially in areas such as mathematics, science, foreign language, or advanced placement courses, has driven many districts to adopt distance learning strategies. The need to provide inservice training and professional development to school staff has been another motivating factor.**
- **The key to success in distance learning is the teacher.** If the teacher on the system is good, the technology itself can become almost transparent. Conversely, no technology can overcome poor teaching; poor teaching is actual] y exacerbated in distance education applications. But when skilled teachers are involved, enthusiasm, expertise, and creative use of the media can enrich students beyond the four walls of their home classroom. Outstanding teachers can also serve as "electronic mentors" to other teachers.
- **Teachers' concerns about being displaced by technology must be taken seriously.** Systems imposed from above are understandably threatening. However, when teachers are involved in all aspects of planning and implementing distance learning strategies, they can shape the systems to meet the needs of the entire school community.
- **Teachers using distance learning have had to find new ways to structure student-teacher interaction.** Old styles of teaching may not be appropriate or effective. The inherent limitations

¹The Holmes Group, *Tomorrow's Teachers A Report of the Holmes Group* (East Lansing, MI: April 1986), p. 6.

in distance learning technologies can be catalysts for instructional design and teaching techniques that enhance the learning process.

- Distance education systems offer many benefits to teachers for professional growth. Courses can make it possible to broaden and update knowledge, enhance skills, or change specialties. Electronic networks give teachers a chance to connect with colleagues and share resources, experience, and teaching. Teachers delivering courses over distance learning systems can focus on their specialties. They can negotiate more flexible, individualized teaching options.
- Teachers must be trained if they are to use distance learning technologies effectively. Training opportunities, however, remain limited. Few preservice and inservice programs focus on how to incorporate technology into instruction, create new opportunities for interactivity, or develop materials and use the media most effectively.
- **Distance teaching is not for everyone.** For some, nothing can substitute for the intimacy of the classroom. Those who serve as distance teachers report that it takes more time to prepare for class sessions and more effort to compensate for the separation from their students. They must be more organized. Being on stage at all times can be intimidating. But distance teachers are excited about the opportunity to be innovators, to teach the subjects they love to a wider audience of students, and to use technology as a springboard to creativity.
- Classroom facilitators matter. How they work with the distant teacher shapes the style of instruction and affects the success of the effort.
- The opportunity exists **to develop regional or national resources for teacher development over distance learning systems, similar to professional development programs now available for engineers. One** of the reasons for the success of engineering and technical programs is the support provided by employers. Convinced of

the crucial need for their staff to keep up-to-date with courses relevant to their work, employers provide not just tuition fees, but classroom space at or near the work site and release time so that employees can participate. If education were to support similar efforts, the current and developing nationwide distance learning infrastructure could make it possible to create a national system of teacher enhancement, drawing on the best resources around the country.

MATCHING EDUCATIONAL NEEDS AND QUALIFIED TEACHERS

Do we have today, and will we have tomorrow, the number of qualified teachers needed to equip our young people to meet the social and economic challenges of the 21st century?² It is easier to describe the current situation than it is to project into the future, particularly since the future of schooling is being redefined by many forces. Shifting demographics and social needs, advances in technology, and changing demands on the profession of teaching all contribute to current school reform and restructuring efforts.

Teacher turnover is the factor that most affects the demand for new teachers. Districts continually need to replace teachers who leave the profession before retirement. Of special concern is the fact that much of the current teaching force is nearing retirement. The Department of Education projects that between 1988 and 1997 about 1.6 million new teachers will be needed.³

School reform efforts have also pushed hard on the demand side of the equation. State graduation requirements and prerequisites for university entrance have increased demands for curriculum offerings, especially in mathematics, sciences, and foreign languages. Many schools find themselves unable to meet this demand. Technically, few positions for required courses stand vacant, but many schools have had to use teachers who are not fully qualified to fill those positions. The 1985-86

²Much of this discussion comes from James B. Stedman, Congressional Research Service, "Teachers: Issues for the 101st Congress," issue brief, June 1, 1989.

³The Department of Education relies on Bureau of Labor Statistics' estimates of teacher attrition in 1983-84 at 4.9 percent for public elementary school teachers and 5.6 percent for secondary teachers. Some analysts challenge these attrition rates arguing that a higher percentage of teachers leave annually, raising the number needed by a substantial margin. *Ibid.*, pp. 6-7.

National Survey of Science and Mathematics Education⁴ found that a majority of high school principals reported difficulty hiring fully qualified physics, chemistry, computer science, and mathematics teachers, among others. The situation among foreign language teachers is equally troubling. Forty percent of those responding to a State survey of foreign language teacher availability reported an existing shortage at the elementary level; 48 percent reported shortages at the secondary school level. Furthermore, they expect these shortages to increase: 57 percent anticipated foreign language shortages at the elementary level within the next 5 years, and 62 percent at the secondary levels

Concern has also focused on the number of minority teachers in schools today and in the future. At a time when the proportion of students from minority groups is expanding rapidly,⁶ the number of teachers from minority populations is not keeping pace. At one time, 18 percent of the U.S. teaching force was made up of Black teachers. Today the figure is 7 percent, and some estimates suggest that the proportion will fall to less than 5 percent by 1995. Only 2 percent of teachers in public schools are Hispanic.⁷ Minority enrollment in undergraduate teacher education programs has remained relatively stable over the last 3 years, never exceeding 5 percent of the total enrollments

Can the needs for qualified new teachers—especially in these areas of special need—be met through traditional means? Are colleges of education producing enough qualified new teachers? Throughout the 1970s and early 1980s, the number of newly trained entrants graduating from undergraduate teaching programs declined by more than one-half. However, this was a period when teacher

demand was also dropping. After years of teacher surplus, in 1985 jobs and job seekers were roughly in balance.⁹ Reflecting a number of factors, including increased demand for teachers and improved teacher salaries, enrollment in undergraduate teacher education programs jumped by slightly more than 20 percent between 1985 and 1986, and is expected to reflect an increase of about 10 percent between 1986 and 1987.¹⁰

Teacher applicants are coming from a wider pool than just the recent graduates of education programs, however. Teaching is attracting diverse populations, including many reentering teachers. Data from the American Federation of Teachers' survey of States show that 53 percent of *new hires* in 1987-88 were reentering teachers.¹¹ In a recent study of teacher applicants,¹² school districts reported that about 50 to 60 percent of their applicants for teaching positions are "recent college graduates," 10 to 20 percent are "former teachers trying to get back into teaching," 10 to 20 percent are "substitute or part-time teachers seeking full-time teaching positions," 2 to 5 percent are "mid-career changers seeking teaching jobs," and 2 to 5 percent are retirees wanting to become teachers.¹³

Many States have created special programs to recruit and train new teachers in the areas of mathematics and science. Three approaches are in use.¹⁴ Two types of programs recruit professionals (retirees or career changers) who may be interested in teaching. Some programs provide the coursework required for full certification, while others (known as alternative certification) establish less restrictive criteria for the teaching credential. A third type of program recruits teachers who are currently teaching other subjects and gives them the courses they need

⁴See Iris R. Weiss, *Report of the 1985-86 National Survey of Science and Mathematics Education* (Research Triangle Park, NC: Research Triangle Institute, 1987).

⁵Jamie B. Draper, Joint Committee for Languages, *State Activities Update: Focus on the Teacher* (Yonkers, NY: American Council on the Teaching of Foreign Languages, December 1988).

⁶By the year 2000, one-half of the student population will be made up of Blacks, Hispanics, and members of other minority groups. In many school districts, especially urban districts, this is already the case. The Task Force on Women, Minorities, and the Handicapped in Science and Technology, "Changing America: The New Face of Science and Engineering," unpublished interim report, 1988.

⁷Martin Haberman, "More Minority Teachers," *Phi Delta Kappan*, vol. 70, No. 10, June 1989, p. 773.

⁸Lynn Olson, "Education Schools' Enrollment Rises for Third Straight Year, Study Shows," *Education Week*, vol. 7, No. 26, Mar. 22, 1989, p. 7.

⁹Carnegie Forum on Education and the Economy, *A Nation Prepared Teachers for the 21st Century*, *The Report of the Task Force on Teaching as a Profession* (New York, NY: 1986), p. 26.

