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PROGRAM ON APPLICATION OF COMMUNICATIONS SATELLITES
TO EDUCATIONAL DEVELOPMENT

WASHINGTON UNIVERSITY

Memorandum No. 71-6

October, 1971

INSTRUCTIONAL TELEVISION UTILIZATION IN THE UNITED STATES

James R. DuMolin

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INSTRUCTIONAL TELEVISION UTILIZATION IN THE UNITED STATES*

1. INTRODUCTION

The purpose of this memorandum is to summarize and evaluate various aspects of utilizing instructional television and to develop basic guidelines for future utilization of television as an instructional medium in education. The report is divided into four sections. The first discusses the role of technology in education, outlines the capabilities and limitations of television as an instructional media system and briefly reviews the state of ITV research efforts. Section two is designed to familiarize the reader with examples of various ongoing ITV programs, and to summarize the possibilities inherent in instructional television. Section three deals with the problems involved in the three stages of the ITV process; production, distribution and classroom utilization, which are necessary to deliver instructional programming to the student via television. Section four is a summary analysis which outlines probable trends in future utilization.

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*The author is grateful to his colleagues in the satellite-education program for many helpful discussions; in particular, Dr. Harold Barnett and Mr. Arthur Denzau and especially Dr. Robert Morgan for his detailed comments on the manuscript. The responsibility of the work remains that of the author. The author also wishes to thank Mrs. Emily Pearce and Mrs. Janis Lapp for their skillful typing of the manuscript.

SECTION I

2. INSTRUCTIONAL TELEVISION: A TECHNOLOGY IN EDUCATION

2.1 The Role of Technology in Education

In the United States we find that almost every aspect of our business, industrial, and cultural life is influenced by technology and that strong pressures exist for applying scientific knowledge to practical purposes in a particular field. Technology, per se, is neither good nor bad. It is the manner in which technology is applied in any given field which determines its value, positive or negative. To a great extent the level of application, utilization, or saturation of technology varies among social institutions depending on the level of resistance generated by the internal social structure of each institution.

In the field of education, resistance to innovative technology, or for that matter any form of change at all, has been extremely high. There are probably many reasons for this resistance but one possibility may lie in the explanation that education (and possibly religion) has perceived its role to be that of passing from one generation to the next not only the academic disciplines of the past but also the traditions, values, and morals from which they were developed. These values are not always consistent with the rapid and efficient introduction of technical innovation.

2.2 The Capabilities and Limitations of Instructional Technology

Considering the nature of education and that scientific technology has only been with us in its present high-power, mechanistic form since World War II, it is not surprising that technology has not yet been assimilated into education. However, this inability to change appears to run deeper than just an institution's slowness to adapt to new ways. It appears that education as a whole has not yet gained an understanding of both the potentials and the limitations of the technologies that can contribute to instruction and education. These limits have been outlined by Knezevich[1] and are briefly summarized here. Technology has the potential to force a re-examination of goals; to stimulate concern for performance; to automate certain learning tasks; to help individualize some aspects of student learning; to provide self-instruction in non-institutional surroundings; to strengthen research and management of instructional detail; and to improve educational counseling through rapid data processing. Technology also has its limitations in that it cannot determine values or goals, or define purposes; it cannot overcome poor utilization of its potential; and it may result in isolation of the learner by not allowing for socialization during the learning experience.

One would assume that once the basic potentials and limitations of technology in instruction were understood that the educational establishment would proceed towards optimal utilization. This, however, does not appear

to be the case. The Commission on Instructional Technology,[2] reporting in January of 1970, found that not more than 5% of classroom time at all levels of American education was in any way affected by the newer media of television, films, programmed texts, etc. In addition, a recent study of the utilization of ITV in sixteen urban centers shows that television utilization is less than 3% of actual classroom time.[3] When one takes note of the fact that in the four year period from Fiscal Years 1966 to 1969 it is estimated that the Federal Government spent 2.5 billion dollars on instructional materials, media and media related activities,[4] there is clearly a need to examine instructional technology's potential for impact on the education scene and the reasons for its limited success. In a study of ITV entitled "Learning by Television", Judith Murphy and Ronald Gross of the Academy for Educational Development state the present situation flatly:

