CABLE TELEVISION:
USES IN EDUCATION

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RAND REPORTS ON CABLE TELEVISION PREPARED FOR THE NATIONAL SCIENCE FOUNDATION

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R-1139-NSF, Citizen Participation After the Franchise, by Monroe E. Price and Michael Botein.
R-1140-NSF, Applications for Municipal Services, by Robert K. Yin.
R-1143-NSF, Uses in Education, by Polly Carpenter.

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CABLE TELEVISION RESEARCH AT RAND

The Rand Corporation began its research on cable television issues in 1969, under grants from The Ford Foundation and The John and Mary R. Markle Foundation. The central interest at that time was federal regulatory policy, still in its formative stages. Rand published more than a dozen reports related to that subject over the next three years. This phase of Rand’s concern ended in February 1972 when the Federal Communications Commission issued its Cable Television Report and Order.

The Report and Order marked the end of a virtual freeze on cable development persisting since 1966 in the major metropolitan areas. It asserted the FCC’s authority to regulate cable development, laid down a number of firm requirements and restrictions, and at the same time permitted considerable latitude to communities in drawing up the terms of their franchises. It expressly encouraged communities to innovate, while reserving the authority to approve or disapprove many of their proposed actions.

The major decisions to be made next, and therefore the major focus of new cable research, will be on the local level. These decisions will be crucially important because cable television is no longer a modest technique for improving rural television reception. It is on the brink of turning into a genuine urban communication system, with profound implications for our entire society. Most important, cable systems in the major markets are yet to be built, and there is great pressure on the cities to start issuing franchises prematurely. The decisions shortly to be made will reverberate through the 1980s.

Aware of the importance of these events, the National Science Foundation asked Rand in December 1971 to compile a cable handbook for local decisionmaking. The Handbook, now completed, presents basic information about cable television and outlines the issues a community will face.1 It is addressed to citizen group members, local government officials, and other people concerned with the development of cable television in their communities.

Cable television embraces such a host of political, social, economic, legal, and technological issues that any single book on the subject is in danger of being shallow at best and pretentious at worst. Consequently, the Handbook is intended as an introduction and guide to these issues, which are explored separately in the series of companion reports listed inside the front cover.

1 Baer, Cable Television: A Handbook for Decisionmaking.
We gratefully acknowledge the support of The John and Mary R. Markle Foundation, whose three-year grant to The Rand Corporation for communications policy studies facilitated completion of this report on the uses of cable in education.
PREFACE

The present report is the first volume of a two-part study on the use of cable television in education. It deals with the past history of television in education and the special ways in which cable TV can serve the education community and is directed to readers with a general interest in the subject. The companion piece, A Guide for Education Planners, R-1144-NSF, has been prepared for those charged with planning, developing, and operating an education project using cable TV; it is the more technical of the two reports.

The FCC rules require that all new cable systems in the top 100 markets reserve three channels for local uses, known as "access channels": one each for education, local government, and public access. The education and government channels must be made available free of charge for a developmental period of at least five years. Systems in the top 100 markets established before March 31, 1972, will have at most five years to comply with requirements for access channels.

Thus far, education channels have been little used. Except for a few universities, most school systems still lack the required skills, funds, and equipment, or are simply unaware of the possibilities. This state of affairs must be altered drastically and quickly, lest the rapid development of entertainment and other commercial services foreclose promising uses of cable in education. Hopefully, this report will render such a foreclosure less likely by making the general reader and the education community more aware of the services now available.
SUMMARY

Since the early 1950s, television has offered the education community\(^1\) means for solving or alleviating a number of its problems. A few individuals and school systems have realized these possibilities and taken advantage of them; they provide our models for the future applications of television opened up by the advent of cable TV. But they have been too few. By and large, the education community has ignored television except as a superficial token of its support of innovation.

This neglect is part and parcel of a pervasive problem: the education community’s lack of interest in or outright resistance to major change. Within the system, traditional classroom practice is accepted as the core of the educational process almost without question. Although outsiders have castigated education for years as a cottage industry and urged its change from a labor-intensive to a capital intensive enterprise, educators remain happy to support whatever is added to their habitual ways of operating and continue to resist change agents that replace humans. For instance, budget deficits are often answered by irrational across-the-board cuts in operations, rather than by percentage shifts in resource allocations. Television can make only peripheral contributions under such a modus operandi.

Because of this history, the Federal Communications Commission has adopted a wait-and-see attitude toward the education community’s requests for a large measure of preferential treatment in the operations of new cable TV systems. The FCC’s recent regulations give the education community an opportunity to prove its intention to take advantage of cable’s potentialities. But the rules do not dedicate large numbers of channels to education or lock cable operators into other highly preferential arrangements that the education community may let lie fallow.

We believe the FCC and most cable TV operators would welcome greater use of television in education. But this use must contribute significantly to improving education; a few sets in classrooms will not turn the trick. Effective change must be instituted at the local level, where incentives are needed to reward those who take on new roles in terms of their own values.

APPLICATIONS OF CABLE TV

Television can contribute to education in four ways:

\(^1\) We shall refer to people concerned with education, for brevity, as the education community.
• By increasing the physical accessibility of education.
• By providing services to education that cannot readily be provided in other ways.
• By improving the quality of education.
• By decreasing the unit cost of education.

Television is more appropriate for teaching cognitive facts and skills than it is for teaching motor or psychomotor skills. Even with the latter, however, television can be useful for demonstrations and for providing cognitive support for student performance. More important, a wide variety of audiovisual experiences can be provided only through the media of television or film; many others would be so costly to supply by direct experience as to be inaccessible.

Broadcast television has been criticized as a mass medium for passive viewing. This criticism is damaging to its use in education, with its current emphasis on individualized instruction and active participation by the student. But Sesame Street has shown that imaginative programming can encourage student involvement with broadcast television. And, because it is economically feasible to direct cable television programming to specialized audiences, cable TV can be made even more directly responsive to audience needs and interests.

Subjects formerly thought to be of too limited interest for Instructional Television (ITV) may now be provided over the cable. Therefore, even though cable TV's touted two-way capability may be a number of years away, communication links (such as the telephone) from the classroom or student to the point of program origination now make it possible for the studio producer to change the program during its presentation to suit viewer needs. Efforts are currently under way to develop hardware and software that will permit cable TV systems to provide even more fully adaptive programming.

Cable TV is feasible if the cable system reaches the majority of the target audience or can easily be adapted to do so. The effective reach of a cable system is about 5 miles in radius; beyond that, other or additional means of transmission are needed. The reach also depends on whether the majority of the target audience will be on the cable. If the target audience already exists in a school or other education institution, this becomes a question of the franchise provisions for connecting the schools to the cable. If the target audience is home-based, the demography of the cable TV subscribers becomes important, since people at lower income levels can't afford cable service. Intermediate cases are also possible in which the education agency provides special facilities or arrangements for reception of cable TV transmissions.

Whether cable TV should serve in a particular situation will depend on whether its use satisfies two criteria:

• It is essential to the school program.
• It cannot be done better (if at all) in some other way.

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2 These two principles are adapted from a paper submitted to the Commission on Instructional Technology by the Research and Development Office of the National Association of Education Broadcasters. This paper referred to two discriminating tests: "(1) The teaching-learning task involved must be extensively valuable, even critical, to contemporary educational operations; (2) the task could not be performed as well—if at all—without television mediation." Carnegie Commission on Higher Education, The Fourth Revolution—Instructional Technology in Higher Education.
PROGRAMMING

In almost all applications of television to education, the hardest task is to find or produce television programming of acceptable quality. At present there is a growing stockpile of high-quality programming for general supplementary or enrichment purposes, but it is difficult for a local school system to obtain programming tailored to local needs. To meet local needs, it may be best to share resources for program origination with other interested groups.

For example, one may

- Use the cable operator's studio and equipment.
- Form a consortium of education groups.
- Use existing school facilities.

To help educators find out whether programming exists that will meet specific needs, an objective rating board, unaffiliated with any group with vested interest, should be established to search for, test, and rate programming. The establishment of such a board is an appropriate task for the new National Institute of Education.

There are other ways to entice viewers than producing or acquiring programming of high production quality. One is to get them personally involved. Cable TV can play a role here because the relatively large number of channels makes it possible to focus on a greater diversity of needs and interests and to make programming more directly responsive to the viewer. The privacy of cable also makes it possible to transmit programming (such as medical instruction) that cannot be broadcast. And the eventual two-way capability of cable will open up many possibilities for on-line adaptive programming.

UTILIZATION\(^3\)

Whatever approach is taken, cable TV’s effectiveness in education can be assured only if people strive to see that it is utilized. We recommend that school systems shift the bulk of their resources for TV from local program production to the four basic activities that ensure the utilization of TV programs:

- Conducting concurrent instructional activities that integrate the televised programming into the school curriculum.
- Monitoring the audience (both students and teachers) to determine the effectiveness of the programming.
- Establishing and maintaining adequate facilities for distribution of TV programming.
- Publicizing the program to the intended audience (for out-of-school programs).

Careful attention in two areas will promote the utilization of televised programming:

\(^3\) See the Glossary for a definition of how we have used this term.
1. Utilization activities should be planned systematically from the outset.
2. The needs, interests, and wishes of the intended audience should be determined as definitively as possible and consulted from the beginning and throughout the life of the program.

THE EDUCATOR'S STAKE IN THE CABLE TV FRANCHISE

The FCC has ruled that all cable TV systems in the 100 largest television markets franchised after March 31, 1972, must supply one channel without charge for educational purposes. Previously franchised systems must do so before March 31, 1977. The education channel should be allocated to those who can make best use of it in terms of need and cost. Allocation decisions should be made by a coalition or consortium of local education agencies to ensure that the greatest needs are met.

The cable operator is required to make additional channels available for lease as needed. Additional channels will be needed for particular applications. For example, an entire elementary curriculum might require four channels, a secondary curriculum more than ten. These numbers are highly contingent on the extent to which the classroom teacher can adapt his schedule to the schedule of TV transmissions.

The new FCC rules specifically enjoin the franchisor from requiring cable operators to give preferential treatment to education agencies. On the other hand, the FCC has requested that special showings be made in support of exceptions to these rules. Exceptions are likely to be approved if the education agency can make a convincing case that (1) its requests will result in a significant use of television in education and (2) the cable operator will not be unduly burdened financially.

If a franchise has not yet been granted or is up for renewal, members of the local education community can influence the negotiations in their favor. They should consider

1. Forming consortia with other users or using interconnected systems to share the costs of programming, computer terminals, and the like.

2. Ensuring that the franchise provides for
   - The administration of the free education channel mandated by the FCC.
   - Access to additional channels for lease and reasonable leasing rates.
   - Connection of school buildings to regular cable service and reasonable installation and monthly charges for that service.
   - Charges for initial installation of multiple connections within school buildings and additional service charges for buildings with multiple connections.
   - Providing or sharing facilities and equipment for production and transmission of educational programming.
   - An early date for operational two-way capacity.
   - Incorporation of new technical standards when they are set by governmental agencies.
A FINAL WORD

If television is to make significant contributions to education, the education community must change its idea that the process of education consists primarily of communications from teachers to their students. Not only classroom teachers but administrators, curriculum supervisors, and budgeteers must learn or become aware of new ways of operating and must be given effective incentives for promoting needed changes. Other community leaders must also combat stereotypes that hamper development, such as the misconceptions that one stops learning after youth is over, that one needs a teacher to learn, or that entertaining teaching is merely entertainment. Fortunately, because good programs sell themselves, a snowball effect may bring realization of much of the potential of television for education.
ACKNOWLEDGMENTS

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Chapter 1

INTRODUCTION

The past few years have seen the rapid growth of cable television throughout the United States, both in terms of the number of systems and in terms of the development of cable technology. With this growth has come an increasing awareness of the potential of cable TV for providing more than improved quality of signal in fringe areas for broadcast TV. Some people have gone so far as to predict a revolution in our way of life brought about by the many services that conceivably may be provided over cable, services that might greatly diminish needs for transportation. For example, one might "go to the office" or "go marketing" via cable.

But reality has been far different. As of March 13, 1971, only 18 percent of the operating cable TV systems in the United States originated programming locally that went beyond purely automatic services (for example, weather reports) or advertising.¹ Why? Federal Communications Commission (FCC) regulations, market uncertainties, and the high cost of providing local services have all impeded development.

Cable TV has the capacity to provide better, more, and new telecommunication services. Recognizing this potential, in 1972 the FCC issued a set of regulations for installing and operating cable TV systems.² These rulings have given rise to increased interest in the use of cable TV for public services.

PURPOSE AND PLAN OF THIS REPORT

One purpose of this report is to discuss the implications of the FCC regulations for those who will be concerned with the use of cable TV in education. But a more important objective is to stimulate the interest of the education community by acquainting them with the potential contributions of cable TV to education. This is the text of Chap. 2, "The Potential of Cable TV for Education." Our aim is to increase the involvement of educators in current cable TV planning and franchise negotia-

tation activities to ensure that the contributions of cable are well exploited for education and not lost to commercial interests.