¹⁰Olson, *op. cit.*, footnote 8.

¹¹American Federation of Teachers' Survey, cited in C. Emily Feistritzer, *Teacher Supply and Demand Surveys 1988* (Washington DC: National Center for Education Information, 1988), p. 7.

¹²Ibid.

¹³Ibid.

¹⁴For more information on these programs, see Linda Darling-Hammond et al., *Redesigning Teacher Education Opening the Door for New Recruits to Science and Mathematics Teaching* (Santa Monica, CA: Rand Corp., Center for the Study of the Teaching Profession, 1989).

to obtain certification in mathematics and science. Of those graduating from all three alternative programs, 85 percent enter the teaching profession immediately after graduation, and about 75 percent stay in the classroom at least 2 years. Both percentages are comparable to those for graduates of traditional teacher preparation programs. Sixty-four of these programs provided about 10 percent of new science and mathematics teachers in 1986-87.¹⁵ These nontraditional programs also appear to be attracting substantially more minority candidates than other teacher preparation programs.¹⁶

What Role Can Distance Learning Play in Matching Educational Needs and Available Teachers?

Distance learning provides a way to overcome field-specific teacher shortages by offering classes taught by fully qualified teachers. Because today's technology makes it possible to bring a teacher from any distance to the school electronically, sharing teachers among schools, once a geographic or physical impossibility, is now feasible. For example, **in a recent survey of shortages in foreign language teaching, 38 percent of the States reported that they now offer foreign language instruction via technology (most commonly satellite-delivered courses) as one solution.**¹⁷

Distance learning can do more than fill the gaps in an uneven teaching supply. It can allow student teachers to observe and work with outstanding teachers' "electronic mentors"—anywhere in the country. It can provide a way to keep teachers up-to-date or to develop expertise in new areas. It can facilitate the preparation of new teachers from nontraditional sources. And it can bring new resources to enrich the classroom environment, create opportunities for team teaching, and open up the walls of the once-isolated classroom.

IMPLEMENTING DISTANCE LEARNING: CLASSROOM CONSIDERATIONS

The Need for Teacher Involvement

If distance learning is to take hold, teachers must be involved in the planning of these systems, trained to use the tools they provide, and given the flexibility to revise their teaching accordingly. Some school reformers and technology zealots have eagerly embraced technology as the new educational fix, an all-purpose solution to the educational ills that beset America today. Those responsible for running the Nation's schools typically take a more conservative, long-term view of change. The physician's "First, do no harm" may be the unspoken watchword of school administrators looking at alternatives to the present system. One requirement for constructive change is the involvement of those who will be left holding the reins—the teachers.

Distance learning, like most technological solutions, may instill initial skepticism and apprehension among parents, students, and teachers. Like the introduction of computers, some of this apprehension subsides once the technology becomes "demystified." When teachers develop experience and an understanding of how to complement their own teaching, their outlook changes. With familiarity, they look at technology as another teaching tool.

But teachers are aware that some schools may try to take educational shortcuts by buying into distance learning courses as a way of reducing staff. Teachers also worry about the quality of instruction students will receive if distance learning systems are not well planned. **Teacher concerns must be factored into any planning for distance learning. The National Education Association has taken a strong stand on this issue:**

The committee believes that the Association and its affiliates should be involved in the planning, implementation, and evaluation of long distance learning proposals and programs to provide students the highest quality learning experience.¹⁸

¹⁵*Ibid.*, p. xiv.

¹⁶Overall, 20 percent of the nontraditional recruits are minority group members; 10 percent are Black. By comparison, the 1985 Survey of Recent College Graduates found that only 9 percent of all bachelor's and master's degree candidates newly qualified to teach (in all subject areas) were minority group members; 5.6 percent were Black. U.S. Department of Education, Center for Education Statistics, May 1986, cited in Darling-Hammond, op. cit., footnote 14, p. 49.

¹⁷Draper, op. cit., footnote 5, p. 2.

¹⁸National Education Association Special Committee on Technology, "policy Statement on Technology," unpublished document, July 1989, p. 7.

Some teachers fear that they will be replaced by teachers beamed in from afar, in a Star Trek vision of the future. Interestingly, this concern diminishes in schools that have used distance learning technologies; those teaching in distance learning projects are adamant in their feeling that teleteaching will not replace regular teachers.¹⁹ Other teachers are concerned that they will be forced to teach over these systems. A more realistic concern is that teachers will be given distance learning responsibilities as an add-on to their regular teaching, with no allowance for the demands of this new role. There is some basis for this concern. Teleteachers (those who teach a **course over distance learning systems**) **consistently report that it takes them more time to prepare for distant teaching lessons, and more time for followup with students.** For example, in the OTA case studies,²⁰ despite the varying systems, most teachers strongly agreed that preparing lesson materials for distant teaching is much more time-consuming than preparing lessons for regular teaching. These teleteachers estimated that preparation of a typical daily lesson ranged from 38 minutes up to 4½ hours. Yet, despite the increased preparation time, fewer than one-half of the teleteachers surveyed in the OTA case studies received a higher salary for teaching a telecourse than they would in a regular classroom, and 87 percent were not given a reduced teaching load.²¹

Some districts that have not involved teachers early on have experienced labor-management difficulties. Unions representing teachers want to ensure that teacher employment and responsibility levels do not decrease after the implementation of a distance learning network.²² When faculty feel they do not have enough input into the planning, implementation, and uses of distance learning systems, the result can be frustration, confusion, and potentially less effective use of any system.²³

When teachers are involved in the development of distance learning systems they have been able to

shape the systems to assure appropriate and high-quality instruction and to help planners consider a broader range of services for the entire school community. More importantly, this planning can contribute to a rethinking of staffing requirements and alternative educational arrangements as part of school restructuring efforts. There has been little research on the issue of how distance learning can affect staffing, or how new or desirable teaching models can be utilized, but alternative staffing arrangements and flexibility in collective bargaining issues can be negotiated. Several new possibilities could be considered.

. Part-time or reduced load teaching assignments.

Teachers who are at home with young children, or have retired or left teaching for other careers may wish to keep their hand in teaching on a part-time basis, specializing in distant teaching. For example, in Houston's Region IV Interact system, the 11 instructional television teachers are recruited from 3 alternative sources of public school teachers: retired teachers, teachers not currently employed full time in secondary teaching assignments, and full-time university graduate students who hold teaching certificates.²⁴

• Using master teachers or subject area specialists for some or all portions of a distance learning course to supplement the skills of the home-site classroom teacher.

In one example, a high school in New York State offered Russian history using faculty from a nearby university via distance learning.²⁵ The classroom facilitator was a history teacher who lacked the special qualifications to teach Russian history. The teacher took the course along with his students, collaborated with the teleteacher throughout the course, and was able to teach the Russian history class himself the following year. Distance learning

¹⁹See Bruce Broker, Texas Tech University, "Distance Learning Case Studies," OTA contractor report, May 1989.

²⁰Ibid.

²¹Ibid.

²²s, for example, New York State United Teachers, Division of Research and Educational Services, *Survey of Distance Learning Projects*, No. 868718 (Albany, NY: June 1987).

²³New York State Legislative Commission on Science and Technology, *Distance Learning: The Sky's the Limit* (Albany, NY: September 1988), p. 26.

²⁴Barker, op. cit., footnote 19.

²⁵Center for Learning Technologies, *Emerging Technologies: Distance Learning*, The Learning in New York Teleconference Series (Albany, NY: Department of Education, Feb. 2, 1988).

did not displace this teacher; instead, it expanded his skills and areas of expertise, increasing his teaching options.

• Employing student teachers, retired teachers, or paraprofessionals as classroom facilitators.

Here, too, the unique cooperation possible between the teleteacher and the teacher in the receiving site makes it possible to combine the skills, expertise, and experience of different levels of teaching. In many distance learning projects, the teleteacher is a uniquely skilled teacher; a teaching intern could learn a great deal by working with these teachers as a site facilitator. Conversely, a retired teacher serving as a classroom facilitator could bring experience and perspective to enrich the distance learning course.

• Sharing teaching among several teachers within a distance learning course (see box 4-A).

