The Coming of Age with Technology in Rural Schools

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Articles in The Rural Educator from the early Eighties reflect the new interest in bringing technology to rural schools, primarily for delivery of courses to schools where they would otherwise be unavailable. Expanding the accessibility to curricula would improve the opportunities of rural students to compete with students from larger metropolitan schools for admission to colleges, for job opportunities, and for a broader education as well. Delivery of such courses was first recorded in the journal in an article in the Fall 1983 issue in which John E. Davis, the Executive Head of Field Services and Extension at the Ontario Institute for Studies in Education at Toronto, recounted the history of the use of correspondence courses by various parts of the world, but especially their use in Western Australia, New Zealand, and the United States. Although this methodology hardly fits our definition of “technology” today, it was the forerunner of delivering information to public school students without the physical presence of the teacher and with kits developed by others than the actual classroom teacher. Of course such courses had been available at the college level as early as 1918, but this was a new innovation for public schools. The information in this article proved of such interest to readers that it was expanded and rewritten for the Spring 1985 issue of the journal.

In the article Davis wrote, “Not only are correspondence courses now being used to supplement a school’s curriculum, but also to permit students to work at varying degrees of pace. The have a special applicability to rural students who, even in these days of advanced mechanization, are (at different seasons of the year) called away from schools for periods of time to become members of the farm work force.

The suggestion is not being made that correspondence courses should replace conventional classrooms and that teachers should become mere supervisors of correspondence classes. Rather, the idea is that the two might be used to complement each other.

Davis’s article deals only with the in-school use of correspondence materials. “At their most ineffective level of use, such materials are provided to students who are then assigned study space somewhere in the school, most often in the library, and then are left to work more or less on their own. Experience shows, however, that only a small percentage of these students succeed [with this method]. … On the other hand, when the students are supervised even in the sense of providing only moral support or giving assistance in understanding the questions, the percentage of successes rises dramatically (Davis and Ryan, 1980). This suggests that an important factor in the success of correspondence students is not just the availability of teacher assistance, but the regularity and immediacy of that assistance. The fact, of course, has long been recognized by proponents of computer-assisted instruction who are quick to emphasize the immediate feedback and support features of that mode of instruction.”

Of course, Davis’s comments could be applied to any other method of delivery of instruction, including on-line courses of today in which the instructor is not readily available for immediate feedback and encouragement. In the Spring 1985 issue of The Rural Educator Davis says, “Correspondence education in rural secondary schools is not a new concept. It has been accepted widely enough to have proven itself to be a superior alternative to inadequate and insufficient curricula. Recent developments which have the potential to enhance its attractiveness center around the use of new communications technology. Two innovations have great potential. The first of these, (which may be coupled with the use of print material), is satellite communications which gradually will make two-way television learning a practical possibility. This will be a major advance over television which delivers only program segments rather than a complete course.

The second is a major development in the ways that audiotapes, videotapes and computer discs are used to expand the scope and depth of more traditional types of correspondence materials and, in some instances, even replace them. Computers in particular have a two-way communication facility which makes them especially appealing to young students. Mini programs in a wide variety of subject areas provide diversity and interest in standard correspondence courses.” Davis concludes the 1985 article with “Supervised correspondence courses and materials continue to play a valuable role in providing curriculum diversity in rural schools, especially since new courses no longer are composed of purely print materials but now may incorporate many “hands on” features and, in addition, use new communication technology. There is also a growing trend towards making the materials available to school libraries where they act as resource materials for students and teachers alike.”