A basic stumbling block to the use of technology in education is the education community's lack of interest or ignorance. Working within institutions that define the process of education rigidly in terms of teachers, classes, and classrooms, educators have had little incentive to become involved in planning and implementing educational programs that make significant use of technology. And the materials and other features that are required to make the technology useful, such as instructional television programming of high quality, have gone by the board for lack of support. We discuss such difficulties in Chap. 3, "Barriers to the Use of Television in Education," both to help the reader steer clear of pits into which television has fallen in the past and to convince him of the necessity for his involvement and commitment.

This involvement should begin in the early stages of negotiations for award of the cable TV franchise. It is important that members of the education community play an active role in these proceedings, as many decisions made at this point can bear strongly on the future usefulness of the cable TV system to education. Possible roles for educators in the franchise negotiations and major franchise provisions they should consider are described in Chap. 4, "The Educator's Stake in the Cable TV Franchise."

WHAT IS CABLE TELEVISION?

Cable television is only one of several ways to distribute audiovisual information. Its essential features include a head-end\(^4\) for amplifying and processing signals for cable transmission, coaxial cables to carry the signals to subscribers, terminal equipment connected to subscribers' TV receivers, and a group of antennas for receiving broadcast television signals for retransmission over the cable (see Fig. 1). Studios for local program production also can be connected to the head-end. Although the cable may be buried underground, it is usually strung from utility poles.

Other transmission media of particular importance to education are the familiar broadcast TV, closed-circuit TV (CCTV), and instructional television fixed service (ITFS). In the companion piece to this one,\(^*\) we discuss the similarities and differences among these media and cable TV and point out situations in which one medium or the other would be more practical. At this point it will suffice to say that in many instances cable TV will offer multiple channels and privacy at a lower cost than the other transmission media (broadcast TV cannot, of course, offer multiple channels). Cable TV systems also have the potential to provide two-way service; most will not, however, for the next ten years.

\(^4\) See the Glossary for definitions of technical terms.
\(^*\) Carpenter, *Cable Television: A Guide for Education Planners*, R-1144-NSF.
Fig. 1—A comparison of broadcast TV and cable TV
Chapter 2

THE POTENTIAL OF CABLE TV FOR EDUCATION

We will first discuss general ways in which cable television can contribute to education, illustrating the discussion with whatever real-life applications exist and showing how the special features of cable could help television make even more effective contributions. Second, we will treat in detail the roles that cable television can play in instruction by describing the subject matter and teaching methods that are (and are not) suited to the medium.

The education community must consider cable TV as a means to attaining its goals—not as an end in itself. If a school system adds cable TV facilities to its inventory only to demonstrate its commitment to progressiveness or innovation, chances are very high that all that will be accomplished is a rise in the cost of running the school; the cable TV system will be just another dispensable frill. To ensure that the cable system is being used as a means to desirable ends, the contribution of cable TV should be essential to the school program and not performed as well—if at all—in some other way.

GENERAL CONTRIBUTIONS

We shall discuss four significant uses of cable TV in education:

- Making education physically more accessible to students.
- Providing educational services that cannot readily be provided by other means.
- Improving the quality of education.
- Decreasing the unit cost of education.

Examples of each use will be drawn from recent experiences with educational and instructional television (ETV and ITV). ETV is a broad term that encompasses all types of educational programming, including information, instruction, culture, public affairs, and entertainment. ITV, on the other hand, refers to educational efforts using television "which have as their purposes the production, origination, and distribution of instructional content for people to learn...". Instructional television
is closely related to the work of organized formal educational institutions." Public television (PTV) is that portion of ETV that is directed to the general community.\(^1\)

ITV may use any expedient combination of broadcast TV, ITFS, closed-circuit TV, or cable TV; PTV is usually carried over broadcast or cable TV. Because cable TV has appeared relatively recently in most communities, however, most of the examples of its potential use will be drawn from systems using some combination of the other transmission media. This does not make these examples any less relevant in considering the use of cable TV, except for systems covering a large geographic area. In that case, cable TV might not be available throughout the area of interest, and other transmission media might be needed in addition to cable TV.

Whether it is a practical medium will depend on local circumstances. Of course, few examples demonstrate the instructional potential of the multichannel and two-way applications made possible by cable TV. In these instances, hypothetical examples must be provided.

Improved Accessibility

A cable TV system can provide links between schools and homes. One apparent advantage, on first thought, is that students who must be absent because of illness or handicap can join their classmates at school via cable. In fact, this has been done in several systems. In Overland Park, Kansas, a student confined to his home after an operation took a course in American history over a special cable setup. He responded to his teacher's questions by using a keyboard attached to the set, and she was able to see him through a camera at his bedside.\(^2\)

Consider, however, what would be required if the cable system were to be put to such a use on a broad basis. Assume that the average number of classrooms in a school is 22, the average number of students in a classroom is 25, and the average absence rate is 10 percent. Assume further that each teacher is free to conduct his classes as he thinks best, within certain broad guidelines. This means that the work of each class is different. If only one channel is to be used from the school to the homes of its students, an average of less than three students (10 percent of 25) will be able to keep up with their class via cable. (Obviously, on the average, 22 channels would be needed to provide the service to all absent students.) This is clearly an uneconomic use of the cable TV resource.

A less costly application would be to provide programs of general enrichment or review for homebound students. These could be designed for the average student at a given grade level and could be accompanied by assignments for student work that would be checked periodically or upon the student's return to class.

It has also been suggested that review and remedial materials could be presented to home viewers after class hours. Unless ITV becomes much more attractive to students, this seems unlikely to be successful below the college level; few students will be motivated strongly enough to continue schoolwork after the regular school day without a teacher's supervision. With the exception of the dedicated student, home viewers must be enticed into viewing by captivating or engrossing program-

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ming. In addition, it may not be desirable to extend the school day for the elementary or secondary school student.

Of course, the school system may already be geared to the use of television for instruction to the extent that all students in a given grade and subject view the same program at the same time. This is the case in the Hagerstown system,\(^4\) which will be described below. In this event, the total number of channels needed for at-home instruction would be the same as the number used in the system. In Hagerstown, six channels are used to serve grades 1 through 12.

The large-area coverage of broadcast TV soon encouraged its use for students who found it difficult to attend school regularly. Some of these students, such as women with small children, are homebound; others are working during the normal school day and are too far from technical schools or other institutions to attend night classes. There is also convincing evidence that large numbers of adults would make use of television for continuing education whether or not these programs led to course credits in a formal institution.

An outstanding example is the Chicago TV College which, since it was established in 1956, had provided courses for credit to over 98,000 students by the fall of 1970. Data indicate that "there are about 250,000 regular viewers each semester, and perhaps 500,000 frequent, but not daily, viewers of each semester's courses."\(^5\)

Several networks have been established to link graduate students at geographically dispersed points, such as colleges and industrial firms, with graduate schools at institutions of higher education. One of these is the TAGER\(^6\) network in Texas, which links program-originating facilities at Southern Methodist University with 9 institutions of higher education and 11 industrial plants in the Dallas-Fort Worth region (see Fig. 2). Similar systems are now operating in California and Oklahoma. Despite the relatively small number of students who participate in such systems (approximately 2000 students per semester in the Texas system),\(^7\) the high cost per student is justified because conventional graduate education would cost at least this much even if the students had ready access to formal classrooms.

A single cable TV system would be inappropriate as a transmission medium for these networks because of the relatively large geographic areas they cover. According to Feldman,\(^8\) a single CATV system that covers an area of much more than 5 to 6 miles in radius from the head-end suffers signal degradation at the outer periphery. Cable TV could, however, be used for local distribution within such a system. For example, the cable TV systems being planned in 1971 for Dallas and Fort Worth\(^9\) could be used to distribute the Southern Methodist programs to residents as well as to industries in those cities. Alternatively, videotapes and films produced by Southern Methodist could be distributed by mail to the program-originating facilities of these cable TV systems, saving channel space on the larger network for the graduate programs with small audiences in each city. Of course, if distances are small or if sufficient subscribers exist to support several cable TV

\(^{4}\) Wade, "Hagerstown: A Pioneer in Closed-Circuit Televised Instruction."

\(^{5}\) Bretz, Three Models for Home-Based Instructional Systems Using Television.

\(^{6}\) The Association for Graduate Education and Research.

\(^{7}\) TAGER, Annual Report, 1969-70.

\(^{8}\) "System Designs for the Dayton Metropolitan Areas."

The circles symbolize the omnidirectional microwave transmission which is available in Dallas and Fort Worth. All other transmission is via microwave beams.

Fig. 2—The TAGER television network
systems linked together, as proposed for Dayton, Ohio, cable TV could be used as the main transmission medium.

England’s Open University and Germany’s Telekolleg are other examples of successful ventures in using TV (along with other offerings) to make higher education more accessible to people who find it difficult to attend established institutions. Unlike the preceding examples, however, both of the European ventures were undertaken wholly independently of established schools, although each draws heavily on talent within the existing academic structure and supplies credits to students who complete the course work successfully and pass the examinations.

Despite the ubiquitous U.S. system of elementary and secondary education that brings schooling to nearly all below the age of 18, there are probably a large number of older people who find it difficult to attend regular schools and who would take advantage of more convenient opportunities to further their education. The responses to Telekolleg and the Open University in Europe, and the Chicago TV College and Sunrise Semester in New York, all suggest that there are many adults who would participate in TV-based programs in secondary and higher education. The 1970 census, for example, reports that nearly 48 percent of the population over 25 have not completed high school. In 30 selected “Standard Metropolitan Statistical Areas,” over 55 percent of the nonwhite population do not have a high school diploma.11

Also, it is estimated that 20 million adults are functionally illiterate, many because their native tongue is not English. These people either do not have a convenient school in which to learn English or are cowed by formal educational institutions. But there are enough of these people concentrated in large cities that TV programs for them would be economically feasible. For example, of the 1.5 million persons in low-income areas in New York City, 331,000 are foreign-born, most of them of Puerto Rican origin. (In the same areas, more than 65 percent of the population have not completed high school.)12

Unfortunately, much of the audience with the greatest need for this type of programming will not be on a cable system, as people in the lower income levels usually can’t afford the monthly fee for cable service. However, it is possible to provide the target audience with cable service as part of the project. An intermediate solution is to provide neighborhood viewing centers connected to the cable system.14 A concomitant advantage of this solution is that it supplies the audience with the social stimulus of its peers, along with the televised programming.

A crippling problem with many programs for adult education is that they are consigned to the very early morning hours. Sunrise Semester’s name aptly describes the situation. Although many people may be sufficiently motivated to view educational programs at these hours, it is likely that more convenient viewing times would greatly increase the audience. By alleviating present restrictions on educational channels, cable TV could reach this large audience.

As suggested earlier, there are undoubtedly large numbers of adults who would watch educational programs that are not for credit. Despite the complications of

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10 Feldman, "System Designs."
12 "Interview with Dr. Donald G. Emery, Director National Reading Center," Reading Newsreport.
13 Employment Profiles of Selected Low-Income Areas.
attending class at night, the University of California at Los Angeles Extension
typically enrolls many students not seeking formal credit in extension courses. For
example, over half of the students in an extension course in anthropology in the
winter of 1971 were not for credit. And, despite its uncomfortable viewing hour,
Sunrise Semester lures an estimated 1.25 million students from their beds; most of
these students do not take the courses for credit. 15

People who take advantage of such learning experiences have passed the age at
which they feel the need to participate in educational rites of passage; they are
involved with learning for the contributions it can make to their enjoyment of life
and self-development. They may be older people whose primary careers have ended,
women whose children have left home, adults seeking to brush up on salable skills,
or adults wishing to participate in intellectual, political, and cultural activities. The
potential population of such people is very large, numbering in the tens of millions.
Traditional schools, however, are youth- and degree-oriented, and few schools have
attacked the tasks of providing worthwhile educational experiences for the older
population. The challenge will be to devise educational programs that will have a
general appeal to these people. On the other hand, removal of requirements for
accreditation will allow producers of these programs the freedom to take advantage
of the television medium to devise programs that are both captivating and intellectu-
ally stimulating.

We have been discussing audiences of adults whose primary educational needs
are shared by large numbers of people—people wanting high school equivalency
courses, literacy training, or courses of general cultural, social, or economic interest.
Because broadcast TV must appeal to large audiences to be economically attractive,
it has been limited in its ability to serve specific needs for vocational or professional
education. Only where the cost of conventional instruction is high, as in graduate
engineering education, medical education, or military training, has television
played an important role. The multichannel capacity of cable, however, opens the
possibility that it might help in meeting needs for specialized vocational and profes-
sional education in various situations.