Opportunities exist for creating new interdisciplinary courses, combining the expertise of several teachers from many schools. A district could offer a course in “Major Issues of the 20th Century,” highlighting the teaching of a top-notch history teacher from one school, the literature teacher in another, and science and technology experts from other schools. Teachers might welcome the opportunity to participate in special courses if each could focus on those topics in which they have special expertise and interest, working with distant colleagues whose expertise complements their own.

In the traditional classroom, one of the barriers to team teaching has always been scheduling. In distance learning, scheduling adjustments, while difficult, are accepted as the norm. In cooperative distant teaching, changing concepts of time and place can make team teaching more feasible. The class environment can remain the domain of the home school teacher, but it can be expanded by sharing teaching resources with colleagues.

Distance Learning Technologies and Teaching Style: Issues of Interaction and Instructional Design

Clearly, distance learning can add new resources to the traditional classroom, whether those resources

are specialized teachers or contributions from wise and unique people from many walks of life. These resources will change the design of courses and how teachers conduct their classes. In fact, many teachers develop new skills and insights that carry over into their regular classrooms.²⁶

Students, teachers, course material and presentation, and interaction are all affected; distance learning creates a new context within which the education process and student-teacher interaction take place. Old styles of teaching and learning may not be most appropriate or effective when mediated by telecommunications technologies. These technologies impose inherent limitations (which vary by individual technology), but they can also enhance the learning process.

In attempting to incorporate distance learning into a classroom setting, or in designing distance courses or modules, teachers and instructional designers have had to find ways to restructure interactivity. Various types of distance learning systems may limit interaction in different ways. Some systems, such as audiographics, do not permit students and teachers to see each other, but they can converse and exchange written materials, sophisticated graphics, and visual images. And use of the graphics tablet can be very effective in courses such as astronomy and calculus. This interaction, while not face-to-face, may be equally effective.

In one study²⁷ looking at several projects using audiographics systems, teleteachers confirmed that the preparation required for audiographic presentation forced them to rethink the design of their courses. Many commented that the lack of visual contact with their students forced them to improve their communication and listening skills.

Regardless of whether they changed teaching styles, virtually all instructors claimed they were better teachers after teaching even one course over the audiographic system. They attributed this to the fact that they had to be much better prepared than in the traditional environment. They began to think more systematically about what they were teaching and how best to present the information in spoken

²⁶Barker, op. cit., footnote 19.

²⁷Kay W. Gilcher and Sally M. Johnstone, *A Critical Review of the Use of Audiographic Conferencing Systems by Selected Educational Institutions* (College Park, MD: International University Consortium, University of Maryland, 1988).

Box 4-A—Team Teaching Over a Two-Way Video Link¹

During the 1988-89 school year, two high schools in the Hartford area piloted a two-way video and audio hookup over the local telephone system. This demonstration project was funded by the State of Connecticut and Southern New England Telephone (SNET). Bulkeley High School in inner-city Hartford was linked with Hall High School in suburban West Hartford. A teacher at each school volunteered to participate in the first pilot run of the compressed video system and to explore applications for teaching advanced Spanish in their districts.

Why were the two teachers in these high schools eager to participate? Mary Foley, Hall High School teacher, wanted to join the two classes in order to expand her students' cultural understandings and enrich their course content. She felt that her students would benefit from experiences that prepared them for learning and working with people from many different walks of life. And although her students were "advanced" in Spanish, they were not fluent speakers. Bulkeley's students, many whose first language was Spanish, had much to contribute. For Bulkeley High School teacher John DiPietro, the project". . . provided an opportunity for others to learn about us, and us about them."

The two teachers spent many hours working together, preparing to team teach their advanced Spanish courses (one Advanced Placement, the other designed for native language students with high levels of fluency). They found common ground, despite a contrast in their teaching styles, curriculum emphasis, backgrounds of their students, and classroom facilities.

The first day of team teaching started with both classes coming together for a joint class held at Bulkeley High School. The day was an exciting one; officials cut the ribbon at the door of the electronic classroom at the high school and the technology links between the sites were turned on. The classes met in a roundtable forum, conversing in Spanish, while district, State, school board, and telephone officials watched. Teachers felt that this first "face to face" meeting was essential. The classes teamed for 1 week during the spring 1989 pilot, and will continue on a regular basis in the fall. In addition, the two-way classroom link will be used to offer a new course in Italian from Bulkeley to Hall, adding curriculum resources that neither school had offered before.

How will this joint project influence other efforts in the State? According to Betty Steinberg, State Supervisor for Curriculum and Instruction, this project will help educators understand the strengths and limitations of distance learning. She is cautious about the benefits: technologies alone cannot resolve differences in educational resources. "Let's not kid ourselves, technologies are not educational panaceas." Nevertheless, State Commissioner of Education Gerald Tirozzi believes that these efforts can open up thinking about sharing teachers and resources across districts.

From the SNET point of view the project will help telephone companies learn how students and teachers can use telecommunications, what technical changes are needed to make the system work better, and what creative applications are possible. As Kathy Bucky, head of the SNET Links to Learning Project notes: ". . . these schools will use our telecommunications resources to serve their needs--two different schools, two different facilities linked by the need to share knowledge."

¹OTA site visit, February 1989.

and graphic forms. They stated that this improvement in their teaching carried over into the traditional classroom .28

Distance learning teachers have found that, unless they pay close attention to the need to create an interactive environment appropriate to the technology, students can and will tune out. One study suggests:

The best way to learn new information is to receive it while in an active, rather than passive, state of consciousnessOne simple method the instructor can use to assist the learner . . . is to do something that is never done on broadcast television: to talk directly to the distant learner and require a response at the very beginning of the session .29

In another project, instructors show a short videotape during the first class session that high-

²⁸Ibid., cited in *American Journal of Distance Education*, vol. 3, No. 1, 1989, p. 82.

²⁹Sally M. Johnstone, "Interactive Teaching: Breaking Television Viewing Habits," *ED, The Distance Education Network Report*, vol. 2, No. 5 (San Ramon, CA: Applied Business Telecommunications, May 1988), p. 4.



Photo credit: John Hubbard, Colgate University

Teacher and student, though miles apart, work together on a mathematics problem over this audiographics system.

lights the difference between recreational viewing and interactive instruction via television.³⁰ When teachers help their students prepare themselves for active viewing of media, the students are more likely to overcome the passive habits acquired from recreational use of media.

Teaching in a distant learning setting challenges teachers to rethink their interaction with students. Even in the traditional classroom, interaction between teacher and student does not just happen—good teachers are always looking for ways to involve their students. Furthermore, student learning comes not just from interacting with the teacher; it comes from interacting with other students, and relating new information to prior understanding and knowledge. The distance learning teacher must deliberately structure opportunities that encourage students to work together in small groups, tackle problems on their own, or work with materials like computer programs to test and reinforce learning when the teleteacher is not available.³¹ In these instances, the local facilitator can play an important role. Both the teacher and facilitator function as instructional guides or coaches, to explain, answer questions, and go into greater detail. With less opportunity for traditional forms of interaction, students may have to take more responsibility for their own learning.

Because of the physical separation between the teacher and students, teleteachers need to establish ways for students in the remote classrooms to feel comfortable contacting them. These arrangements vary with the type of distance learning project, the technology used, distances, and the number of students involved. They include:

- meeting in person with students in each of the distant classes early in the course;
- arranging for all the students to meet together at least once, ideally at the beginning of a class;
- asking students to send in pictures of themselves to personalize their responses to questions on the air;
- having telephone office hours when students can call and discuss the lessons with them, or with teaching assistants;
- setting up assignments for students to handle as members of learning groups;
- using electronic keypads to gauge student understanding during the lesson, allowing the teacher to assess if the material is understood before moving ahead in the lesson; and
- assigning computer activities that give students the opportunity to move along at their own pace, with feedback enabling the teacher to assess each student's strengths or trouble spots.

³⁰Rich Gross, Dean of Telecommunications, Kirkwood Community College, Cedar Rapids, IA, personal communication, July 1989.