Only one year later Bruce Barker wrote in an article entitled “The Role of the Microcomputer in Rural Schools” in the Fall 1986 issue of The Rural Educator how this innovation had impacted rural education. He wrote “Though actual research is limited on the role of the microcomputer as an educational tool (Karoff, 1983), few educators would argue that computers are just another fad that will wind up on the shelf as have so many previous innovations. In the past 30 years, our nation has moved...
from an industrial society to an informational society. Nearly 60 percent of today’s labor force is engaged in the production of information goods and services, and that figure is still climbing. In 1950 only about 17 percent of the work force was so engaged (Annison, 1982). This change has enormous implications for educators who face the challenge of helping train and prepare young people for the workplace of tomorrow. “

Barker also said, “The National Commission on Excellence in Education (Nation at Risk, 1983, page 10) reported that ‘Computers and computer-controlled equipment are penetrating every aspect of our lives—homes, factories, and offices’ The Commission also noted that by the year 2000 millions of jobs will involve new and advanced technologies. To help ensure student preparation for the future, the Commission has recommended that one-half year of computer science be included as a high school graduation requirement. The purpose being, to help students:’…(a) understand the computer as an information, computation, and communication device; (b) use the computer in the study of other basics [English, math, science, and social studies] and for personal and work-related purposes; and (c) understand the world of computers, electronics, and related technologies (A Nation at Risk, 1983, p. 23).”

Reading Barker’s article today makes us realize how accurate he was in describing the need for computer education in the schools. His advice in the following excerpt from his article emphasizes that need, “The importance and necessity of placing added emphasis on computers in education seems self-evident. But to what extent do small/rural high schools — in comparison to their larger counterparts—include computer science as a part of the school’s curriculum? Are computers used chiefly for student instruction or for other purposes such as word processing by school staff or inventory management by office personnel? What is the computer/student ratio, and how many teachers understand computer technology well enough to teach others.”

Over 90 percent of the principals in both samples state that microcomputers were used for instructional purposes. In fact, student instruction was ranked as the number one use of microcomputers in the schools. Principals also agreed that the second major function was for recordkeeping (attendance records, scheduling, library, etc.) and that the third was for word processing by office staff-related questions. “Two random samples of operating public high schools in the United States were used. The first consisted of 475 schools with enrollments of fewer than 500 students each. The second consisted of 900 schools with enrollments in excess of 1000 students each. A mailing list, purchased from Market Data Retrieval, Incorporated, indicated a total of 5060 qualifying schools in the first sample (this did not include continuation, alternative, or specialty schools, almost all of which enroll fewer than 500 students) and 4799 qualifying schools in the second sample.

A self-administered questionnaire was mailed “to school principals in each of the two samples. Responses were returned from 319 of the small schools for a return of 67.2 percent and from 350 of the large schools for a return of 38.9 percent. Returns were received across 46 different states for the small schools and 45 different states for the large schools. The study was conducted during the 1983-84 school year.”

Findings reported by Barker are as follows: “The mean student enrollment in the small schools was 296.8 students and in the large schools was 1598.4 students. Ninety-nine percent of the schools participating in both samples reported ownership of at least one microcomputer. The mean number of microcomputers reported per school was 9.8 in the small schools and 27.2 in the large schools. Findings indicated a computer /student ratio of 1:34.2 and 1:59.1 respectively. Under ideal conditions during a six hour instructional day, this would allow students in the small schools an average if 11 minutes on the computer and those in large schools an average of about six minutes.

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In schools reporting instructional use of microcomputers, the percent of content use across specific subject areas indicated that business, computer science, and math classes were the most likely to use computers and foreign language the least likely. “The offering of computer science as a part of the regular school curriculum was more frequent in the large schools than the small ones (91.2 percent compared to 75.2 percent). Computer literacy was offered about equally between the two samples (82.3 percent and 80.3 percent respectively).

The average number of full-time teachers in the samples was found to be 22.9 teachers in the small schools and 90.4 in the large schools. Of those teaching in the small high schools, principals reported that 20.1 percent were “computer literate” and 43.2 percent were ‘computer aware.’ By contrast, large school findings indicated that 14.5 percent of teachers were ‘computer literate and 35.9 percent were ‘computer aware.’” Computer literacy was defined on the questionnaire as: ‘teachers who are familiar with how the microcomputer functions and are able to write
simple or complex programs.’ Computer awareness was defined as ‘familiar with how the computer can be applied and are able to access and use software programs, but are unable to write simple programs.’ In-service programs to train the faculty on how to use the microcomputer had been implemented in 64.6 percent of the small schools and 81.2 percent of the large schools. In most cases, however, the training did not extend beyond five hours of instruction in either sample.