It might be argued that existing institutions for vocational and professional
education can take care of these needs, that anyone really wanting such an educa-
tion will find a way to get it from the current offerings. Two facts suggest that this
may be a limited view. Foremost is the lack of people with middle skills (skills
requiring some education or training but not formal degrees). For example, in the
Akron area, there are chronic shortages of auto body repairmen, draftsmen, regist-
ered nurses, production machine operators, and tool and die makers. 16 Second is the
expressed need for additional education or training in certain segments of the
population. Of the 1.2 million adults in low-income areas in New York City, over 12
percent stated that they were hampered in working by lack of skill, experience, or
education. Two-thirds of these are employed, suggesting that work experience may
sharpen a person’s awareness of education and training needs. Currently, the Office
of Education, in one of its programs in Career Education, is experimenting with the
possibility that television and other media can be used to foster such an awareness

15 Efron, "Peter Chelkowski, Ph.D., I Love You."
16 Ohio Bureau of Employment Services, Occupational Survey, 1970-71, Akron Metropolitan Area. The
total number of positions in the middle-skill areas was around 20,000.
in the homebound population.\textsuperscript{17} Beginning in the fall of 1972 in Providence, Rhode Island, a concerted campaign was conducted through the mass media to bring the unemployed and misemployed to career counseling services offered by the Educational Development Center.

\textbf{Added Services}

Probably the best known examples of the ability of television to add significantly to the education provided by the schools are Sesame Street and the Electric Company. Sesame Street is viewed by surprisingly large numbers of children of preschool age and in the first grade. In 1970, the number of viewers ranged from a low of 32 percent of the preschoolers in Washington, D.C., to a high of 100 percent in Boston. A Nielsen survey from November 1969 to March 1970 estimated the average audience for Sesame Street at 1.1 to 2.4 million.\textsuperscript{18} By appealing to such a large audience, the producers of Sesame Street have been able to bring large resources to bear on a pervasive educational problem—the teaching of basic skills. The $600,000 that went into research and the $24,000 per hour for production\textsuperscript{19} resulted in programs with high student (and adult) appeal and teaching effectiveness. Some schools now form two classes for students entering the first grade—one for students who have watched Sesame Street and one for those who have not. Similarly, the Electric Company is making strides to solve the problems of the nonreader in schools, where the teaching of reading nominally stops above the lower primary grades.

Less well known than Sesame Street is the Home Oriented Preschool Education (HOPE) program of the Appalachia Educational Laboratory in Charleston, West Virginia. HOPE combines daily television lessons, weekly home visits by paraprofessionals, and weekly group sessions to educate the otherwise isolated preschooler in rural areas of Appalachia. Children and parents are reported to participate actively in the program; the National Center for Education Communications has selected HOPE as one of ten most innovative programs of recent years.\textsuperscript{20} If successful, HOPE may provide a model for preschool education for which cable TV is particularly appropriate.

By far, the bulk of ITV is devoted to supplementing the regular curriculum with materials that would be difficult for the classroom teacher to acquire or devise. Because of the supplementary nature of these programs, their use is left to the discretion of the classroom teacher, and often little or no preparatory or follow-up activity is prescribed. This probably explains the low usage of ITV; in 1970, 4590 hours\textsuperscript{21} (at most) of ITV were broadcast during a week in March throughout the whole United States. Other figures suggest that 12,000 school districts could have used ITV broadcasts in 1970; a utilization rate of only one hour per district per week would more than double the amount of ITV programming provided. Of course,

\textsuperscript{17} Career Education Research and Development Program.
\textsuperscript{18} Samuels, The First Year of Sesame Street.
\textsuperscript{19} Connell, "How Sesame Street Raised and Spent Eight Million Dollars."
\textsuperscript{20} "Experts Praise AEL's Home-Oriented Preschool Program."
\textsuperscript{21} This figure was derived from data provided in Rockman, One Week of Educational Television. I have adjusted the data upward to account for stations and school-owned systems that failed to reply to the questionnaire.
several school districts may use the same program simultaneously; this practice is not common, however. The low utilization rate is not surprising when we note that of the schools having TV sets, 52 percent have less than one for every five classrooms.\textsuperscript{12}

In some states, statewide networks have been set up to provide television to the schools. One of these is KET, Kentucky Educational Television, serving the length and breadth of Kentucky from Lexington. The network is laid out in five divisions, comprising 13 educational TV stations linked by closed and broadcast circuits. Programs reach 325,000 students in 175 of Kentucky's 195 school districts. All five divisions currently carry the same programming, but it is planned to tailor programming to interests in each region when program material becomes available.

The objectives of KET are to

(1) Improve education in Kentucky classrooms; (2) make teachers more effective without working them harder; (3) reach every schoolchild in the state; (4) enrich the community around each school; (5) supplement college and university instruction; and (6) help state agencies serve Kentuckians.\textsuperscript{13}

In spite of the supplementary nature of most uses of television in the schools, some of these applications have been successful, when measured by teacher demand. An example was the Ottawa cable TV system for televising films and videotapes chosen by the classroom teachers. The system used 12 channels to service 130 learning areas in two primary schools, one junior high school and one high school. The schools were connected to a library of 2600 videotapes and films, selected by a committee of teachers.

The typical terminal had a TV receiver and a telephone with a direct link to the library. Each receiving location was also equipped with a cross-referenced catalog of the contents of the library, to inform users of its contents. Having decided what program he wanted to view, the user called the library and gave his program request to the librarian. The librarian allocated the channel on which the program would be shown and gave a time of transmission. Transmission normally began within 60 seconds of the receipt of a request.\textsuperscript{14} In this system, the television receiver played the role of a movie projector or videotape player in the classroom, thereby alleviating problems of logistics and equipment unreliability that usually deter teachers from greater use of films and videotapes.

However, in an evaluation of the Ottawa system, the Ontario Institute for Studies in Education determined that such a system is unlikely to do much more than double the average student's exposure to films and television. Furthermore, [it] will be used predominantly for enrichment.

Hence,

It does not seem worthwhile to add at least 2 percent to a school board's annual budget until the expenditure can result in some significant impact

\textsuperscript{12} See the Appendix.

\textsuperscript{13} Belt, "Education in Kentucky—By Television."

\textsuperscript{14} Billowes, "On-Demand Educational Television Program Retrieval System for Schools."
on the teaching and learning tasks to which schools are particularly suited.25

The public schools of Washington County in Maryland have been using a closed-circuit TV system as an integral part of instruction since 1956. This system (usually referred to as the Hagerstown system) has made it possible for pupils: (a) to take, instead of extremely limited amounts of elementary-school science and one-year science courses in high school, a sequence of science courses that extends from grades 1 to 12; (b) to have special television instruction by experts in art and music; (c) to take a modern-language course beginning in grade 3; and to take an advanced mathematics course in high school that covers calculus and analytics.26

Because special skills are called for, these services would have been too expensive to be provided by classroom teachers. Thus, the Washington County students had a much richer educational experience than they would have had without television. The Hagerstown experience might well point the direction to maintaining a diversity of educational offerings in view of school budgets whose buying power continues to shrink.

Most teachers are constantly involved not only in teaching others, but in learning themselves. Salary schedules for teachers are typically geared to years of teaching experience as well as to additional education intended to contribute to teaching competence. In addition, school systems usually provide in-service training, training aimed at improving teaching competence in special areas or in developing skills to be used in innovative programs. So it is surprising that only small percentages of ITV programming are being devoted to education as a subject area. For 1970, Rockman gives between 1 and 5 percent of ITV programming to education as a subject area.27

It would seem that the hours after school or in the early evening would be especially suitable for providing in-service training and education courses for credit. Schools already making use of television are in an excellent position to supply this service to their teachers. In fact, Oregon State University, which has an extensive CCTV system, provides the following services to the School of Education:

- Nearly all the Methods classes in the School of Education use the TV Center for micro-teaching28 purposes by teacher-trainees utilizing a variety of formats ranging from the teaching of short lesson segments to full class hour presentations.
- The School of Education Counseling Center in Education Hall has three TV-equipped rooms linked to the Kidder Hall TV studio by private line. At any time, a counseling session may be recorded on one of the studio machines in complete privacy and transmitted back to the counselor for evaluation and later erasure.29

25 McLaughlin et al., *Educational Television on Demand*. Although 2 percent seems small, remember that most school systems are already bumping against their budget ceilings and that this sum must come from the already very small amount (from 10 to 15 percent) allocated in a typical school budget for all items other than salaries.
26 Wade, "Hagerstown."
27 *One Week of Educational Television.*
28 Micro-teaching is practice teaching of small classes. Usually, the trainee is videotaped during the session for later self-evaluation and critique.
29 Johnson, *Cable Television and Higher Education.*
In addition, many services are provided to the School of Education along with other University departments, such as transmission of course review materials before final exams to residence hall viewing rooms and, when desired, to over 4000 homes and apartments.

Two other instructional uses should be mentioned. One is the obvious use of television to train students in techniques of production and in operation of television equipment. Although professional preparation will be most common in senior high schools and higher education, students at all levels will find some participation in the television medium stimulating. For example, in Newburgh, New York, young people developed their own production facility in which they produced videotaped interviews, discussions, documentaries, and reports for the cable system. The project was supported by The Ford Foundation.\textsuperscript{20}

Television can also be used for giving examinations, particularly those that test students' abilities for audiovisual recognition and discrimination. The national drivers' tests are an obvious example. TV-administered testing can also help to ensure uniformity of testing conditions from classroom to classroom so that student scores will be more comparable. Trained testers can give directions and administer parts of the test requiring oral stimuli, a stumbling block in many teacher-administered tests.

A few school systems have recognized that cable TV offers an excellent opportunity to involve the community more closely with the schools:

Educators have come to recognize that informed parents and taxpayers are likely to be more understanding and supportive of the schools' efforts, and that parent involvement during (and even as a forerunner to) the formal teaching process is highly desirable.\textsuperscript{31}

Thus, the Willingboro Township Public Schools in Willingboro, New Jersey, has instituted a wide variety of school-to-home programs over the public cable system. Among them are

- Coaches Corner, a discussion of high school athletics.
- Transmission of student-produced videotapes on such subjects as "How Congress Works" (made in Washington, D.C.), a student interview with the assistant administrator for the Federal Aviation Agency on a proposed jetport in the vicinity of the school district, another student interview with a state senator on the Anti-Ballistic Missile System.
- Taped sessions of the Social Action Committee established at the junior high schools to work for better human relations.
- Entertainment by student musicians and dancers.
- Information about new school programs.
- Instruction in reading and arithmetic for preschoolers, accompanied by manuals for parent participation.

Improved Quality

It could be argued that adding services as described above improves the quality

\textsuperscript{20} Price and Wicklein, \textit{Cable Television}.
\textsuperscript{31} Reuben, "Using Cable Television To Involve Parents."
of education. Here, however, we are addressing uses that improve quality by substituting for some of the normal activities of the classroom teacher. Although such usage is far less common than supplementary uses, some school systems in the United States have been making routine use of television for classroom teaching for more than ten years. One of these is Hagerstown, mentioned above. Basic instruction in both required and elective subjects is given by television in the Washington County schools served by the studios in Hagerstown. Nearly 30 programs a day are transmitted over up to five channels in the closed-circuit system. Subjects taught include science, music, arithmetic, art, language, math, English, social studies, biology, history, reading, algebra, physics, and advanced math; grades range from 1 through 12.

When the Hagerstown system was first implemented, there was considerable concern about the effectiveness of TV as a teaching tool. Extensive studies were conducted with the support of the Fund for the Advancement of Education and the Ford Foundation. Achievement data on Hagerstown students indicated that they learned more, by and large, from television than they would have learned in the regular classroom. As is frequently the case when several subjects and grade levels are involved, however, results varied by subject and grade. Achievement in arithmetic and upper-level mathematics, as measured by the Iowa Test of Basic Skills, was greatly improved after television had been introduced. Similarly, there was a notable, sometimes spectacular improvement in science, as shown in Table 1. Note that television seemed to be most helpful to students of lower ability. On the other hand, achievement in reading and English was not as impressive, and small gains were recorded in social studies and language. The gains were explained "in large part, at least, as a result of the new curriculum made possible by television."

For over ten years the Psychology Department of the University of Akron has used closed-circuit television to teach general psychology to undergraduates. During this period, the University has conducted extensive research on the effects of televised instruction on student learning, attitudes, and other matters. In 1972, Dambrort summarized this experience by stating that teaching by television is a viable educational technique that need not dehumanize or mechanize the learning process. With proper presentation and administration, a televised course has the capability of transmitting a quality level course to a large mass of students.

Television at the university level seems to be preferable to the practice of inexperienced graduate teaching assistants teaching freshman and sophomore classes.

### Decreased Unit Cost

For many years, the quality of education has been measured by the cost of the resources used—teachers, buildings, and materials—rather than by the amount of learning produced or the number of graduates who get jobs or enter college. As a

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32 Wade, "Hagerstown."
33 The comparisons were made among students at the same grade level from year to year.
34 Wade, "Hagerstown."
35 "General Psychology over Closed-Circuit Television."
Table 1
COMPARISON OF STUDENT GROWTH IN SCIENCE ACHIEVEMENT

<table>
<thead>
<tr>
<th>Average IQ</th>
<th>Growth (in months)</th>
<th>Average IQ</th>
<th>Growth (in months)</th>
</tr>
</thead>
<tbody>
<tr>
<td>117</td>
<td>12</td>
<td>118</td>
<td>15</td>
</tr>
<tr>
<td>100</td>
<td>11</td>
<td>100</td>
<td>14</td>
</tr>
<tr>
<td>83</td>
<td>6</td>
<td>83</td>
<td>13</td>
</tr>
</tbody>
</table>

result, it has been increasingly expensive to teach a student a given subject—and apparently without a commensurate increase in the amount and quality of learning. Measuring quality of product by resource use encourages educators to put more resources into schooling; practically no one has advocated economy because of the fear that a cutback will somehow damage the students.