³¹Broker, *op. cit.*, footnote 19. See also Toby Levine, *Communications, Inc.*, "SERC Pilot Semester Evaluation Project," report prepared for Satellite Educational Resources Consortium, Columbia, SC, July 1989.



Photo credit: Sandy Welch, Kentucky Educational Technology

In some satellite courses, students send answers instantaneously via electronic keypads. Teachers know at once who needs additional help.

Teleteachers interviewed in the OTA case studies³² were concerned that distance made one-on-one communication more difficult. In systems that had no immediate visual feedback, teachers missed being able to read their students' visual cues and nonverbal behavior. These negative features created by the technology should not be minimized. One of the main reasons many teachers chose teaching and remain in the position is the satisfaction they derive from working closely with individual students, listening to their problems, and observing and guiding them in their personal and social development as well as academic growth, both in and out of class.³³ The implication for distance learning efforts is important. Not all teachers want to teach at a distance, especially if the distance learning system is one in which they teach to an empty studio and have no classroom that is their "home class," or in systems where all students cannot immediately reach them with questions and comments. It is easier to maintain interpersonal relationships between students and teachers in systems where the distance learning teacher maintains a home classroom and extends his or her reach to students in distant classrooms, while limiting total student enrollment to that found in a typical class.

³²Barker, op. cit., footnote 19.

³³For example, one study found that the majority of teachers (70 percent) discuss personal interests or hobbies, current events, and personal problems with their students outside the classroom. And, when the relationship between teachers and students is described as positive, teachers are more likely to be perceived as "excellent" teachers; students listen more often in class, and students' performance and enthusiasm for learning are higher. Louis Harris & Associates, Inc., *The Metropolitan Life Survey of the American Teacher 1988* (New York, NY: 1988), p. 8.

³⁴Dean Bradshaw, *The Promise of Distance Learning* (San Francisco, CA: Far West Laboratory for Educational Research and Development, January 1989), p. 22.

³⁵Gross, op. cit., footnote 30.

What Skills Do Teachers Need To Teach Via Technology?

The key to any distance learning system is the teacher. Not every teacher makes an effective teleteacher. As suggested by one researcher:

Just as every person in the world is not born to be a teacher, every teacher is not born to be a teleteacher. Being a good teleteacher calls for all of the understanding, experience, and skills of a live classroom teacher—and lots more. A good voice; pleasing appearance; stage presence; plenty of self confidence; a flair for the dramatic, artistic, creative; being comfortable with the use of the technology; and a willingness to go the extra mile are all vital qualities. Most important is an openness to becoming comfortable with the new technology and an ability to use its strengths to enhance teaching and learning.³⁴

More is required, however, than just these personal attributes. The critical role of the teacher in the distance learning setting makes it imperative that teachers get adequate training not only in the technical aspects of the system, but also in the educational applications of the technology. Teachers' understanding of how to design a course and of appropriate and effective communication skills for teaching at a distance are central to the success of the effort. These are also the lessons they will most likely carry with them back to the face-to-face classroom environment.³⁵

Many teachers have asked for more training on how to use distance learning systems most effectively. For example, faculty members in the Learn Alaska Network requested preparation for distance teaching, identifying the need for assistance in such areas as:

- the amount of time needed to prepare and teach distance delivered courses,
- methods to establish and maintain effective communication with distant students,
- experiences of other faculty members,

- strategies for adding visual components to audio courses,
- strategies for increasing interaction both among students and between students and faculty,
- planning and management of organizational details involved in distance delivery, and
- strategies to encourage group cohesion and student motivation.³⁶

Unfortunately, many projects throw their teachers into distance teaching assignments with little preparation. One study suggests:

With only a few exceptions, the best training is little more than a quick effort at the last moment before implementation or after problems have already appeared. Often teachers are left to grapple with the new programs on a “sink or swim” basis under the assumption that no training is required.³⁷

In OTA’s seven case studies,³⁸ nearly two-thirds of the teleteachers surveyed (64 percent) had not received training prior to teaching over their respective distance learning systems.

All the large multistate distance learning projects have, however, addressed the training of both distant teachers and facilitators. Some projects give prospective distance teachers screen tests. For example, in the STEP network, despite the fact that teleteachers are certified high school teachers who have extensive teaching experience, they all receive instruction in communication skills for presentation over television. The training is provided by the private broadcast studio from which STEP programming originates. As the general manager of the studio said:

You can’t just walk in front of a camera and start to talk. Our major role is integrating the teachers’ teaching skills with the broadcast medium. The producer and director show them how to use the set, how to move across the set. We emphasize the importance of maintaining eye contact with the camera and projecting an image that personalizes their instruction to the students. We don’t want any

of the broadcast or teaching of the teacher to look clumsy. The students will recognize clumsy programming and judge the quality of instruction accordingly. . . . We want the student to see that the teacher looks smooth, comfortable, under control, and professional in front of the camera.³⁹

Many teachers are natural actors. The classroom is their stage. For them, communicating in front of a camera may not be so different. But teleteachers must learn how to use the resources provided by the distance learning system creatively to communicate with their students, however far away they may be.

Research on collaborating in the workplace and in “virtual classrooms” (educational communities separated in time and place), suggests new opportunities for learning and different communication methods.⁴⁰ In research on computer-supported cooperative work, research focuses on creating virtual environments similar to human communities and facilitating emotional bonding and social relationships over distances. The major applications developed so far use video imaging and digital voice to widen communication as much as possible, so that users can transfer face-to-face interaction skills into the new environment. **However, while many aspects of virtual environments are similar to face-to-face encounters, the overall communication style needed to be effective in electronic interaction is different.**

The interchange of ideas in distance learning requires different communication methods than in conventional classrooms for a number of reasons:

- information technologies are predominantly a visual medium, rather than the textual and auditory environment of the conventional classroom,
- the affective content of technology-mediated messages is muted compared to face-to-face interaction, and
- complex cognitive content can be conveyed more readily in electronic form because multi-

³⁶See Michael Moore, Pennsylvania State University, “Effects of Distance Learning: A Summary of the Literature,” OTA contractor report, May 1989, p. 23.

³⁷Anne Batey and Richard N. Cowell, *Distance Education: An Overview*, ERIC, ED 278 519 (Portland OR: Northwest Regional Educational Laboratory, 1986), as cited in Moore, *op. cit.*, footnote 36, p. 22.

³⁸Barker, *op. cit.*, footnote 19.

³⁹Jason Vingelen, RXL Communications, Spokane, WA, personal communication in Barker, *op. cit.*, footnote 19, p. 12.

⁴⁰For a fuller discussion of this concept, see Christopher Dede, University of Houston-Clear Lake, “The Evolution of Distance Learning: Technology-Mediated Interactive Learning,” OTA contractor report, July 1989.

ple representations of material (e.g., animations, text, verbal descriptions, and visual images) can be presented to give learners many ways of understanding the fundamental concept.⁴¹

Training is **also an integral part of distance learning projects that are intended as supplements to, rather than substitutions for, regular classroom teaching.** The training that is given to the classroom teacher who is responsible for implementing these activities and lessons in the classroom varies with the depth, sophistication, range, and, perhaps, novelty of the enrichment materials. For example, in programs presented by the Public Broadcasting System, the National Aeronautics and Space Administration, and Talcott Mountain Sci-STAR, advance materials help teachers prepare for the series with their students. Suggestions and materials for followup activities are often provided as well. Other projects take a more intensive training approach to prepare teachers for an instructional approach that will be different. The Technical Education Research Centers (TERC) Star Schools Project involves the use of electronic databases for students to record, analyze, and compare scientific data they have collected in their communities. This “hands on” teaching approach to science and technology may be novel to many teachers. TERC staff believe that teaching with databases and telecommunications is new to most teachers and thus teacher training and ongoing support is central to the success of the project.