Barker concluded, ‘Schools, whether rural or urban, have a tremendous responsibility to help assure that students graduate with an acceptable measure of technological literacy. The fact that 99.0 percent of the schools participating in this study owned a microcomputer(s) and that the machines were used chiefly for instructional purposes is evidence that many administrators recognize the importance of this responsibility. With appropriate software, it appears that the microcomputer has instructional application in almost any subject area. The extent to which microcomputers are presently used by students is limited. One reason is that the student/computer ratio is still sufficiently large as to restrict most students from having adequate time to work on-line with the computer at school. Although the findings from samples taken in this study showed a lower student/computer ratio in small high schools compared to large ones, the actual on-line computing time is still surprisingly inadequate. Another factor limiting microcomputer use is lack of qualified instructional personnel to teach the new technology. According to principals contacted in this study, over 36 percent of teachers in small high schools and 49 percent in large high schools are neither familiar with how the computer operate nor do they know how to use it.

It does not appear that the emphasis placed on computer use in the schools will decline or even stabilize. Instead, computer use in the schools is expected to increase at an annual rate of 60 percent (Leuhmann, 1982). Administrators are likely to face two serious problems in either implementing a new or monitoring an existing program that makes computers a major part of the school’s curriculum.

As evidenced by the high computer/student ratio, the first and most obvious problem is money. The average cost of a typical microcomputer is between $500 - $600. In addition, the school will need to purchase software programs and peripherals (e.g., monitor, printer, etc.) to make the computer functional. By contrast, a textbook for $20 to $25 looks very inexpensive.

The second problem, and perhaps equally as serious, is personnel. Many teachers presently in the profession received their teacher training before the advent of the silicon chip and simply are not computer oriented. Others may be fearful of the new technology or unwilling to change established teaching routines. As one writer put it, ‘You can bring the teacher to the new technology, but you may not be able to get the teacher to plug it in (Melville, 1983).’

Regardless of the problems, the challenge remains, and neither rural nor urban schools will be exempt from the responsibility to include computer technology as a regular part of the high school curriculum.”

In reviewing Barker’s study, one is struck by its timeliness and by how accurate his conclusions were. It is hard to imagine these conditions for computer instruction today, 21 years later, when many rural schools provide every student with a laptop to take home if necessary, when nearly all teachers have computers in their classrooms, when every teacher is computer literate, and when many, many rural schools have Smart Boards as teaching tools, when state-of-the-art computer labs are the norm. Certainly it was research such as Barker’s that led the way for such progress.

Another use of technology for innovative delivery of instruction was the use of Interactive Television in rural schools. Gerald Hansen, a Past President of NREA and former Superintendent of the Cheboygan-Otsego-Presque Isle Intermediate School District in Indian River, Michigan, was on the cutting edge of this new means of reaching isolated rural areas. His article in the Spring 1987 issue of The Rural Educator addressed his school district’s experience with this new medium for teaching. Hansen wrote, “Quality of instruction is not a major problem in Northern Michigan schools. In our small to medium-sized rural school setting, classes tend to be small, teachers are an integral part of the community, and the community, in turn, takes an active interest in school programs. This ‘checks and balances’ system works effectively to ensure a high level of instruction.

What, then, do we northern Michigan educators have to be concerned about? While the quality of our present instructional program is of utmost importance, the administrators in our Cheboygan-Otsego-Presque Isle Intermediate Schools District have, for some time, felt a great need to increase the quantity of curriculum offerings. Sparsity of population and declining enrollment problems have resulted in limited class offerings. Particular subjects (especially advanced classes or foreign languages) may not be offered in any given year due to small enrollment or lack of a qualified teacher. Not only does this deprive our students of a broader education, but some of our districts cannot qualify for accreditation with the University of Michigan, North Central, etc.”