Thus, it is not surprising that technology has been added to other elements of instruction, rather than being used to replace them. In fact, today's byword is "You can't expect to save money in education by using technology." Until technology is used to replace other elements of instruction for some tasks, particularly those performed by the classroom teacher, the heavy burden of teacher salaries will continue to grow and schools will not realize the savings that are potentially available.

The Anaheim system is one of the few examples of the successful use of TV to decrease the unit cost of education as well as to improve educational quality. The Anaheim scheme includes the redeployment of fifth- and sixth-grade students into rooms that can accommodate 75 students during the televised instruction under the direction of two teachers. This plan saves two classrooms and two teachers for every 150 fifth- and sixth-graders. The result is that in 1959-1960 the TV instruction handled 12 percent of the curriculum at less than 5 percent of the total annual district budget.56

ROLES IN INSTRUCTION

Let's now look specifically at the uses of television, particularly cable television, in instruction. For what subjects is television an appropriate or inappropriate medium? For what teaching methods is it especially suited or unsuited?

56 Bretz, "Closed-Circuit ITV Logistics."
Subject Matter

Television has been shown to be very useful in teaching facts, concepts, and cognitive skills, that is, objectives falling into the cognitive domain in Bloom's taxonomy.\(^7\) It is also useful in demonstrating motor and psychomotor skills and, to the extent that demonstration is sufficient for instruction, television can carry the burden of instruction even in some performance areas. Calisthenics is an obvious example. In fact, many demonstrations may actually be made more effectively via television than in person because the visibility of small or hidden movements may be improved.

Television must be supplemented by other instructional resources if

- Student performance must be monitored for safety reasons (learning to put out fires).
- Student performance must be monitored at each step so that successful progress may be made toward an end result (building a complex piece of equipment).
- The student must work with special materials or equipment that he would not normally have access to (aircraft repair).
- The student must learn an interactive skill, that is, one that requires him to work with others (team sports).

Most subjects with a large content of instruction inappropriate for television will fall in vocational areas (building trades, repair of equipment or machinery, service occupations) or in areas requiring large amounts of student performance, especially if interactive skills are required. In addition to team sports, examples of the latter are coordinated operation of a piece of equipment such as crewing a sailboat, group performance for an audience such as drama workshops or orchestra, or less rigidly prescribed group interactions such as public speaking or debating.

It is not doing the television medium justice, however, to consider its appropriateness only in terms of activities for which it can substitute for classroom instruction. First, a wide variety of audiovisual experiences can be provided the student only through the media of television or film, and, second, many others would be so costly to supply by direct experience that they are not feasible. In the first category are experiences that would endanger life or property, such as demonstrations of the spread of forest fires or of the hazards of braking an auto suddenly on an icy street. Also in this category are one-of-a-kind events such as the Apollo moon shots or Presidential addresses. And, of course, film or videotape is ideal to capture time-lapse or slow-motion photography, animation, pictures that are larger- or smaller-than-life, and sequences that depend for their effects on a mélange of images—all of which serve to expand the students' perceptual and conceptual capabilities manifold.

In the category of presentations that can be provided more practically via the film or tape medium are those that involve

- Equipment that is either too expensive, unwieldy, or fragile to supply in the classroom, such as an electron microscope.

\(^7\) Taxonomy of Educational Objectives.
Facilities or locations that are difficult for the students to visit, such as Jacques Cousteau's undersea laboratory.
Prominent people or people with unique skills to whom access is limited.

Some examples of these kinds of uses have already been cited on p. 13.

And, finally, because more resources can be expended on the production of film or television programs than the classroom teacher usually has at his disposal, such programs can be of better quality and without doubt more effective in bringing about student learning.

Television's unique capacities for presenting subjects that are inaccessible to the classroom teacher have been tapped in the field of instructional television for more than a decade. Table 2, which gives the percentage of ITV programming hours devoted in the United States to various subject areas during a week in 1970, is suggestive. The data reveal that classroom teachers find ITV most useful in supplementing courses that are not skill-oriented and that draw from a large body of nonclassroom experience (such as the first two subject-area categories) or that require skills the ordinary teacher may well lack (such as music and art). The data on language arts and literature are the apparent exception; quite possibly most of the programs in these areas are also not skill-oriented. Book reviews and dramatic productions are favorite topics for such television programs.

Table 2

<table>
<thead>
<tr>
<th>Subject Area</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Social and behavioral sciences</td>
<td>28</td>
</tr>
<tr>
<td>Physical sciences</td>
<td>19</td>
</tr>
<tr>
<td>Language arts and literature</td>
<td>16</td>
</tr>
<tr>
<td>Music and art</td>
<td>14</td>
</tr>
<tr>
<td>Mathematics</td>
<td>6</td>
</tr>
<tr>
<td>Foreign languages</td>
<td>5</td>
</tr>
<tr>
<td>Health, safety, and physical education</td>
<td>4</td>
</tr>
<tr>
<td>Other</td>
<td>8</td>
</tr>
</tbody>
</table>

Because of the traditional stress in education on the cognitive and psychomotor areas of personality development, little is known about the use of television in bringing about affective learning. What is considered, if anything, are the students' (or teachers') attitudes toward the use of television for teaching.

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38 Rockman, One Week of Educational Television. These data refer to ITV only. Sesame Street is not classed as ITV because it is not intended for in-school use, but during the survey week, it accounted for nearly 20 percent of all ITV programming that was not ITV.
39 Recall that almost all uses of ITV are for supplementing basic instruction.
40 Chu and Schramm, Learning from Television.
medium of film, "Much thought has been given but little experimentation has been done in this difficult area."41

The advertising industry has exploited the ability of television to mold public taste. Evidence indicates that television may bring about superficial shifts in preferences (say, from one brand of cigarettes to another), but major shifts in attitudes (say, from smoking cigarettes to not smoking) are much harder to bring about. "In fact, the mass media in general have proved to be ineffectual as tools for profoundly converting people. Studies have shown that persons are more likely to heed spouses, relatives, friends, and 'opinion leaders' than broadcasted or printed words when it comes to deep concerns."42

The implication of this quote is not, of course, that films and television do not affect people's attitudes, but that to affect fundamental attitudes the media must be reinforced by people whose leadership is accepted by the viewer. Cable TV can possibly be a powerful tool in this regard because it will facilitate the participation in the television programming of local leaders, perhaps personally known to many of the students. How effective such a tactic would be in bringing about attitude change must be left for future experimental test.

Teaching Method

With much ITV programming, the classroom teacher is transferred to the TV screen. He uses either straight lecture or a combination of lecture and demonstration. In the hands of accomplished teachers, these techniques can be captivating, as Continental Classroom, a forerunner of Sunrise Semester, proved. They are ineffective, however, in the hands of the average or even better-than-average teacher, especially when directed to audiences accustomed to the talent and expertise of commercial television. Conventional techniques also allow for little or no active viewer involvement and little or no adaptation of instruction to the needs and interests of individual students or groups.

The charge that television is a mass medium for passive viewing is damaging to its use in education, particularly now, when there is heavy stress on tailoring instruction to the needs of the individual student and on the active involvement of the student during instruction. Meeting the needs for individualization will be far more difficult than meeting the needs for involvement, however. This will be illustrated in the following discussion with regard to both broadcast TV and cable TV.

Methods for the Mass Media. In the early days, some attempts to involve the TV student consisted of showing televised instruction being given to a class of students, who asked questions and discussed the material on TV during the program transmission. The TV student supposedly thought of himself as part of the class. It soon became evident, however, that the viewers did not respond well to this technique, because the loss of eye contact with the TV teacher made them even further removed from him.

Despite its lack of requirements for overt response, Sesame Street obviously involves the viewer. This is accomplished primarily by amusing him, by piquing his curiosity, and by presenting a continuous variety of attention-getting stimuli.

41 C. R. Carpenter, "Instructional Film Research."
42 Etzioni, "Human Beings Are Not Very Easy To Change After All."
Sesame Street’s success in this regard was largely a result of steps taken during the development of the series to capitalize on the preferences of the target audience for existing film and television materials. The researchers devised

an experimental method . . . to measure a child’s interest in a given piece of material by continuously recording his visual orientation toward or away from the television screen during the presentation.

[This resulted] . . . in an index of the relative appeal of a broad range of entertainment and instructional films and television programs. Furthermore, graphing the fluctuations in audience interest in a particular program permitted the researchers and producers to analyze the program from moment to moment to discover those elements which were most compelling of attention . . . .

The result was a series of one-hour shows that held many children spellbound before the TV set, disproving the traditional notions of the short attention span of young children. To say that the child who is watching Sesame Street is passive is to miss the overriding importance of covert (i.e., unobservable) response. In fact, all reflex responses are initially covert responses.

Linear programmed instruction is a method of getting the student actively and continuously involved with the instruction. In such instruction, concepts and facts are presented in small increments or steps; after each step, the student is asked a question to test his understanding of the fact or concept. After a suitable pause, during which the student is expected to respond, the program usually provides the right answer so that he may check himself.

Linear programmed instruction may be used by either broadcast or cable television. It doesn’t require that the student have a direct effect on the program. Its primary teaching advantage is that it encourages (or can be made to require) the student’s active participation in the program. A disadvantage, however, is that the pace of presentation cannot be adjusted to the rate with which each student grasps the materials. If students have highly disparate learning rates, the program will be either too slow for some students, too fast for others, or both. This problem may be largely overcome by separating students of similar learning rates into groups and pacing the presentation appropriately for each group. Perhaps as few as three groupings would be sufficient to accommodate the spreads of learning rates that would normally be encountered. Note, however, that this solution automatically multiplies by three the amount of program transmission required and makes a multichannel system more attractive than one using only one channel.

In one system developed in Pennsylvania, International Correspondence Schools and TuTorTape Laboratories developed a response device attached to the television receiver that controlled the portion of the screen to be shown. When a question was asked, a possible answer was given in each of the four quadrants of the receiver. The student pressed the button corresponding to the response he felt was correct. If he was correct, his answer was repeated to reinforce the concept. If incorrect, he was told in the numbered square activated by his button why he was wrong and then given the correct answer and an explanation. Although this system adapted the program to the student in a rather limited way, it could be an effective

43 Kratochvil, Sesame Street.
44 Sivatko, "Newest Teaching Method Provided by Educasting."
teaching tool for the slow learner. The technique suffered from the disadvantages that each student needed his own TV monitor, which increased the cost of an in-school system, and that the degree of individualization provided seemed too limited to justify the cost.

Methods for Dedicated Systems. We noted earlier that the uses of cable TV would be similar, by and large, to the uses of other media of TV transmission in education. This is true in the broad sense; that is, cable TV can serve the same general goals as can any TV transmission medium. There are significant differences, however, stemming from the relatively large number of channels that cable TV may make available at relatively low cost to the schools or other educational endeavors. This will greatly alleviate scheduling difficulties and may serve a greater diversity of needs and interests. The privacy of the dedicated system contributes to this possibility as well.

Since a single channel can be directed to a small audience, its transmissions can be made more responsive to the viewers. The Ottawa system described earlier, in which teachers received on demand films and other audiovisual material on the classroom TV sets, is an example of the responsiveness that can be obtained in a multichannel system. Also, the university-level ITFS systems using talk-back, mentioned previously, are examples of what can be done in the way of on-line feedback with live programming. In these systems, the lecture is transmitted live to receiving points scattered over a large geographical area. Students gather in classrooms at each receiving point and can transmit questions to the lecturer in the studio via either a special audio channel integral to the system or a telephone circuit. Thus, instructional programming is further tailored to the needs and interests of the students on the basis of their responses during program transmission.

The lecturer is not overloaded with questions because only one transmission can be sent from a classroom at a time. Users report that this system encourages productive small group discussions within the classroom and that the single talk-back channel is more than sufficient to carry questions that cannot be resolved by classroom discussion. Many courses at the graduate level exist primarily to provide students with direct contact with leading scholars; hence talk-back systems are especially useful at this level.

It will be noted that a talk-back capability can readily be obtained by renting telephone lines. Thus, the eventual two-way feature of cable TV is not essential to such a use, although in most instances telephone company charges will exceed the cost of providing the talk-back capability within the transmission system.45

Another direct feedback technique could be used to provide a running record and a final summary of student responses during a televised presentation using programmed instruction. One such system is EDEX, which has been in use for some years in schools, industry, and the military. The instructional material for EDEX is prepared in a linear programmed format, with multiple-choice questions and pauses for student response. The response system is a push-button device attached via the cable to a simple computer at the origination point. This computer displays the responses of each student and the number of right responses for each question.