The Role of the Classroom Facilitator

Although the role of the classroom facilitator varies across distance learning projects,⁴² training is

important if this individual is to be more than a “babysitter” for the students in the receiving classroom. Many projects take a hit or miss approach to facilitator training, despite the fact that this new position offers opportunities to enhance learning for students in the remote classroom. The facilitator is usually responsible for operating the receiving equipment, monitoring student behavior, evaluating or distributing homework and materials, supervising testing, and assisting with educational activities as assigned by the teacher.⁴³ Under ideal circumstances, **the distant teacher and facilitator work as a team.**⁴⁴ **Before classes start they meet (in person or electronically) to discuss the teacher’s goals for the class, instructional techniques, and, most importantly, how the facilitator can contribute to the students’ learning experience.** For example, in some cases, facilitators allow students in receiving sites to discuss and explain points to one another during class, with the talk-back microphones turned off. This peer tutoring can greatly enhance learning without disrupting the rest of the class in other sites; it is an example of structuring the situation to encourage alternative learning. This would be difficult to manage in traditional classroom settings.

DISTANCE LEARNING AND THE PREPARATION OF NEW TEACHERS

Despite the fact that teacher improvement has been a major issue in recent school reform efforts, schools and departments of education are not well funded; and, many are not well respected. Even though there are some encouraging signs that the number of students entering education programs is

⁴¹Ibid., p. 14.

⁴²Some distance learning projects do not involve classroom facilitators. In these projects, no teacher or other adult is present in the remote site with the students, although a video monitor in the principal or counselor’s office maybe used to keep an “eye” on the students. In these projects, distant teachers develop a different instructional approach, requiring increased student responsibility for their learning. See Minnesota Department of Education, *Interactive Television Teaching* (St. Paul, MN: 1988).

⁴³Bradshaw, op. cit., footnote 34, p. 23.

⁴⁴A study of multiple classes taking a German-by-satellite course found significant differences in the role of facilitators in the receiving sites. These differences corresponded with student success in the course. Students were consistently most successful in those sites where the facilitators had responsibility for coordination of and assistance with software use, watching all broadcasts with the students, encouraging student interaction with the instructor, learning German along with the students, troubleshooting equipment, answering or finding answers to simple student questions, providing additional quizzes or worksheets, solving individual problems, and assisting with use of the modem. The facilitators in these sites were also much more likely to have received training in operation of the equipment and software use. Vicki M. Hobbs and Donald D. Osburn, *Distance Learning Evaluation Study Report II: An Inter- and Intra-State Comparison* (Denver, CO: Mid-Continent Regional Education Laboratory, 1989).

slowly rising⁴⁵ and that their quality is also improving,⁴⁶ the teacher education programs are still of mixed quality.

Almost every State has taken steps to alter the education of teachers.⁴⁷ The reforms include higher standards for admission, improvements in the teacher preparation curriculum, and requirements that prospective teachers pass tests of subject matter or professional skills as prerequisites for initial certification. Leading education professionals are developing a broad agenda for improving the profession, taking as their charge the goal of enhancing the intellectual underpinnings of teacher education while simultaneously improving the profession.⁴⁸

Educators today have also come to appreciate that computers, videodiscs, and other technologies should be basic tools of the teaching trade; nevertheless prospective teachers are not necessarily trained in their use.⁴⁹ Although over one-half the States require or recommend technology training for teachers prior to certification, many schools and colleges of education are still struggling to find ways to train teachers to use computers as a general teaching tool.⁵⁰ **As difficult as the problem is with computers, even fewer programs prepare teachers for assignments that go beyond the four walls of the classroom.** Few education school faculty are experienced in the use of new technologies, and few universities tie such training into educational methods courses. In one survey⁵¹ of schools of education and teacher training programs (undergraduate and graduate) examining the extent to which future teachers and administrators are trained in distance education technologies, 84 percent of the institutions surveyed offered training in the instructional

use of computers, 64 percent in the instructional use of video, and 55 percent in the instructional use of audio technologies. These courses dealt primarily with the use of equipment. Only 52 percent of the institutions offered training in the management of small groups of students using computers, 37 percent offered instruction in the use of live interactive television for instruction, and only 26 percent offered courses in the use of audio technologies in instruction. Fewer than 20 percent of institutions required this instruction for teachers.

Because of the rapidly changing nature of distance learning technologies, it is not possible to try to prepare students for all the situations that lie ahead. There are, however, some examples of teacher preparation programs in which prospective teachers are trained to understand the distance learning experience. In some cases, distance learning systems help prepare teachers for classroom work.

At Mansfield University in Mansfield, Pennsylvania, education students taking an elective course in instructional technologies use audiographics to teach students in Riverdale, North Dakota.⁵² Computer screens prepared ahead of time can accompany lessons, as can pictures, charts, outlines, or other visuals sent live from the student teacher's computer to the distant sites via high-speed scanner technology. Students in the participating Riverdale classrooms send written or graphic responses via computer and talk to their student teachers via telephone. Riverdale, which has no teacher education institutions nearby, welcomed the opportunity to expand their curriculum with the mini lessons presented by the distant student teachers. The project makes it possible for prospective teachers to develop student

⁴⁵Olson, *op. cit.*, footnote 8.

⁴⁶Indicators of quality of prospective teachers are mixed. One survey noted that the typical teacher education student is in the top one-third of his or her high school graduating class. American Association of Colleges for Teacher Education, *Teaching Teachers: Fact & Figures* (Washington, DC: 1987). Nevertheless, other indicators, while showing improvement, still give reason for concern. For example, although the average SAT scores of high school seniors intending to major in education have risen in the last 2 years, this slight gain follows a period of over 10 years during which scores of prospective teachers declined at a faster pace than the drop experienced by all college-bound students, and a wide gap remains between prospective teachers and all other college-bound seniors. Carnegie Forum on Education and the Economy, *op. cit.*, footnote 9, pp. 31-32.

⁴⁷"A Survey of Two Years of Action by 50 States and D.C. to Reform the Education of Teachers," *The Chronical of Higher Education*, Apr. 20, 1988, p. A31.

⁴⁸See The Holmes Group, *Op. Cit.*, footnote 1.

⁴⁹U.S. Congress, Office of Technology Assessment, *Power On! New Tool for Teaching and Learning*, OTA-SET-379 (Washington, DC: U.S. Government Printing Office, September 1988).

⁵⁰*Ibid.*, p. 102.

⁵¹J. A. Riccobono, *Instructional Technology in Higher Education: A National Study of the Educational Uses of Telecommunications Technology in American Colleges and Universities*, ERIC, ED 278369 (Washington, DC: Corporation for Public Broadcasting, 1986).

⁵²Barker, *op. cit.*, footnote 19.

teaching experience early in their education program, and to learn about distance learning technology through direct practice.

Classroom Observation for Education Students Via Distance Learning

A major focus in the reform of teacher education is the clinical teaching experience. Observation and analysis of classroom practice prepares future teachers for more extensive teaching and clinical experiences. However, many teacher preparation institutions lack the ability to provide a variety of early observation opportunities. Distance learning technologies can fill this gap. (See box 4-B.)

Electronic Networks Linking Student Teachers

Another way distance learning technologies can improve the preparation of new teachers is through the use of computer networks to link education schools and novice teachers during their first teaching experiences. These networks provide an on-call help line, a resource that education faculty, supervising teachers, and beginning teachers find valuable for asking questions, solving problems and minimizing the sense of isolation many new teachers feel. (See chapter 1, box 1-C.)

Other education schools are establishing networks to communicate with student teachers as well as recent graduates. Iowa State University has a network for student and first-year teachers and new public school administrators, partially supported by Apple Computer. The Harvard Graduate School of Education's Beginning Teacher Network links 50 of Harvard's newest graduates with one another and several faculty from the School of Education. Information sharing, professional advice, and support for the new teacher in the difficult first year of teaching are the goals of the network.⁵³

RESOURCES FOR THE ONGOING PROFESSIONAL DEVELOPMENT OF TEACHERS

Distance learning technologies are being embraced by many school districts as valuable resources for the entire school staff, not just the

students. Staff support via distance technologies ranges from breaking barriers of isolation via electronic networks to the offering of graduate degrees. A sampling of these activities include:

- support over networks linking teachers and other school staff (e.g., librarians, counselors, and principals) to their colleagues;
- live teleconferences or video conferences using open audio lines (e.g., AIDS information meetings and State education association annual meetings);
- short courses on content or pedagogy based on new research or newly available materials;
- full courses to meet recertification requirements, change teaching specialties, or earn advanced degrees; and
- any variations and combinations of the above.