Hansen then told how his district found the answer to the problem of quantity when in the spring of 1984 the constituent school in the intermediate school district learned ‘that two-way interactive television had been instituted in remote rural areas of Minnesota, Wisconsin, and Iowa—to solve the same problems we were facing. If it worked for them, why not for us? Thus began 18 months of intensive investigation, consulting, planning, more planning, training, and installation of equipment. Our intermediate school district served as the ‘nerve center’ for coordinating ideas, consultants, proposal writing, and personnel support for our...
newly-formed consortium called PACE—Providing Academics Cost Effectively.”

Hansen recalled, “We determined that if we could manage the funding, interactive TV could reduce the cost of course offerings even to our two larger districts, while making courses available to our several smaller schools. Project financing became a cooperative venture between the Michigan State Department of Education, Intermediate School District, local schools, and the TCI-Taft Cable Vision Company.

We selected two pilot schools—Cheboygan and Mackinaw City—to be operational in the first year (1986-1987). Initial consortium funds were channeled toward completion of the link between the two districts. The two schools each agreed to pay for necessary renovations and equipment for the two special classrooms. None of this would have been possible, however, without substantial funding from the Michigan Department of Education. Grants were made available during planning, building, and training/inservice stages …

Interactive television allows teachers and students in separate classrooms, often many miles apart, to see, hear, and talk to each other. This is accomplished through use of microwave cable and/or fiber optics which transmit video and audio signals between two or more locations. In our pilot case, signals from the two schools travel by cable to transmitting and receiving equipment located about one and one-half miles from each school. From there they are transmitted by microwave.

Each of the two classrooms is equipped with three TV cameras: one focused on the students, one focused on the teacher, and a self-focusing camera above the teacher’s desk. (This takes the place of a chalkboard or overhead projector). This camera also has a zoom feature which the teacher can cause to focus on small detail.

Six large monitors are located in each classroom (three at the front of the room for student viewing, and three at the back for teacher viewing). In addition, the teachers have three small monitor screens on their desks where they can see what each camera is filming: the remote class, their desk top (pad), and themselves. They control the displays on the monitors in each classroom with switches on the console. One monitor at each end of each classroom displays the remote class so that the groups can see each other. The second monitor focuses on the teachers, and the third on the desk pad. A tiny pressure zone microphone mounted in the center of the ceiling picks up voices of the students and permits class discussion as if they were in the same room. Additional room modifications include carpeting covering the floor and extending halfway up the walls for acoustical purposes, draperies to eliminate glare on TV monitors, new acoustical ceilings and lighting, and one-way windows which allow visitors to observe without disturbing the class.”

In his article, Hansen answers the questions, “How Is It Working?”

“With any new undertaking such as this, you expect to have problems—especially technical difficulties. So far, there have been very few. As one pilot school principal explains, ‘If one camera should become inoperative, it doesn’t shut the class down. We can operate with two, and of course, the technician at the intermediate school district is on call all the time.’ The equipment is tested by a teacher or principal prior to each class session. You may wonder how the technical operations affect the teacher. The German class teacher says matter-of-factly, ‘All you have to do is to remember to look in the right place and push the switches. Sound level control is important. If the equipment malfunctions, I call for help via the telephone in my room. It’s working better than I thought. If can do it, anybody can!’

Students seem to have acclimated easily too. We should remember, of course, that TV is the kids’ medium! In no time at all, they were carrying on before-and-after class discussions via the TV; and it’s commonplace for them to discuss weekend games, social activities, etc.

The teachers deserve much credit for helping the students adapt easily and feel comfortable with their ‘remote’ teacher and classmates. Early on, they arranged for their classes to meet face to face with get-acquainted pizza parties, joint class sessions, etc. The two teachers also often confer between classes via the interactive system.

School administrators find the economic advantages most welcome. ‘It is more economical to run,’ says one of the pilot school superintendents. ‘It actually costs less to set an interactive TV classroom than most vocational classrooms! The other superintendent appreciates the fact that “We can now justify a teacher for a position where there were too few pupils before.”

By combining classes, we have enough students to justify hiring a teacher.’ …The bottom line is that the kids are the winners!... We believe that bringing these opportunities within reach of four educational communities is providing cost effective instructional programming.”