45 For example, Martin-Vegue et al. estimate that telephone lines would cost nearly twice as much over a ten-year period as the cost of providing the same capability via ITFS response stations. The cost of using time-shared talk-back would be less than a fifth that of using telephone lines. "Technical and Economic Factors in University Instructional Television Systems."
asked; it also keeps a record of each student's score throughout the program. Probably several hundred student responses could be easily returned to the transmission point, and the program could be stopped and discussed if large numbers of incorrect answers were coming in. In this way, the high quality that can be provided in programmed, recorded media can be supplemented by responsive on-the-spot discussion of troublesome points. Each student can also be apprised of his performance, and his questions can be dealt with by other students or the classroom teacher.

The cost of a digital terminal is relatively small, perhaps on the order of $30 at most. This is less than the cost of an audio microphone such as those used in the university level systems, and unlike the microphone, the digital terminal serves an individual student rather than an entire classroom. However, when the costs of the control console, projection control box, and other equipment are included, the initial cost of equipment for systems such as EDEX can run from $100 to $300 per student. The cost will, of course, depend on the configuration selected and must be judged in light of the services provided—immediate knowledge of the progress of the class as a whole and of each individual student, a permanent diagnostic record for each student, and administering and scoring tests.

As noted, such systems have been in use for several years; some have used videotape as a software medium. However, although there have been proposals to implement these systems using cable TV (in Philadelphia, for example), no digital response system with display and recording of student response has actually been tied into a cable TV system. Therefore, before such a system could be implemented, some engineering development would be needed.

**Self-Directed Study.** Self-instruction requires that the student have access to study materials at his own discretion, to meet needs as they arise and to follow individual interests. It does not necessitate on-line, adaptive programs such as those provided by computer-assisted instruction, but individual, random access to libraries of films, tapes, books, or other recorded materials is mandatory. Access may be manual or automated, depending on the number of programs available and the number of individuals requesting materials at any one time. The use of cable TV for self-instruction is currently economically feasible only when the cost of conventional instruction is high, for example, industrial and military training, continuing professional education, and graduate education.

Fully automated, completely independent, random access, in which any student can access any program in the library at any time, is expensive and at the cutting edge of the state of the art. Such a system must either contain as many copies of each program as will ever be used at one time or must be equipped to copy programs as they are called for so that a student can immediately access any program from its start, regardless of whether another student is already using it.

But less ambitious versions are useful. The conventional library or media center is the obvious example. Accessibility to programs (audio or audiovisual) stored at such repositories can be enhanced by providing at remote stations display equipment connected to the repository via telephone or television channels. A student at the remote terminal can request material either by voice or by a dial system, such as the one in operation at Oral Roberts University. These systems do not provide

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46 The present console accepts up to 60 student responses. The largest system installed to date has a capacity of 660 students. These numbers and the following cost data were provided by the manufacturer.

47 *Educational Product Report, No. 36, Dial Access Systems and Alternatives.*
independent access, however, because once a student has started using a given program, other students wishing to use the same program will either begin receiving it partway through or will have to wait until the program is not in use.

Another type of semiautomatic self-directed program, developed by Wilson, consists of a taped lecture (but could be any style of presentation) supplemented by answers to a set of questions that may occur to the student as he is listening to or watching the presentation. After the presentation, the student consults a question map, a display of questions related to segments of the lecture. He then punches in codes for those questions that most closely match his own concerns and receives prerecorded discussions on those points. The technique requires careful preparation of both the lecture and the question map, with considerable time for pretrial with representative samples of students. Nevertheless, students report that it is a highly satisfactory study device and that they feel it provides more effective interaction with the teacher and the subject matter.

The lectures and answers to questions are recorded on audio tape, with drawings and other visual materials recorded on the second track of the tape by means of an electrowriter, making it possible for the professor to illustrate what he is saying in much the way he would use a blackboard. The electrowriter has two units: a transmitter, on which the speaker writes with a pen on a roll of paper, and a receiver in which a stylus reproduces the writing in ink on a similar roll of paper. It costs from $1500 to $4000, depending on the model chosen. The complete recording is packaged in audio cassettes, with answers to specific questions indicated by index codes. Using these codes, students retrieve answers to their questions manually. All equipment is available off-the-shelf. The major investment is clearly in the development and testing of the recorded materials. Engineering development would also be required to adapt the system to cable TV.

Students who are deficient in study skills are likely to find programmed instruction more helpful for self-study. Linear programmed instruction presented in programmed text or on teaching machines helps the learner pace himself through the material, as he is aware of his progress at each step. A few systems are being developed at present that will provide on-line responsive programs over television channels. One of these, the TICCIT system, will use still-picture TV to increase channel capacity and thereby lower cost. The other, Plato IV, will use a plasma panel to store information at the terminal. Both require computers to supply the adaptive logic and are therefore considerably more expensive to install and program than the systems we have been discussing. Both systems are several years in the future.

None of these systems, no matter how advanced, fully satisfies requirements for self-directed study, except for the academically sophisticated student. Even he, however, will prefer to have "internal random access" to study material, that is, to be able to skim some parts of the program, linger over others, and skip back and forth at will. At present, only printed materials give him this liberty; developments in film and tape cassettes will permit audiovisual programs to be used in this way in the future.

48 "Interactive Lectures."
49 Hammond, "Computer-Assisted Instruction."
SUMMARY

Cable TV is one of several ways to transmit audiovisual information. Local conditions will determine whether it is a feasible transmission medium and whether it is more practical than other available media. If the target audience is dispersed over an area whose radius is greater than 5 miles, interconnected cable systems or other media of transmission must be used. Also, if the target audience is at home and in the lower economic strata, special provisions will be needed to give them access to the cable system.

It should be emphasized that whatever media are chosen, they should be used only as means to solve pressing needs in education, not as ends in themselves. Applications of television that most obviously satisfy this requirement are those that reach audiences outside of regular school buildings—out-of-school uses. Probably the most significant educational uses of cable television will be these out-of-school uses.

Television can help meet several general needs in education; in fact, it can provide some services that can be provided in no other way. Cable television can be even more useful than other television media have been in the past because it offers additional technical features at a cost that is often below that of all but broadcast television.

Because schools have not made significant use of television in the past, there has been little of the development needed to apply its full potential to educational services. Most of this needed development is in the production of high-quality programming, although some, such as adaptive programming and indexing of recorded programming, requires new hardware as well.

The success of Sesame Street can be attributed in part to its use of the magazine format of commercial entertainment television. Thus, many of the techniques and talents for making television a useful teaching tool may already exist. What is lacking is the drive to apply them. Why this drive is lacking and what may be done about it are discussed in the next chapter.
Chapter 3

BARRIERS TO THE USE OF TELEVISION IN EDUCATION

In this chapter we shall discuss the two major barriers to the use of television in education, the lack of high-quality television programming (software) suitable for school use and the inadequacy of means for using what programming does exist. We shall identify the likely sources of these obstacles and suggest some ways for surmounting them.

THE SOFTWARE PROBLEM

From several case studies of the use of TV in public schools in 1969, Wagner et al. concluded that the greatest single barrier to the use of TV is the lack of high-quality films, videotapes, and live programming. Most of the programs being used were of unknown teaching effectiveness because of lack of formal, continuing, student-performance classroom evaluation procedures. Whatever their [teaching] quality, students and teachers subjectively felt that most existing programs were of poor quality. Undoubtedly, many were using commercial TV as a standard, but this single factor cannot account for the wide-spread impression of generally low ITV program quality in most school systems.

Poor program quality was found to be related to several factors. Basically, the "cottage industry" approach to ITV program production, characteristic of many of the school systems visited, in which it is envisioned that most of the ITV programs to be used by the system would be produced within the system, has been a failure to date.

Costs for local program production have been the single largest ITV operating budget line item. Even so, the resources have been inadequate for producing high quality programs because the resources have been spread too thinly over too many programs.

The relief from high local production costs that was anticipated through "program-sharing" among school systems has not occurred; program-sharing has run afoul of existing copyright laws. These contain a tangle of restrictions related to use permission and fees. Two key issues are: the residual rights of teachers involved in producing a program; the use permission and fee paid by a school system producing a program, when a proprie-
tary clip is used in the program, not being applicable to the program's use by a "borrowing" school system.¹

Some have argued that the programming should be produced by regular faculty because this will ensure teacher commitment to the project. The merits of this seemingly reasonable argument evaporate in real situations, however.

A dramatic case in point is the recent attempt by Scarborough College of the University of Toronto to fend off a growing shortage of teaching staff by making videotaped lectures the core of its curriculum. (The lack of teachers was predicted to reach such a level by 1972 that 10,000 university students would have to be turned away.) One of the key assumptions in the design of the TV college was that it would teach only the General Programs in Arts and Sciences, courses designed to produce a liberal arts education in three years. In the first year of the Programs, the choice of courses was very limited, and even in the upper years, options were few. Thus, by the time Scarborough reached its anticipated full enrollment of 5000 students, planners expected that as many as 1200 students would take first-year English; 1000, first-year mathematics; and 500, first-year history. Enrollments in other first-year courses were expected to be similar. According to Lee,

These massive concentrations of students provided an ideal application for the technology of television teaching. Lectures could be prepared in advance and recorded on videotape, to be replayed during the academic year in lecture theatres holding about 200 students at a time. This would eliminate the need for enough faculty members to deliver the same content to several classes in a course, or the need for one professor to lecture to a class of 500 to 1,000 students. Since the content of these large introductory courses did not change substantially from year to year, the same tapes with slight revisions could be replayed for several years.

This arrangement was expected to allow for 30 per cent fewer teaching staff than a comparable "live" system would need to handle the same number of students. Not only would teaching salaries be saved, but also the office space for these teachers. The secretaries, cleaners, and other support staff required by teachers would also not be needed. These savings would pay both the capital and operating costs of television facilities and would produce a surplus over the comparable cost of "live" instruction of about $1 million a year when the 5,000 enrolment was reached.²

The college very nearly founded within a few months of its inception because of faculty disenchantment with TV. Although resentment and anxiety appeared to center on legal questions concerning the production of videotaped lectures, a transcript of a special meeting on the problem shows that many of the faculty were in effect defending their traditional method of teaching against a threatening innovation:

At one point, this debate became direct and explicit. One professor, referring to the process of developing a television lecture program with script, visuals, studio rehearsal, and editing asked: "How essential is this whole production treatment?" The professor explained that his method of lecturing was simply to walk into the classroom and start talking...³

¹ A Study of Systemic Resistances to Utilization of ITV in Public School Systems.
² Test Pattern.
³ Ibid.
Scarborough planners had not thought far enough ahead to do research on the effects of their proposed system on the faculty and students. Rather, they assumed that TV would, somehow, carry the day. They ignored two essential facts: (1) professors, by nature, are not inclined, and often not able, to change their customary methods of teaching, and (2) the students, who are the TV generation, expect much more of television than a college can afford.

Traditionally, universities have shown much less concern for a faculty member’s teaching ability than for his ability to publish. This had special impact on Scarborough College teachers, as Lee points out:

There is one important factor which makes Scarborough College teachers less likely... to be willing to take the risks involved in developing television skills. They are frequently concerned with being out of the mainstream of activities in their departments, set apart in something of a remote outpost. Publishing becomes even more than normally important, to ensure the attention of the colleagues downtown who decide on promotions. Making good television is rarely counted as publishing.⁴

Finally, the TV lecturers could see that they had more at stake in producing a videotape than in giving a live lecture. They were on record for anyone to see and quote. In the studio their effectiveness was on display before the technical staff. And on videotape, their ability to use television—where the camera eye can magnify ordinary teaching deficiencies—was readily apparent to the students.

As for the students, they demanded the invitation to involvement that is built into much commercial television, but which many educators reject as "mere entertainment." And, like most university teachers, Scarborough planners assumed that lectures were more important to the students’ learning than they actually were.

The Scarborough experience is not unique. From their case studies, Wagner et al. concluded that

Attempts to insure high classroom utilization of locally produced programs through "involvement" of classroom teachers in the production process have been counter-productive in terms of both program quality and teacher acceptance. Most classroom teachers have neither the desire nor talent to be so involved; there seems to be little positive transfer from the ability of some teachers to recognize a "good" program to an ability and willingness to produce one. Agreement on program specifications is difficult to achieve among teachers themselves; teacher views frequently clash with professional production views. The inevitable compromises in content and pedagogical technique necessary in such situations frequently results in a program judged by even the teachers who were involved to be of poor quality. The combination of frustration in "involvement" and dissatisfaction with end-product clearly militates against high utilization, particularly when an objective evaluation system, based on student performance, is not available.⁵

Initially, there was little or no programming of usable quality available to the schools. Even instructional films were either of poor quality or had been made so general in their appeal (to prorate the cost of quality production over a large audience) that they did not fit into specific school curricula. Production of high-quality

⁴ Emphasis added. Ibid.
⁵ A Study of Systemic Resistances.
programming tailored to localized needs can be prohibitively expensive for small school systems. Even simple programming, which is unlikely to interest today's students or teachers, can cost from $25 to $100 an hour, and more elaborate programming will cost considerably more. Sesame Street, for example, cost $30,000 an hour during its first year of production.