The major advantages provided by the distance learning technologies are the same for teachers as they are for students: expanded curricular access, opportunities to interact with top quality instructors, and opportunities to take classes without having to travel. Yet different factors come into play in the training of adults than in the training of children, and it is these factors that make analogies to business training appropriate. Schools are beginning to use technology in much the same way as businesses—as an efficient means of providing professional development.

Much of the literature on distance learning effectiveness has dealt with the training of adults via distance learning technologies.⁵⁴ That is not surprising since most of the use to date has been in higher education, business, and military training applications. The factors contributing to the success of distance learning involving college students, businessmen, and army personnel also make distance learning effective for teachers. In training adults, there is less concern about the physical absence of the teacher. Teachers, like other adult professionals, have the maturity, attention span, motivation, and discipline to succeed in the somewhat unusual distance learning environment.

⁵³See Office of Technology Assessment, op. cit., footnote 49, p. 104.

⁵⁴See ch. 2.

Box 4-B--Guided Observation: Iowa Teachers on Television¹

At Iowa State University (ISU), student teachers observe exemplary teaching in diverse classrooms across the State, without leaving the campus. The Teachers on Television (TOT) program, which received a 3-year (1985-88) grant from the Fund for the Improvement of Postsecondary Education (FIPSE), is now in its fourth year of operation. The TOT project addresses two concerns in teacher education: preparing preservice teachers to become competent observers of teaching and learning environments, and providing a diversity of high quality introductory observation experiences to teacher candidates regardless of their location. TOT was designed to address these issues by using remote structured observations, supplemented with course material that shows the education students the relationship of pedagogical theory to real life teaching practice.

The TOT program uses live microwave television broadcasts that are remotely controlled via telephone from an observation site at Iowa State University at Ames. Classroom teachers are chosen for their diversity in grade level, curriculum materials, teaching style, and educational philosophy. All are exemplary teachers. Each observation classroom has a camera mounted on a pedestal with remote pan, zoom, and tilt features. The audio is mixed with the video signal and returned to ISU via microwave. The receiving site at ISU is equipped with a large video screen, multiple telephones, a control panel, a broadcast camera and mixing equipment to overlay the facilitator's comments onto the classroom signal.

Prior to each broadcast, the participating classroom teacher supplies information about the instructional setting (e.g., lesson plans, student work, floor plan, teaching philosophy). An ISU education school faculty member serves as the facilitator, maintains regular contact with teachers, and interprets the class activity during the broadcast, shown in a second window in the television picture. The facilitator's role is to bridge education theory with actual teaching practice. At the end of each broadcast sequence, a followup interview with the teacher allows for discussion of what happened, identification of successes and problems encountered, and future classroom plans. Education students are able to observe TOT classrooms live on a drop-in basis at one of two classroom sites, or via videotape at their convenience.

Evaluation of the original FIPSE project focused on the impact of the TOT program on sophomore preservice teachers' attitudes and abilities to recognize effective teaching behaviors, and found positive outcomes in both areas. Students were enthusiastic about the experience, especially the opportunity to observe real classes on a regular and convenient basis, and to go back over certain portions of an observation with the use of the videotapes. Curriculum materials helped guide their observations. Some of the best teachers in the State were available to every education student at ISU without interrupting their work. The partnerships formed between the participating schools and the education school faculty also created an unusually high level of university/classroom collaboration leading to joint research projects, curriculum revision, and national presentations. Classroom teachers enjoyed the challenge of being role models for a new generation of teachers and found that teaching on television provided an opportunity for professional growth and statewide recognition while allowing them to remain where they are happiest—in the classroom.

At first, most of the ISU education faculty viewed the TOT project with skepticism. Education faculty lacked time and resources to integrate TOT into their courses. Faculty training and discussions focused on how these new resources could be used effectively. These discussions led to the design of a project funded by the Iowa Department of Education in mathematics and science instruction using teachers from the TOT classrooms and the ISU faculty.

As the project gained acceptance, transmission costs became a critical factor. A university-wide change in telephone service resulted in long distance call rates (Ames to Des Moines) jumping from a 50 cents per day flat fee to an hourly charge averaging \$10 per hour and \$60 per day. In addition, technical support costs increased when the university television station became a for-profit enterprise, and charges for service, microwave transmission satellite transmission, and other activities were no longer subsidized. **Both these** factors made the project more expensive than anticipated.

At the conclusion of the FIPSE grant the project sought to become self-sustaining by developing a national consortium of university subscribers. In 1988-89, there were 7 subscribing institutions, with a long-term goal of 40 participants. Because of economic factors and the difficulties of scheduling broadcasts to other institutions across time zones, the observations are videotaped and mailed to subscribing institutions rather than being offered live over satellite.

¹OTA site visit, March 1989.

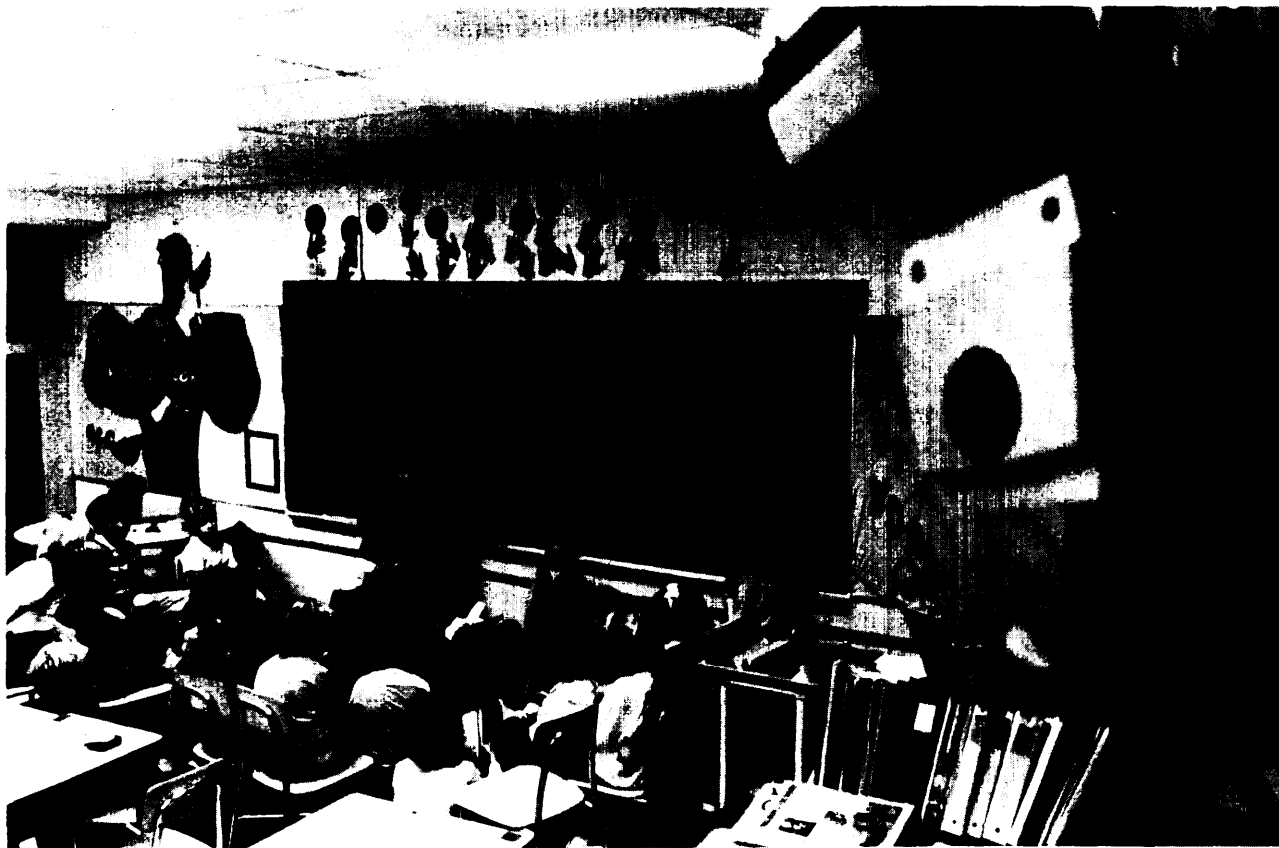


Photo credit: Iowa State University

One of the best ways to learn about teaching is by watching good teachers. Nancy Frazier's second grade class at Fellows Elementary School in Ames is beamed live to education students at the university.