Certainly Superintendent Hansen was on the “cutting edge” of technology when he implemented ITV as a delivery system for his district. Schools and universities all over the country soon implemented this technology as one way to meet the needs of students in distant areas, some in rural isolated areas and some in other towns and cities. Currently these students are on satellite systems as well as cable, the studios use computers and document loaders, as well as Smart Boards, to provide visual aids for learning. Teachers have become more sophisticated about effective delivery and about how to fix their own technical problems.
Only two years after the publication of Hansen’s article, *The Rural Educator* included an article entitled “Technology and Rural Education: The Case of Audio-Graphics Telecommunication” in the Spring 1989 issue. The authors were Patrick F. Galvin, a graduate student at Cornell University, and Robert Bruce, a Professor of Educational Technology at Cornell. This article is indicative of the interest during this era in using technology to improve instruction in rural schools. They describe a system developed by Dr. Freeman Van Wickler, Executive Officer for the Delaware-Chenango BOCES (Boards of Cooperative Educational Services) to test the capabilities of a relatively inexpensive, but promising, telecommunications technology known as Audio-graphics. The authors of this article describe Audio-graphics as “a telephone-based system, allowing two-way voice communication, which is enhanced with a computer network that exchanges graphics between broadcast points. This computer system is described as an ‘electronic blackboard’ by the company that developed the technology (Optel) and serves the same purpose as a conventional blackboard. While students at a distant school cannot see their teacher, they can see what is being written or drawn on the ‘blackboard’ just as if they were in the classroom” The authors’ study evaluated the merit and worth of such a system. “The evaluation was organized around two questions:

1. Does the Audio-graphics telecommunication equipment work well enough to enable teachers and students to function successfully in the classroom? and
2. Do the Audio-graphics tele-learning programs offer students educational opportunities which significantly add to their learning at school?

Underlying these evaluation questions is an assumption that people—not technology—produced learning. It is true that tele-learning is a technical innovation and it attracts considerable attention as a technology. But focusing on the technical abilities of telecommunications merely emulate a live classroom ignores and important point about the meaning of an exchange; to wit, a ‘live’ classroom can be one of the least interactive environments known to mankind. Consequently, this study focused on the meaning and value of the telecommunication classroom for students, teachers, and administrators.

Judgments about the meaning and value of a program delivered via the Audio-graphics technology will depend upon who is asked. For example, school administrators, primarily concerned about expanding curricular opportunities, may find such an arrangement both meritorious and valuable. Teachers, on the other hand, may find it difficult to use the technology in the classroom, while the students identify the work of the program in ways its planners had not guessed.

The research design relied on a purposive sampling strategy, collecting data from four very different sites. Case studies were written, using the participant’s words and language to describe actual events, for each of the four sites. These stories were intended to give the reader a sense of the experience teachers and students had in their Audio-graphic tele-learning classrooms. Next, the four Audio-graphic programs were each analyzed in terms of how successfully they worked as an instructional medium. These judgments were made using a specific criteria which emerged, in part, from the analysis of the interviews with administrators, teachers, and students. Finally an analysis across the four cases was conducted to reach general conclusions about the Audio-graphic technology as an educational medium.”

The researchers’ findings are summarized by them as follows:

“The studies in this evaluation indicated that Audio-graphics holds great potential for teachers and students to positively affect educational purposes. Indeed, given how differently each of the tele-learning programs was organized—each program differed in content, teaching style, student participation, and number of schools involved—it seems reasonable to conclude that the Audio-graphics technology has a certain robustness, if you will, in its utility…. The Audio-graphics tele-learning programs have offered students important educational and social opportunities which would not have otherwise been available to them.”

Some eighteen years after the publication of this article in 1989, we can agree with the conclusions and look how much more these are true with the advanced technology of today.