Of course, Sesame Street costs were compensated by the program's large-scale use. During the last few years, the National Instructional Television Center (NIT) has promoted and coordinated the establishment of consortia for producing education series for large-scale use on ITV. For example, the popular Ripples was planned and financed by a group of experts on early childhood and of television specialists from fourteen education agencies. The Northern Virginia Educational Television Association produced the programs. Many of the participating agencies were state-based, although several educational television stations associated with larger school systems (such as WETA in Washington, D.C.) or universities were included. Ripples cost $12,000 an hour and was two years in planning and production. A 31-member consortium is currently producing a series in health education (Inside Out) that will cost $90,000 an hour.

Such ventures have resulted in high-quality programming and a decrease in the percentage of locally produced programming transmitted by broadcast ITV. This is illustrated on Fig. 3, taken from Rockman. Another result has been support of the consortium concept by the Council of Chief State School Officers and promotion of a permanent national organization for developing quality school television programming.

None of these series is intended for basic instruction, that is, to teach subjects in a regular school curriculum. They are produced for broadcast TV and are to supplement or enrich basic instruction. For example, Ripples is intended to help children build human values, extend their knowledge, increase their aesthetic sensitivity, and understand the changing nature of the real world. However, when most teachers are supplied with high-quality programming in the basic curriculum such as Sesame Street and the Electric Company, they are happy to use it in their classrooms. But this attitude would probably not persist if the costs of producing such programming were defrayed by reductions in the cost of other parts of school operations rather than simply added to other costs, as at present.

How can a local school system support the costs of programming tailored to local needs? The best advice is to share resources for program origination with another group. Baer lists the following possibilities:

- Use the cable operator's studio and equipment.
- Form a new consortium of education groups.
- Use existing school facilities.

6 Baer, _Cable Television: A Handbook for Decisionmaking_.
7 Other sources of ITV programming are listed in the companion volume, R-1144-NSF.
8 National Instructional Television Center, _Newsletter_, September/October 1972.
9 _One Week of Educational Television_.
10 _Education Daily_, November 21, 1972.
11 National Instructional Television Center, _Ripples_.
12 _Cable Television: A Handbook for Decisionmaking_.
A number of cable operators have arrangements with schools for the use of facilities and equipment. Also, local consortia have been or are being established for sharing the costs of educational programming. (Both of these options are discussed further in the next chapter.) Finally, a number of schools, such as Pennsylvania State University (WPSX-TV) and the University of Southern California, already have studios for producing their own programming. Schools with their own facilities might be willing to help other education agencies with program production.

Not only is high-quality programming lacking, but there is almost no way to find out whether programming exists that will meet a specific educational need. The repositories of instructional programming do not provide search or rating services; their catalogues usually give only the general subject area and grade level of the prospective student. There are no lists of instructional objectives pursued by the programs, specific delineation of the target audience, evidence on teaching effectiveness, or indicators of quality.

An objective rating board, unaffiliated with a production agency or other group with vested interest, should be established to search for, test, and rate instructional television programming, in somewhat the way that nonprofit agencies rate consumer products. The establishment of such a board is an appropriate task for the new National Institute of Education.
THE UTILIZATION PROBLEM

Utilization activities fall into four major categories:

- Concurrent instructional activities that integrate the televised programming into the school curriculum.
- Audience monitoring (of both students and teachers) to determine the effectiveness of the programming.
- Development and maintenance of adequate facilities for distributing TV programming.
- Publicizing the program to the intended audience (for out-of-school programs).

In their conclusions from the case studies, Wagner et al. also noted that

ITV classroom utilization, as a process independent of production and transmission, has received an inadequate allocation of resources in school systems. More often than not

- classroom utilization aids,
- adequately compensated teacher training,
- equipment maintenance,
- objective classroom program evaluation, and
- formal utilization feedback systems

were, if existent, insufficiently programmed and supported in the school systems to have had a significant impact on ITV utilization rates.\(^{13}\)

Therefore, they recommended that school systems shift their emphasis from program production to program utilization.

Although utilization activities receive short shrift in most schools, there are examples of good utilization efforts. In Anaheim, for example, instructional committees cochaired by television teachers and classroom teachers determine what is televised, when it is televised, how it is televised, and what the evaluation shall consist of. These committees operate at each grade level for each subject area taught. The process includes setting objectives as well. Classroom teachers also participate, along with television teachers and producer-directors, in developing lesson guides.\(^{14}\) During its first year of operation, the Children's Television Workshop (CTW) spent $700,000\(^{15}\) on utilization, working through 35 field coordinators assigned to 12 metropolitan areas.\(^{16}\) These people set up viewing centers in Head Start facilities and other public areas. CTW also spent $400,000 on promotion through the mass media and by means of special materials.

Careful attention in two areas will help ensure that the televised programming is utilized effectively:

\(^{13}\) A Study of Systemic Resistances. The Appendix indicates that, in addition, few schools had near enough TV sets for routine use of TV. Only 1 out of 10 schools had as many as 10 sets in classrooms. (With an average of about 22 classrooms per school, 10 classrooms with sets would be comparable with the TV classroom setup provided in TV-intensive systems such as Hagerstown and Anaheim. These systems, however, generally have more than one set in a TV classroom.)

\(^{14}\) Anaheim City School District, "Teaching with Television."

\(^{15}\) Connell, "How Sesame Street Raised and Spent Eight Million Dollars."

\(^{16}\) Scope, Field Services Department, Children's Television Workshop, New York, June 1971.
1. Utilization activities should be planned systematically from the outset. These include designing the TV distribution system and its monitoring and maintenance, structuring concurrent instructional activities, planning the production and distribution of supporting instructional materials, planning teacher training, and designing the program monitoring and evaluation components.  

2. The needs, interests, and wishes of the prospective audience should be determined as definitively as possible and consulted from the beginning and throughout the life of the program. (For in-school programs, the audience includes the classroom teachers.) Representatives of the audience should participate in program planning and development. Teachers should be trained to use the televised programming in realistic workshops and to conduct concurrent instructional activities. In-service training should be provided routinely after the program has been established.

THE BASIC PROBLEM

Lack of appropriate, high-quality programming and inadequate provisions for its utilization are not the primary barriers to the use of television in education. Rather, they are symptoms of a pervasive problem—lack of interest in or outright resistance to major change by the education community. The propensity of education institutions to maintain the status quo has been observed and studied for a number of years. The primary cause is behavioral in nature, as suggested by the Scarborough College experience. Educators, whether faculty or administration, find it difficult to change their concept of what the process of education should be. Even when the teacher in the classroom is actually replaced by television, it is usually a surrogate classroom teacher who replaces him. Very few programs have broken far enough out of this restrictive mold to achieve even part of the potential for instruction offered by the television medium. And even when the programming is simulating, if it is only an adjunct to the teacher's business as usual, the production expense is hard to justify.

If television is to be more than an adjunct, the teacher must take on the new roles of coordinator and manager and submerge the old role of primary purveyor of instruction. Since teaching is a person-to-person activity, it is a direct expression of the teacher's personality, and like other human beings teachers are reluctant to change their image. The profound revision in teaching style that would be required of a teacher making full use of television can be brought about and maintained only by a continuous, concerted effort. Teachers must be given incentives to change their ways and must be taught how to do so. The incentives will be harder to come by than the training. Monetary incentives buck the teacher unions with their opposition to merit pay. Teachers who do an outstanding job of utilization might be given rewards tailored to their own values. Special activities for their classes or professional recognition might also be effective.

Other factors exacerbate the situation. The two that are the most difficult to deal with are closely interrelated. One is the complexity of the process of education;

17 These activities are described in detail in the companion report, R-1144-NSF.
the other is the lack of usable information on effective change. Teachers, administrators, students, and the community interact in complex and subtle ways. Materials, methods, facilities, equipment must be appropriately fitted together to support these, human interactions. This complexity can turn the development and implementation of changes in the education process into a nightmare. It is little wonder that most school administrators prefer to live with processes that at least run smoothly and that run themselves to a large extent. The companion volume is aimed at easing problems of development and implementation by setting forth steps in planning and implementation in detail.

Complexity also makes it hard to define change in terms that communicate readily. Changes are often described by means of catch phrases (such as individualized instruction) that tell the educator nothing about how to implement the change in his schools. Evaluations are often thinly disguised sales pitches that leave the educator distrustful of all miracle solutions to educational problems. Even honest evaluations rarely treat more than one or two outcomes, whereas education projects affect their participants in many ways. Evaluations almost never describe the programs in detail, let alone recount the steps needed for successful implementation. The companion volume also treats these problems in the chapter on evaluation.
Chapter 4

THE EDUCATOR'S STAKE IN THE CABLE TV FRANCHISE

How well a cable TV system will meet the needs of the education community depends not only on the community's initiative but also on the arrangements that are made for cable service to the schools. These arrangements are usually (but not always) spelled out in the franchise under which the cable TV system will be operated. Provisions of greatest concern are those regulating

- The administration of the free education channel mandated by the FCC.
- Access to additional channels for lease and reasonable leasing rates.
- Connection of school buildings to regular cable service and reasonable installation and monthly charges for that service.
- Charges for initial installation of multiple connections within school buildings and additional service charges for buildings with multiple connections.
- Providing or sharing facilities and equipment for production and transmission of educational programming.
- An early date for operational two-way capacity.
- Incorporation of new technical standards when they are set by governmental agencies.

The discussion of these issues will draw, where relevant, from current practice, the recent rulings of the FCC, and policy statements by several influential groups concerned with the use of television in education.

We have said that the FCC has required that newly franchised operators in the 100 largest television markets provide one free channel for educational use during an experimental period of at least five years. Systems franchised before March 31, 1972, will have at most five years to comply with this requirement. Other possibilities, which may or may not be stated in the franchise, should also be considered. For example, it may be possible to negotiate the lease of additional channels or to use facilities that are not needed full-time by the cable operator. The operator may be eager to cooperate to increase his output of locally originated programming, to attract subscribers. And more than a single channel may be made available free to the education community if a special showing of need and plans for use can be made to the FCC.¹

¹ See Johnson and Rostein, *Cable Television.*
The implications of the FCC ruling for preferential treatment of community groups is unclear. Right now, the FCC seems to view 3 to 5 percent of the cable system revenues as a nominal maximum return to the franchisor. Any franchise provisions that would, in effect, grant the franchisor a higher return will probably be treated as potentially burdensome to the franchisee and will require a special showing.

The FCC is much more likely to consider requests for preferential provisions favorably if the showing supports the need with a viable plan and demonstrates the ability of the cable system to provide what is asked for. Thus, the importance of careful planning by those who view cable TV as a way to improve education cannot be overemphasized. Only after such people have argued to the FCC a series of well-supported cases will the rulings be clarified and will it be possible for the education community to take for granted certain forms of preference. All of the possibilities for preferential treatment discussed in this chapter should be viewed in that light.

Of course, preferential treatment that adds no financial burden to the cable operator can be provided without requiring a special showing before the FCC.

FRANCHISE NEGOTIATION

The FCC requires that local franchise proceedings include "public hearing affording due process." Representatives of the local school district, institutions of higher education, and other institutions concerned with preschool or adult education should participate in these hearings. After the franchise is awarded, the same group should promote the establishment of a local regulatory agency that will protect the public's interest in the system.

As a general rule, the franchisor is a body of a municipal government, such as a city council; the franchisee is a private, profitmaking concern. But these are not the only options, and in some instances, arrangements such as municipal or nonprofit ownership have been considered. The prime argument for such arrangements has been that the needs of the community or of special community groups must not be subordinated to the cable TV system operator's desire for profits. In its policy statement to the FCC on cable television, the National Education Association (NEA) strongly supported such arrangements:

in an effort to guarantee the public a fair share in public cable communications, the Commission should encourage experimentation in selected local communities with the development of public cable corporations dedicated to fostering a richly beneficial system serving the public interest.

Schools might well take the leadership in local communities in mobilizing public institutions to form such public cable corporations which themselves could operate the local franchise in a given community. Such cable corporations should include not only the public broadcasting stations but also public schools and other public education organizations and institutions. In some communities a public nonprofit cable authority (similar to a port or power authority) may be a more appropriate licensee of the noncom-
mercial CATV franchise in that community than the public broadcasting station.²

Since the FCC has now required cable TV systems to provide three free channels, one for educational, one for local governmental, and one for public access use,³ there may be less interest in public ownership in the future. Most communities, however, should still consider nonprofit or government ownership of the cable TV system before awarding their franchises.⁴

ADMINISTERING THE EDUCATION CHANNEL

The NEA recommends that beyond the three access channels additional channels "be provided free of charge up to a total of 20 percent of the system's capacity for educational, instructional, governmental, and public access programming, as the schools and the public demonstrate their ability to use these channels."⁵ The NEA has based its recommendation on precedent, noting that

In the 1940's, public policy dictated that 20 percent of FM radio frequencies be set aside for educational and other noncommercial uses. In the early 1950's, when new broadcast television channels were established, approximately 20 percent were likewise reserved for educational use.⁶

But most people who have FM radios and UHF television receivers are well aware that public agencies have not begun to make use of the frequencies allocated to them under these rules. Thus, the precedent has to do with rules, not with usage.