Inservice Training

No nationwide figures reveal the number of teachers who receive staff training via distance learning technologies. However, of the more than 100 distance learning projects entered in OTA's database, one-half include teacher support or training components. Projects in Virginia and California are illustrative.

Through funding from the National Science Foundation, the Center for the Liberal Arts at the University of Virginia (UVA) offered a 14-week chemistry course by satellite to teachers at nine regional classrooms across Virginia.⁵⁵ Two hundred sixty-three science teachers, or the equivalent of one-half the chemistry teachers in the State, com-

pleted the course. The class was carried live every Saturday morning to the downlink sites, where teachers gathered with their local colleagues. Instructors from local colleges served as on-site facilitators. Each session consisted of 1 hour of live, two-way audio, one-way video lecture/discussion conducted by a UVA chemistry professor, followed by 1 hour of group activity led by the local instructor. During the third hour of each class, videotaped laboratory demonstrations and videotours of university research laboratories were sent via the satellite transmission. In each of the local sites, teachers collaborated on classroom projects, and at the final session each regional classroom presented its most successful project to the other sites via the system. The course also provided participants an advanced level textbook and over 50 printed handouts, which

⁵⁵R. Bruce Martin, Professor of Chemistry and Associate Director, Center for the Liberal Arts, University of Virginia, Charlottesville, personal communication, August 1989.

Box 4-C—LOS Angeles Educational Telecommunications Network¹

The Educational Telecommunications Network (ETN), owned and operated by the Los Angeles County Office of Education, provides staff development via satellite. Programming is provided at no charge to 62 school districts in the county as well as to 25 other counties around the State. Subscribing counties pay an annual membership fee of \$2,000, plus an additional amount based on their average daily attendance count (15 cents per pupil). Subscribers and the districts within Los Angeles county can participate in any of the live telecourses offered over the system, or may record and retain the satellite transmissions for later use. Each series includes leaders' guides and other support materials that can be duplicated and distributed within the participating district or county.

Telecasts for staff development in curriculum reform have been the largest use of the system. From October to May in the 1988-89 school year, ETN broadcast 54 programs dealing with changes in California curricula (28 in English/language arts, 14 in K-8 mathematics and 4 in preparing for mathematics "A" (9-12), and 8 programs on leadership issues for administrators charged with instituting the new curriculum). Publishers of English/language arts and mathematics textbooks sponsored an additional 26 telecasts to review alignment of their texts with the revised curricula. ETN also offered several hours of programming for teachers on such topics as suicide prevention strategies, child abuse prevention, AIDS update, and Hispanic parenting, as well as 4 hours for parents on special education resources. Administrative briefings and special meetings were also transmitted over the system. In addition, 26 hours of instructional television programs were broadcast over ETN for teachers to copy for later use in the classroom.

An advisory committee composed of teachers and assistant superintendents for curriculum and instruction recommend programming priorities, scheduling, key issues, and staff support requirements. Programs are live and interactive; viewers call in their questions and reactions. Some programs have been designed to be interrupted so that participants at local sites can discuss ideas and issues among themselves in the midst of the program, then go back to the presenters with their groups' questions and comments. Presenters also use video footage from classrooms to model the strategies and content being discussed in the telecast.

Of special interest in the ETN model is the use of on-site satellite facilitators who are trained in both technological "know-how" to receive ETN satellite transmissions, and in leading group discussions. The facilitators work with local district content specialists who are trained to answer questions on the content presented and to manage the pre-viewing, telecast, and post-telecast activities, and to organize later followup activities. Facilitators and content specialists receive leaders' guides that contain a summary of the video conference, masters for handouts, suggested optional activities, facilitators remarks, and detailed suggestions for followup activities.

The network resources can serve a broader range of training needs. Under a contract with the Los Angeles County Board of Supervisors, ETN will produce and telecast staff development courses for paramedics, law enforcement personnel, librarians, and social workers in the county.

¹OTA site visit, February 1989.

included a demonstration handbook and teacher resource guide prepared by the collaborative groups.⁵⁶

The California Department of Education distance learning activities focus on teacher inservice training. This emphasis reflects both the needs of teachers, who must complete 150 hours of staff development during each 5-year cycle as a condition for renewing their teaching credential,⁵⁷ and the State mandate for curriculum reform. This curricu-

lum reform in English/language arts, mathematics, history/social science, science, and the visual and performing arts, includes changes in what and how teachers are expected to teach. The Los Angeles Educational Telecommunications Network has been the catalyst for a statewide staff development program that supports and enhances California's curriculum reform efforts.⁵⁸ (See box 4-C.)

Many States and localities subscribing to multi-state satellite distance learning systems have utilized

⁵⁶With the second phase of National Science Foundation funding, in January 1990, the center will offer a similar course for middle school physical science teachers. All physical science teachers in the State have been invited to participate in planning the course to meet the needs they deem most urgent, 300 will be selected to participate in the tuition-free, three-credit course. Ibid.

⁵⁷Margaret E. Goertz, *State Educational Standards in the 50 States An Update* (Princeton, NJ: Educational Testing Service, March 1988), p. 36.

⁵⁸Patricia Cabrera, director/executive producer, Educational Telecommunications Network, Los Angeles County Office of Education, personal communication, July 1989.



Photo credit: ETN, Los Angeles County Office of Education

Facilitators are important to successful distance learning. Here teachers are trained as site facilitators for staff development courses sent via satellite.

the inservice training programs they offer nationwide. Additionally, inservice teacher training is a component of all Star Schools projects. While the number of teachers participating is unknown, the value of access to national experts is clear. As one superintendent said: "To get a Rita Dunn or a Harry Wong [both well-known inservice trainers] here in person, we can spend between \$3,000 and \$5,000 on a one-day presentation. . . . For \$5,000 via TI-IN, we get a whole year of top quality in-service training."⁵⁹ As States and districts build their own distance learning networks, or link up with others, applications for teacher inservice and professional development are likely to expand (see appendix A).

Electronic Networks for Linking Teachers

Teacher support of a less formal sort is available through electronic networks for teachers. Several States and districts have developed these systems. One interesting example is Montana's Big Sky Telegraph Network, a grassroots telecommunications system supporting rural educators with electronic mail, computer conferencing, a lesson plan database, and a software loan library.

⁵⁹John Rinaldi, Chittenden South Supervisory School District, quoted in National School Boards Association, Institute for Transfer Of Technology in Education, *The Electronic School*, September 1988, p. A19.

⁶⁰Frank Odasz, Big Sky Telegraph, personal communication, Mar. 7, 1988.

⁶¹Big Sky Telegraph is funded by grants from the M.J. Murdock Charitable Trust of Vancouver, Washington and the US West Foundation of Montana. Based at Western Montana College, Big Sky Telegraph customized conferencing software to create a powerful, easily teachable, on-line environment. Over the initial 10-month period, the system logged more than 10,000 calls resulting in 7,000 messages from some 450 callers, of whom approximately 150 are consistent users of the system. Frank Odasz, personal communication, December 1988.

The Big Sky Telegraph Network links teachers in 114 one-room schools across the State of Montana. This bootstrap effort encourages participation by all persons interested in improving rural education through the computer-assisted sharing of creative ideas and available resources.⁶⁰ A one-semester credit course for teachers, "Microcomputer Telecommunications for Educators," is also available on the system. The course objectives are to demystify the telecommunications uses of computers as they relate to K-12 education and to provide needed rural community services through better communications with resource persons, Western Montana College, various service agencies, and other on-line services. The course also aims to develop confidence in computer telecommunications and to encourage continued professional uses for peer networking, resource sharing, and K-12 student/classroom use. The course meets on-line at the learner's convenience for a minimum of 2 hours per week for roughly 20 minutes per call. The location of the course is the ". . . nearest microcomputer to the student's location."⁶¹

New York State also has an extensive support system for teachers through their Teacher Centers electronic bulletin board, TECHNET, at New York Institute of Technology. This, like other teacher networks, can provide a number of professional benefits by:

- increasing the availability of preservice and inservice teacher training, while realizing often substantial decreases in mileage payments to participants;
- providing the capacity for teleconferencing among the boards of education and staffs of the school districts, thus eliminating or reducing some transportation costs;
- increasing the possibility of interdistrict subject-area departmental meetings that allow for continuous improvement of instruction through the sharing of successful techniques and strategies; and



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- . overcoming the feeling of isolation experienced by many teachers at various stages of their career.