In the Winter edition of 2000-2001 Martha Venn, R. Larry Moore, and Philip L. Gunter of Valdosta State University wrote about their experiences using audio-video conferencing to observe field-based practices of rural teachers. The eleven years after the use of Audio-graphics brought even more sophisticated technology into use by universities as well as into public schools. These authors begin their article by quoting, “Distance learning technologies (e.g. interactive t. v., email, video/audio desktop conferencing) have been embraced by higher educations whose service population tends to be rural. (Collins, Hemmeter, Shuster, & Stevens, 1996. The use of interactive distance education technology, web-based courses, and video conferencing is seen as an important avenue to utilize in order to address preservice teacher preparation and professional development (e. g. graduate students) opportunities for rural communities in Georgia."

This rural institution of 10,000 students that serves a large rural geographic area found the following: “While training preservice teachers and teachers to become collaborative problem-solvers, particularly during field-based experiences, the geographic distance between the student and the university supervisor often negatively impacts the supervision/mentoring process. Specifically, the
challenges facing preservice teachers in classrooms include
the lack of: (1) intensive supervision and mentoring by
experienced teachers, (2) resources to collaborate with
university supervisors, and (3) professional support for
implementing “best practices” in the classroom. In turn, the
challenges facing faculty supervisors are the inability to: (1)
provide intensive supervision and feedback on a frequent
basis, (2) monitor preservice teachers’ progress and
effectively guide problem-solving and reflective activities,
and (3) support the preservice teachers in sites in school
systems that may lack the knowledge/skills to implement
“best practices.”

“To address these challenges regarding preservice
teacher and university supervisor interaction and
collaboration, faculty members within the Department of
Special Education and Communication Disorders at VSU
have worked to organize and implement audio/video
desktop observation and conferencing practices to increase
the frequency and quality of collaboration between the two.
To do this, CU-SeeMe software has been used. This
software was originally developed at Cornell University but
is now commercially available through the White Pines
Corporation.”

This program was used to observe teachers’ field-based
practices in rural Camden County, Georgia, St. Mary’s
School District. The practicum teacher was provided with a
Compaq Armada 1571 Pentium II with MMX at 200 MHZ
with 32 MB Ram laptop computer.

A Nagotech Conference Card (Video and Audio
PCMCIA Card) was installed in the computer. A Nogatech
portable camera was included in the price of $393. The
software cost $600 for permission to have it installed on 10
machines. The total cost for the portable set-up was $2,338,
supported by a grant from the state of Georgia for infusing
technology into teacher training programs.

“When a conference or observation was desired (these
were scheduled by telephone ore-mail), the teacher simply
turned on the computer, logged on to the CU-SeeMe
network, and connected with the reflector at VSU with a
manual dial option that was programmed into the computer
prior to delivery at the school. This arrangement allowed
the teacher to request assistance at any time. Additionally, it
allowed observations to occur more frequently than the
minimum required.”

At the time this article was written, Valdosta State
University was committed to the expansion of this
technology for teacher preparation supervisory purposes.
There were plans to install technology to handle 25 audio/
video observations/conference simultaneously.

Although as we review these previously published
articles, the technology seems somewhat antiquated, we
must remember that at the time this was the state-of-the-art
and was an important factor in saving rural schools in that
through the technology they could meet state standards and
curriculum requirements, their teachers were better trained,
and they were no longer isolated. The following two
articles by current authors reiterates the progress we have
made in the use of this innovative medium. First is an
article by R. Stewart Mayers of Southeast Oklahoma State
University and Michael Desiderio of Texas A&M at
Kingsville entitled “Technology Empowered Transitions:
Curriculum, Teachers’ Practices, and...Change?” The
authors describe the impact technology has made on today’s
faculty and students and their access to meeting state
standards.

The second article by Regi Wieland, Kathy Dale, Robert
Moody, and Mike Slatterly of Fort Hays State University in
Kansas entitled “The Essential Role of Integrating
Technology, Content, and Skills Into Building Principal
Preparation Programs” illustrates how graduate programs
can be expanded to meet the ongoing need for preparation
of rural administrators, as well as of those in larger districts.

Little did those first authors in The Rural Educator
realize the impact technology would have on the delivery of
information to those rural students and their prospective
teachers in the next thirty years. Perhaps, like Bruce Barker,
they envisioned it becoming an integral part of our
education life, but perhaps not to the extent it is today in
2007.

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