The recent FCC ruling is more in line with actual usage than is the NEA position. At present, almost all cable TV systems providing channels to the schools supply only one and it is free, according to a recent survey of cable TV operators by the National Cable Television Association. The ruling does not, however, meet the needs of school districts contemplating the use of TV for distribution of films and other audiovisual materials on demand. Because of the requirements for scheduling, this use alone can easily consume several channels, as demonstrated by the Ottawa project. It also does not satisfy the needs of schools wishing to use television for basic instruction above the elementary level. Again, difficulties of scheduling can impose a requirement for over ten channels.⁷

With regard to the education channel, the regulations require only that it be made available by the operator free of charge for an experimental period of 5 years, that advertising, lotteries, and obscene and indecent material be barred, and that a list of applicants for the channel be maintained for two years. Moreover, the rules debar local agencies from establishing additional rules governing the education access channel:

² Wigren, "The NEA's Position on Cable Television."
³ FCC, "Cable Television Report and Order."
⁴ See NEA, Cable Television: Franchise Provisions for Schools, and Baer, Cable Television: A Handbook for Decisionmaking (Chap. 4), for a discussion of various ownership alternatives.
⁵ NEA, Cable Television.
⁶ Wigren, "The NEA's Position on Cable Television."
⁷ Bretz, "The Potential Uses of Cable."
Except on specific authorization, or with respect to the operation of the local government access channel, no local authority shall prescribe any other rules concerning the number or manner of operation of access channels...  

There is a real danger that the cable operator may restrict the channel to a single school agency to simplify management or for some other reason. In some cases, it would be desirable to establish a separate entity comprising several users with jurisdiction over the education channel to assure that the needs of all potential users are considered fairly and to spread the cost of expensive items such as local program production, computers, and software repositories. Establishment of such an entity would require a special showing to the FCC if the group were to have any say over the operation of the channel, and established education institutions may be reluctant to give up their traditional autonomy in the areas of curriculum and teaching practice—precisely the areas in which television would have a major impact.

Even so, joint arrangements have been considered in a few cases. Worth noting (although not associated with a cable system) is the Educational Television Association of Metropolitan Cleveland (ETAMC), with members drawn from the Cleveland education community. Some of the participants are the Diocese of Cleveland, the Board of Education of the Cleveland City Schools, and the Board of Education of the Parma City School District. ETAMC is an umbrella agency that has been awarded 16 ITFS channels to serve its members. In making the grant, the FCC waived the section of its rules which provides that a licensee is limited to four channels in a single area of operation. The community television station, WVIZ, is also a member and provides the other members with nondiscriminatory services at published rates and under the approval of the FCC. WVIZ has been in the forefront of instructional television and has produced many instructional series that are now distributed nationally.

ETAMC is controlled by a board elected by the members. The board is responsible for planning the allocation and use of channels, scheduling time, coordination and use of programming, establishment of fees and charges, and all other administrative functions:

WVIZ will operate and maintain the ITFS transmission equipment and will provide studio space, if needed, to individual users. The individual school systems and organizations participating in the ITFS operation will subscribe to it, but each may also provide its own programming or share in materials transmitted by other systems. Costs of local programming and distribution and charges for printed resource materials will be borne by the developing agency. No one group will have a channel, but each will be allocated time, determined by the governing board in accordance with the party's request and with the amount of time available. The only requirement placed by ETAMC on member groups is that the programming be of minimum broadcast quality. The ITFS system will be operated as complement to broadcast Channel 25. Since the two systems will not be competitive, participating schools will be able to use both ETV and ITFS programming.

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* FCC, "Cable Television Report and Order."
* *Educational Product Report, No. 31, p. 31.*
At present, ETAMC serves 53 systems representing nearly half a million students with five operating channels.

A similar arrangement has been set up to coordinate the development of cable TV systems in Orange County, California. The Public Cable Television Authority, a joint powers authority of five cities, has been established to plan the development of a regional approach to cable TV. The board of directors comprises an elected official from each city. The PCTA is now at the point where specifications for the system can be released to franchise applicants.

Various joint agreements are currently being drawn up among other school districts. Three cities in California (Ontario, Montclair, and Upland) are sharing a cable TV system through separate franchises with the cable company. All such arrangements will require special showings, as noted previously.

The NEA has recommended that "a cable educational advisory board be established in every community as part of the franchise." This board would set policy for the use of the education channel in a number of respects and would develop some educational programming.10 Baer has urged, in discussing a similar recommendation, that

This Board should not be dominated by public school authorities or any other single educational body. It might include elected school board officials, public school teachers and administrators, private school, community college, and university representatives, and private citizens unaffiliated with any educational group. The cable operator could then administer the rules for access set by the Board.11

In Chap. 2, we suggested that the most significant use of cable TV in education will require establishing new organizations and institutions; within-school uses will be of secondary importance. This underscores the need for decisions on the use of the education channel by a coalition of members of the education community.

The FCC ruling avoids restricting the users of the education channel to established education agencies, although users must be "local educational authorities."12 This may leave the door open for the establishment of new institutions to use the cable TV system.

Ideally, the education channel will be allocated to those who can make best use of it in terms of need and cost. Criteria for selection of users should include

- The number in each potential audience.
- The importance of the potential use of the cable TV system.
- The extent to which the cable TV system provides services that cannot be provided better—if at all—in some other way.
- The cost (including the cost to the audience) of providing the educational service in some other way.

Guidelines for performing such analyses are discussed in the companion volume, R-1144-NSF.

To answer these questions, potential users should be partitioned between daytime and evening hours. During daytime hours, the largest potential audiences are

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10 NEA, Cable Television.
12 "Cable Television Report and Order."
in schools or other service institutions or at home. For evening hours, programs for working adults or college students are most appropriate.

USE OF THE OTHER FREE CHANNELS FOR EDUCATION

A case can be made for using the channels set aside for local governmental agencies and for public access for educational applications, but the case is not open-and-shut. Training for municipal employees, public forums concerning school problems, programs dealing with consumer dissatisfaction, public expressions of dissatisfaction of minority groups with the schools or the local government are all subjects for programming falling into gray areas between the free channels. The determination of what agencies can use the free channels for what purposes is one of the pressing policy issues to be faced by both potential users and the FCC. It will be resolved only by direct test in specific situations.

LEASED CHANNELS

According to the FCC rules, the franchising authority must obtain FCC approval before requiring the provision of channels to the schools free or on a preferred basis:

Because of the federal concern, local entities will not be permitted, absent a special showing, to require the channels be assigned for purposes other than those specified above. We stress again that we are entering into an experimental or developmental period. Thus, where the cable operator and franchising authority wish to experiment by providing additional channel capacity for such purposes as public, educational, and government access —on a free basis or at reduced charges—we will entertain petitions and consider the appropriateness of authorizing such experiments, to gain further insight and to guide further courses of action.13

On the other hand, the FCC rules require cable operators to lease additional channels as needed. Therefore, education agencies that need more than the free channel can lease them, perhaps at a preferential rate. For example, a charge could be made covering at least the incremental or out-of-pocket cost of supplying the channels, but . . . less than a proportionate share of the overhead of the cable operation in comparison with the charges for other services . . . . Such a pricing practice, in which some services bear much more of the overhead than others, is common in virtually all industries.14

As long as all users pay more than the cable operator’s marginal cost of providing a leased channel, preferential rates are not a burden. Baer suggests

13 Emphasis added. Ibid.
14 Johnson and Botein, Cable Television.
One approach would be to set multi-part rates, one part of which would be proportional to the revenue that the lessee receives from channel use. An educational user who gains no revenue from the leased channel might pay a base price of, say, $30 an hour, while a pay-TV promoter might pay more than $100 an hour.\(^\text{15}\)

We have already noted that many of the uses for television in education can easily require considerably more than one channel. This is especially true if an attempt is made to tailor transmissions to the needs and interests of special audiences. In addition, a number of education agencies now use ITFS for transmission of educational programming. The NEA recommends that "The franchisee be required to connect with the master control of any ITFS system in the franchise area, as requested..."\(^\text{16}\)

SCOPE,\(^\text{17}\) a nonprofit education agency serving 72 school districts on Long Island, would go further in its model franchise:

the company must provide...distribution of one ITFS channel during the first five years of its franchise. The second five years, the company must provide a second channel, and during the third five years, a third channel.

Such a provision would probably require a special showing to the FCC. The commitment to educational uses of television demonstrated by the community's willingness to assume the effort and expense of installing its own ITFS system would provide strong support to the showing.

At the least, education agencies should have a guarantee that as cable leasing time becomes available they will have access to it. For example, ERDC has urged that educators have the right of first refusal on additional channels;\(^\text{18}\) this may not require FCC approval. Whatever can be worked out, the franchise should make explicit provisions for access to increased channel capacity by the education community and for rates for leasing time.

OTHER PREFERENTIAL ARRANGEMENTS

According to the survey conducted by the National Cable Television Association in 1972, cable operators routinely give preferential treatment to the education community in a number of ways. For example, of the 85 percent of the operators who provide regular service to schools, 70 percent\(^\text{19}\) provide free connection of schools to the cable system. Other aspects of this service are shown in Table 3.

With regard to connecting schools to the cable system, the NEA recommends that schools within 100 yards of the trunk line should be connected to it free and schools beyond 100 yards at cost, and that no monthly charge should be made for

\(^{15}\) Cable Television: A Handbook for Decisionmaking.

\(^{16}\) NEA, Cable Television.

\(^{17}\) SCOPE: Suffolk County Organization for the Promotion of Education. The quote that follows is from an article by SCOPE's director Roger W. Hill, Jr., "Educational Considerations of CATV Cablecasting and Telecommunications."

\(^{18}\) Shafer, A Cable TV Guide.

\(^{19}\) Figures have been rounded to the nearest 5 percent. The preliminary response rate to the questionnaire was about 30 percent, so finer accuracy is probably not justified.
Table 3
CHARGES OF CABLE OPERATORS WHO PROVIDE REGULAR SERVICE TO THE SCHOOLS

<table>
<thead>
<tr>
<th>Service</th>
<th>Charge for Service (percent of operators)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Free</td>
</tr>
<tr>
<td>Installation</td>
<td>70</td>
</tr>
<tr>
<td>Monthly service</td>
<td>90</td>
</tr>
<tr>
<td>Intrabuilding installation</td>
<td>30</td>
</tr>
<tr>
<td>Monthly service for multiple</td>
<td>95</td>
</tr>
<tr>
<td>connections</td>
<td></td>
</tr>
</tbody>
</table>

regular cable service to the schools. With regard to intrabuilding connections, the NEA recommends that the cable operator should provide these at cost, since "to request more would be an unreasonable financial demand upon some cable operators."20 These requirements are not far out of line with current practice. The FCC is silent on these points.

Only 30 percent of the cable operators reported that they charged schools the full rate for making multiple connections in buildings. We do not know, however, how many connections were made, on the average. It is surely less than all rooms, as even in school systems making heavy use of television (such as Hagerstown) only half of the rooms are connected.

Twenty-five percent of the cable TV operators reported that they made studio facilities or equipment available to the schools for production of school programming. Of these, 75 percent allowed schools to use the facilities or equipment without charge. If a large school population will use the cable system, the franchise should contain provisions for production arrangements suitable to the school's needs. NEA suggests that such arrangements are best made through mutual agreement at the local level. Although the FCC rules require the cable operator to provide production facilities for public access, he is not required to extend the same service to users of the education channel. "Still, cable operators want to encourage new applications, and they will generally be receptive to aiding school ... users. The amount charged for the use of facilities would be worked out in each individual case."21 NEA believes that the education community will be able to use the cable operator's studio facilities under the same arrangements as users of the public access channel.

20 NEA, Cable Television.
TWO-WAY USES

The FCC now requires that a "capacity" for nonvoice return communications be built into new cable systems in the major television markets. This means only that the system should eventually be able to provide return communications without "time-consuming and costly system rebuilding." Thus, most systems will probably not install even the capacity for return transmissions. If any services are provided, they will be low-cost data return links; these would be sufficient for such commercial applications as surveys, marketing services, and burglar alarm devices. Similar terminals could be used for instruction calling for selected response from the student, but educators should not expect to use this capacity for 5 to 10 years unless they will pay for the terminals themselves.

The NEA urges that when an education agency has devised a "viable plan for actual use" of two-way services more elaborate than simple data links, the cable operator be required to expand his system to provide these services:

The NEA feels that this is a very important requirement for schools, inasmuch as cable's most unique feature is its ability to make possible interaction between teacher and learner and between schools in widely separated locations. If cable were not to provide this feature, much of its attraction to the educational community would be lost.22

With this statement, the NEA appears to base much of its support for cable TV on its potential for spatial expansion of the teacher-student interaction. Although this would be a worthwhile objective in many situations, the argument overlooks the other features of cable TV that make it attractive for education.