Teachers often express the belief that they are alone and out of touch with their peers. With distance learning systems, communication among teachers on a consistent and structured basis can lead to solutions to common problems and concerns⁶²

Courses for Credit for Professional Development

Teachers, like other professionals, often have a desire to upgrade their skills in their field, either in pedagogy or in subject matter. But for many there is no university program nearby, limiting their options. Distance learning technologies can bring courses from universities or community colleges to them at home⁶³ or at nearby sites, perhaps in the local school. Even when universities are near, there can be advantages in providing professional development courses via distance learning technologies. For example, George Washington University in Washington, DC, has established, in cooperation with the District of Columbia schools and several school districts in nearby Maryland and Virginia, a master's degree in education and human development broadcast over their instructional television fixed service (ITFS) system. The districts negotiated a reduced tuition rate for their teachers, and provide space at local schools where teachers gather after school in small groups to take the courses.⁶⁴

The phrase "televersity"⁶⁵ has been applied to programs like the National Technological University, one of the oldest and most successful nontraditional university programs, which serves the advanced educational needs of engineers, scientists, and technical managers. (See box 4-D.)

Could such a comprehensive system of advanced professional education be developed and offered nationwide for teachers? Momentum toward this end is growing. In 1989, the Carnegie Foundation awarded a grant to New York University, on behalf of a group of institutions of higher learning, to study

Box 4-D-National Technological University

The National Technological University (NTU) is a private, nonprofit institution founded to serve the advanced educational needs of today's busy, highly mobile engineers, scientists, and technical managers. NTU, which is governed by a Board of Trustees predominantly made up of industrial executives, began regular satellite delivery of advanced technical education in August 1985. Today NTU offers a wide range of instructional television courses taught by the top faculty of 28 of the Nation's leading engineering universities. Over 7,000 hours of academic credit instruction were provided to scientists and engineers choosing from the 455 courses offered by the participating universities in curriculums leading to Master's of Science in computer engineering, computer science, electrical engineering, engineering management, and manufacturing systems engineering. Two additional programs in materials science and management of technology were added in 1989. In addition, over 40,000 technical professionals participated in over 1,000 hours of noncredit state-of-the-art advanced technology and management programs.

Receiving sites are generally the laboratories and offices of the 60 some participating corporations and government agencies. Direct telephone lines from the receiving sites to the campus classroom provide for faculty-student interaction. The live classroom activity is supplemented by electronic mail, computer teleconferencing, and telephone office hours.¹

Employee participation in courses is usually on work time and paid for by the subscribing corporation. Along with the quality of the educational courses, these factors are credited with much of NTU's success. Student motivation is high because of the support of their employers. The employer, in turn, benefits by being able to keep key staff up-to-date with technical information without losing them for long periods of study.

¹National Technological University, *NTU Executive Summary* (Fort Collins, CO: 1989).

⁶²New York State Legislative Commission on Science and Technology, op. cit., footnote 2, pp. 19-22

⁶³For example, Mind Extension University utilizes a cable channel to bring satellite courses from colleges and universities into the home. Both credit and noncredit courses are available. The 1989 summer schedule offered six education courses for credit from Colorado State University, one from the University of Minnesota and one from the University of Wisconsin at Stevens Point. Several other courses of interest to educators are offered from among the many universities affiliated with the program.

⁶⁴Janelle Leonard, District of Columbia Public Schools, personal communication, August 1989

⁶⁵Thomas L. Martin, *The Televersity: The University of the Future* (Surrey, England: Industry and Higher Education, September 1987).

the prospect of a national distance learning consortium for teacher training.⁶⁶ One such effort is under way. Starting in the fall of 1989, the Joint Center for telecommunications Studies, a collaboration between Howard University in Washington, DC, and the New York Institute of Technology, with support from Northern Telecom, will offer courses leading to master's and doctoral programs in education to teachers nationwide via telecommunications.⁶⁷

The distance learning technology infrastructure in schools around the country may make it possible for teachers to participate in workplace professional development, but there are still a number of obstacles that must be surmounted. The success of these efforts will require cooperation between providers and the schools to guarantee that courses are relevant to the classroom needs. Universities and other program providers will have to collaborate with one another in involving the best teacher educators and subject area specialists. Administrative and fiscal support for teachers will also be required. Will schools follow industry's model and pay for tuition, provide release time, and cover transportation costs to a nearby site, or offer courses at school?

POLICY ISSUES

Technologies for learning at a distance, while reaching a small but growing number of teachers today, will clearly affect the teaching force of tomorrow. Some will teach through these systems, others will use them to add resources to their classrooms, and many will receive professional education and training over them. Few will be unaffected. These possibilities offer exciting opportunities for the profession. In the past, student enrollment changes meant that teachers were shifted to other schools, had to teach out-of-field, or left their home district altogether. Today teachers can continue teaching the subjects they love by combining students in electronic classrooms. As efforts expand, outstanding teachers can reach larger numbers of students than just those lucky few who happen to be in their home classrooms. They can become electronic mentors to other teachers in distant locations. Role models—superstar teachers, women in politics, minority scientists, poets, artists, business innovators, and creative individuals any-

where in the world—can join communities of learners and directly contribute to the instructional process.

But far more troubling visions could also occur. Will schools districts facing reduced funding use distance learning technologies as an excuse to cut back on needed staff? Limited resources might also place severe constraints on the flexibility and expandability of systems. Schools may find increasing competition for time on networks they helped create. Even more troubling would be investments in hardware and startup operations without adequate investment in the training and resources for teachers who will use the systems.

As policymakers invest in distance learning, they must consider systems to meet immediate needs, but also ensure long-term viability. Policy options serving immediate needs as well as long-term goals could include:

- support to schools and colleges of education enabling them to utilize distance learning technologies as tools to improve the preparation of new teachers;
- support for the development of local, State, regional, and national networks for teachers, for their ongoing professional development and informal communication;
- research on alternative teaching styles facilitated by distance learning technologies, with demonstration models and evaluation of ongoing efforts and long-term impacts;
- support for involvement with the private sector, through tax benefits, employee educational credits, or other means, encouraging their sharing in the provision of educational resources via distance learning technologies; and
- expansion of the infrastructure for distance learning technologies, so that more, and eventually all students, teachers, and districts can access the resources they need.

Setting long-term goals requires expanded vision. Restructuring education to meet the needs of the 21st century will involve today's technologies and tomorrows. These technologies will not be ends in themselves, but means to an end—levers for change.

⁶⁶Arthur Melmed, New York University, Center for Educational Technology and Economic Productivity, personal communication, July 1989.

⁶⁷Stan Silverman, New York Institute of Technology, personal communication, August 1989.

Distance learning has already been used to overcome problems that conventional instruction cannot address: problems of scale (not enough students in a single location) and scarcity (an instructional specialty not available locally). Distance learning also offers opportunities for the new kinds of learning that will be needed in a global information society. Restructuring efforts could include different arrangements of classrooms and schools. By overcoming pupils' segregation into isolated enclaves, distance learning makes possible different combinations of learner communities and teaching arrange-

ments. Each school can be an "electronic magnet school," drawing in resources from the wider community. Students' learning environments will expand from the isolation of the classroom to the world; from individual insight to collaborative experience.⁶⁸ Similarly, doors will open for teachers.

For those of us who have worked in schools that keep teachers distant from one another and condemn us to the chill of isolation, the idea that a teacher in Arizona can seek the counsel of a teacher in Florida is nothing short of exhilarating.⁶⁹

⁶⁸Dede, *op. cit.*, footnote 40, p. 19.

⁶⁹Mary Futrell, "The Last Frontier," *NEA Today*, December 1988, p. 2.