TECHNICAL QUALITY

The FCC has set minimum technical standards for broadcast television signals carried by cable TV systems, and the operator must certify, annually, that his system meets these standards. There are, however, a number of older cable systems that deliver signals that would be unacceptable for color reception today. Subscribers who can receive broadcast television signals only via cable may tolerate such service, but this seems poor justification. In addition, no standards at all are set for nonbroadcast services. The franchisor is permitted to specify more stringent standards if he will enforce them himself.23

At the least, the franchise should contain provisions that will require the incorporation of new standards as they are adopted:

The rapid development of cable technology and new services makes it likely that a number of new standards will be set by federal and state authorities during the initial franchise period.24

22 NEA. Cable Television.
SUMMARY

If the franchise for a cable TV system has not been granted, members of the education community can influence the negotiations in their favor. They can

1. Consider forming consortia with other users or using interconnected systems to share the costs of programming, computer terminals, and the like.
2. Ensure that the franchise agreement makes specific provisions, as listed on p. 32.

Provisions that, in effect, return more than 3 to 5 percent of system revenues to the franchisor will require a special showing to the FCC for approval. In fact, the FCC's new rules specifically enjoin the franchisor from requiring cable operators to provide a large number of free channels or other preferential treatment to the education community. On the other hand, it is likely that the FCC will approve exceptions to its rules if education agencies can make a convincing case that (1) they will make significant use of the cable system (that is, that the criteria stated by the NAEB are satisfied) and (2) whatever preferential treatment they request will not unduly burden the cable operator. The test of significance will usually be more difficult to fulfill than will the showing of financial feasibility.

ASSISTANCE IN FRANCHISE NEGOTIATIONS

Because many education agencies lack personnel who are familiar with the technical and legal aspects of cable TV franchising, a number of agencies have formed to assist schools in taking advantage of this new technology. Some of these agencies are listed below:


Suffolk County Organization for the Promotion of Education, Roger W. Hill, Jr., Suffolk Educational Center, Stony Brook, New York 11790. Telephone: (516) 751-8500. Will advise on franchise negotiations for educational applications.

Office of Communication, United Church of Christ, 289 Park Avenue South, New York, New York 10010. Active in encouraging citizen participation in the communication field, particularly of minority groups. Will provide free literature on request.
Appendix

BASIC STATISTICS ON INSTRUCTIONAL TELEVISION
AND OTHER TECHNOLOGIES

Three Out of Four Public Schools Now Have TV Receivers and One in
Four Has Videotape Recorders (VTRs)

All Public Schools a
(81,000 schools, 100%)

75% have TVs
21% have no TVs or VTRs
22% have both TVs and VTRs
26% have VTRs

Public Elementary Schools
(56,700 schools, 100%)

77% have TVs
21% have no TVs or VTRs
19% have both TVs and VTRs
21% have VTRs

Public Secondary Schools
(20,200 schools, 100%)

69% have TVs
24% have no TVs or VTRs
29% have both TVs and VTRs
36% have VTRs

a The total for all schools includes an estimated 3,900 combined
elementary-secondary schools which are not included in data
by school level.

This appendix is reprinted from HEW, Bulletin, No. 7, February 9,
1971. The source of the material is the School Staffing Survey, Spring
1970. The survey was conducted by the National Center for Educational
Television receivers are more widespread among public schools in the United States for classroom use than either radios or videotape recorders according to principals' reports in the spring of 1970. Relatively few schools (9%) have closed-circuit/ITFS (Instructional Television Fixed Service) systems, but 11% of local public school pupils (which totaled about 44 million) are in those schools. A larger proportion of elementary than secondary schools have TV receivers, while the reverse is true for videotape recorders. See Table 1.

Table 1

DISTRIBUTION OF INSTRUCTIONAL TECHNOLOGIES

<table>
<thead>
<tr>
<th>Instructional Technologies</th>
<th>Number and Percent of Schools</th>
<th>All Schools</th>
<th>Elementary</th>
<th>Secondary</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Number</td>
<td>%</td>
<td>No.</td>
<td>%</td>
</tr>
<tr>
<td>Total schools</td>
<td>81,000</td>
<td>100</td>
<td>56,900</td>
<td>100</td>
</tr>
<tr>
<td>With TV receivers</td>
<td>61,000</td>
<td>75</td>
<td>43,700</td>
<td>77</td>
</tr>
<tr>
<td>With closed-circuit/</td>
<td>7,100</td>
<td>9</td>
<td>4,300</td>
<td>8</td>
</tr>
<tr>
<td>ITFS system</td>
<td>44,700</td>
<td>55</td>
<td>27,200</td>
<td>52</td>
</tr>
<tr>
<td>With videotape</td>
<td>20,900</td>
<td>26</td>
<td>12,100</td>
<td>21</td>
</tr>
<tr>
<td>recorders</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*The total for all schools includes an estimated 3900 combined elementary-secondary schools which are not included in data by school level.

*Closed-circuit/ITFS television system refers to broadcasting not receivable by the general public. This is televised instruction or information only made available to specified locations for specific individuals or groups. The use of a combination of a portable videotape recorder and/or accompanying single camera and television monitor sometimes used for observation or magnification purposes is also considered closed-circuit TV.

Statistics, USOE, with technical assistance on instructional technology from the Bureau of Libraries and Educational Technology, and with support from the Bureau of Educational Personnel Development and the Bureau of Education for the Handicapped. The National Center for Educational Research and Development supported the pilot survey which preceded the 1970 survey. The data presented in this Bulletin are preliminary. This is the first time these statistics have been gathered. No trends can be projected from them.

The spring 1970 survey sample consisted of approximately 1200 public elementary and secondary schools, representative of the nation's public schools by three strata: large cities (over 100,000 population
Table 1 presents the following highlights:

- 82% of all pupils are in schools having TV receivers.
- In large cities, more than 90% of public schools have TV receivers.
- In suburban areas surrounding these large cities, 47% of secondary schools, with 56% of secondary pupils, have videotape recorders.
- Only 13% of schools, mostly away from large cities, have none of the above forms of advanced instructional technology.

More Than 70% of Schools Having TV Receivers Use Educational TV

Telecasts from educational (noncommercial) television stations are used by 53% of all schools, or more than 70% of the schools that have TV receivers (which is 75% of all schools). In terms of pupils, about 57% of the nation's public elementary and secondary school children are in schools which use educational telecasts. More elementary schools than secondary schools report that they use educational telecasts. Proportionately, more schools in large cities use educational telecasts than either the metropolitan areas surrounding these cities or other areas of the country. The highest proportion of schools reporting use of educational telecasts is 90% for large-city elementary schools. See Table 2.

Few Schools Report Many Units Permitting Simultaneous Instructional Use

Among all schools, the median number of TV receivers provided for classroom use\(^2\) is 2, and the median number of radios is 1. Both of

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\(^2\) Principals were asked to report sets available to any of the staff for classroom use, excluding any sets owned by staff members or pupils.
Table 2
USE OF EDUCATIONAL TELECASTS

<table>
<thead>
<tr>
<th>Category of Schools</th>
<th>Schools (no.)</th>
<th>Percent with TV Using Educational Telecasts</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Total</td>
<td>With TV Receivers</td>
</tr>
<tr>
<td>All public schools</td>
<td>81,000</td>
<td>61,000</td>
</tr>
<tr>
<td>All public elementary</td>
<td>56,900</td>
<td>43,700</td>
</tr>
<tr>
<td>All public secondary</td>
<td>20,200</td>
<td>14,200</td>
</tr>
<tr>
<td>Large city public</td>
<td>11,500</td>
<td>10,500</td>
</tr>
<tr>
<td>Metropolitan areas of large cities</td>
<td>22,600</td>
<td>19,200</td>
</tr>
<tr>
<td>All other areas</td>
<td>46,900</td>
<td>31,300</td>
</tr>
</tbody>
</table>

The total for all schools includes an estimated 3900 combined elementary-secondary schools which are not included in data by school level.

these figures are influenced by the sizable proportions of schools reporting no TVs and reporting no radios.

Considering only the schools reporting at least one TV receiver, the computed median is 2.8; considering only those schools reporting at least one radio, the median is 1.6. The average number of pupils per school is 539 for all public schools--420 for all elementary schools and 852 for all secondary schools.

It is apparent that simultaneous use of television by different classes is necessarily very limited, at least for many schools. Further indications on this are given by the frequency distributions of schools and pupils by number of TV receivers available for classroom use, as shown in Table 3.

Three of four schools--accounting for 70% of all pupils--have four television receivers or less for classroom use. However, one of ten schools--accounting for 15% of all pupils--have 10 or more television receivers available for classroom use.
Table 3

NUMBER OF TELEVISION RECEIVERS FOR CLASSROOM USE

<table>
<thead>
<tr>
<th>Number of Television Receivers</th>
<th>Total Schools (81,000)</th>
<th>Total Pupils (44 million)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total (all numbers)</td>
<td>100%</td>
<td>100%</td>
</tr>
<tr>
<td>None</td>
<td>25</td>
<td>19</td>
</tr>
<tr>
<td>1 to 4</td>
<td>52</td>
<td>51</td>
</tr>
<tr>
<td>5 to 9</td>
<td>13</td>
<td>15</td>
</tr>
<tr>
<td>10 or more</td>
<td>10</td>
<td>15</td>
</tr>
</tbody>
</table>
GLOSSARY

Amplifier: An electrical device that amplifies the voltage, current, or power of an electrical signal.

Cable television, cable TV, CATV: A system for distributing audiovisual information via coaxial cable. Includes its signal receiving, amplifying, and controlling equipment and signal origination equipment. The system is used under franchise granted by a governmental body.

Channel: A frequency band providing a single path for transmitting electrical signals, usually in distinction from other parallel paths.

Closed-circuit television, closed-circuit TV, CCTV: A system for distributing audiovisual information via coaxial cable. Includes its signal receiving, amplifying, and controlling equipment and signal origination equipment. The system is under control of the user (see Dedicated system).

Coaxial cable: The most commonly used means of signal transportation for cable TV, consisting of a cylindrical outer conductor surrounding a central conductor.

Common carrier: Microwave service available at published tariff rates approved by the FCC.

Computer assisted instruction, CAI: The use of a computer in a tutorial mode. The computer adapts the presentation of instructional material on the basis of inputs from the student.

Dedicated system: A transmission system operated entirely for a single user or a small group of users. The user determines content, scheduling, points of reception, and other matters having to do with program transmissions.

Digital data: Data and information that can be represented by a set of discrete items such as the integers.

Drop: The connection between the cable TV system and the subscriber's TV set.

Educational television, ETV: All noncommercial television intended for general use. The term includes public affairs, cultural, educational, entertainment,
or other programming. The medium of broadcast television is generally used. The term includes ITV and PTV.

**Film chain:** A device for showing sound, motion pictures on TV.

**Head-end:** The electronic equipment located at the start of a cable system, usually including antennas, preamplifiers, frequency converters, demodulators, modulators, and related equipment. May also include the antenna tower and building housing the above.

**Independent random access:** Access to an item of instructional materials (including audiovisual materials) at random times and independent of the use of the item by another person.

**In-school project:** A project for transmitting television programming to the facilities of an education agency.

**Instructional Television Fixed Service, ITFS:** A service operated by an education organization to transmit audiovisual information to one or a few fixed receiving locations. Directional transmission is provided at frequencies higher than those used for broadcast television.

**Instructional television, ITV:** Television programming that has as its purpose the production, origination, and distribution of instructional content for people to learn. It is closely related to the work of organized formal education agencies.

**Local production:** Production of television programming by a cable TV operator, closed-circuit TV operator, ITFS operator, or other local agency, rather than by television networks or national agencies.

**Microwave:** Applies to transmission at frequencies well above the normal television frequencies.

**Narrow-band:** A range of frequencies less than 3000 cycles from lowest to highest.

**Out-of-school project:** A project for transmitting television programming to the home or other facilities that are not part of an education agency.

**Penetration:** The percent of total homes that have one or more television sets connected to a cable TV system, or being connected to a cable TV system, at the time of a survey.

**Plasma panel:** A computer terminal device for visual display. It consists of bubbles of gas that can be made to glow on and off by electric current.

**Preferential treatment:** The provision of cable system facilities or services to a subscriber free or at a lower cost than that charged the general subscriber.

**Public television, PTV:** ETV programming intended for the general community, as opposed to ITV.
Random access: Access to an item of instructional materials (including audiovisual materials) at random, as distinct from scheduled, times. Access may depend on whether the item is already in use by another person, however.

Trunk: The main cable in a cable system.

Two-way capability: An ability to transmit signals in both directions. Return signals may be digital, audio, or audiovisual.

Utilization: The use of televised programming for its intended (usually educational or instructional) purpose.

Utilization activities: Activities that abet utilization.

Video: Relating to or used in the transmission, reception, or recording of audiovisual information. Usually considered to be signals in the range of normal television frequencies.

Videotape: Magnetic tape carrying audiovisual information.
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———, *Ripples*, Fact Sheet No. 64.