> "After more than a decade of intensive effort and the expenditure of hundreds of millions of dollars, has television made a real impact on America's schools and colleges? Has it made a worthwhile contribution to education?
>
> "The short answer to such a sweeping question would probably have to be 'No.' Whether measured by the numbers of students affected, or by the quality of the product, or by the advancement of learning, televised teaching is still in a rudimentary stage of development. The medium can take credit for helping understaffed schools to cope with ever increasing enrollments. But television has not transformed education, nor has it significantly improved the learning of most students. In short, TV is still far from fulfilling its obvious promise. Television is in education all right, but it is still not of education."[5]

Concisely stated: "the current sum-total of all applications of television to instruction has not made any lasting, important or basic impact on any part of American education".[6] It appears that "we have not yet matched the state of technology's art with the state of education's art".[6]

2.3 The State of ITV Research Efforts

The gross underutilization of media cannot be attributed to lack of research. Much of the research in instructional media, prior to 1950, was centered on evaluative comparisons between a technical medium, film, slide, recording, etc., and an equivalent presentation by an instructor.[7] Almost all these studies, in the hundreds, show various advantages for audio-visual media over classroom instruction.[7] Although much of this type of work was of questionable value, it served as a basis for much of the audio-visual movement.

During the 50's it appears that studies by the military were the only systematic attempts to deal with a number of psychological, production, and utilization variables with any precision. Two major studies were the "Instructional Film Research Program", by C. R. Carpenter from 1947 to 1955,[8]

and A. A. Lumsdaine's research for the Air Force Research and Development Command from 1950-1957.[9] One of the criticisms of this period was that much of the research was undertaken in isolated situations without any system for getting the results to the teacher, software producers, and audio-visual coordinators for utilization.[10]

The "decade of educational television"[7] began about 1955 and was supported by such organizations as the Ford Foundation and the Carnegie Commission. Again a series of "evaluative" studies were done, much in the same style of the pre-1950 research on film. The most authoritative of these studies were: Kanner (1958) on the use of ITV by the Army[11]; Carpenter and Greenhill (1958) on ITV in the university[12]; Goapper and Lumsdaine (1961) on the relationship of student response in programmed instructional modes to televised instruction[13]; and Chu and Schramm (1967) a review of the literature[14]. In general, the findings from hundreds of studies show that ITV is of overall equal effectiveness when compared with face-to-face instruction.[15,16,17]

At present, much of the research being done is in trying to understand the relationship between various media and the performance of a specific psychological function.[7] These are generally stimulus, task, learner experiments designed to show more precisely media's role in learning. The following researchers are working in the field but there still remains extensive work to be done: Gagne (1965)[18]; Briggs, Campeau, Gagne, and May (1967)[19]; Salomon and Snow (1968)[20]; Briggs (1970)[21]; Allen (1970)[22]; and Salomon (1970)[23].

Another area of research presently under study is the relationship of media to the proper structure and sequencing of instruction.[7] Summary reviews of the work so far have been made by Briggs (1968)[24], Gagne and Rohwer (1969)[25], Frase (1970)[26], and Rothkopf (1970)[27].

The third major area of research is focusing on the relationships between media and individualized instruction, emphasizing the relation between the stimulus and the tasks as they apply to different learning aptitudes. Papers by Snow and Solomon (1968)[28], and Gagne (1967)[29] are recent works in this area.

2.4 Summary

In summarizing the material presented and reviewed in Section One we can say that technology, in itself, is neither good nor bad but that it is the manner in which it is applied which determines its value. It can also be concluded that instructional media, and its major component television, has not yet had a significant impact on the instructional process. Finally in reviewing the literature it becomes clear that, with a few exceptions, most of the research in instructional media has been fragmented with little coordination between the research projects and those people in the development stage who are producing software and using it in the classrooms. To understand utilization one must examine "development programs," i.e., programs involving ongoing instructional projects as a separate area.

SECTION II

3. THE DEVELOPMENT PROGRAMS

3.1 Preschool

In the United States there are over 14 million children between the ages of three and five. Research evidence is beginning to indicate that a child's future learning capacity is to a great extent determined by his activities at this age level.[30] The majority of this nation's school systems have no facilities or programs for children at this age level. The few facilities that do exist are located in urban centers, and these are generally only available for those families with financial resources. After recognizing these factors, it is not surprising to find that some of the greatest efforts in instructional television have been in this area. The two programs selected for review here, Sesame Street and the Appalachia Educational Laboratory (AEL) Early Childhood Education project, both have similar goals, and both use television, but present two very different approaches to the problem.

3.1.1 Sesame Street

In the fall of 1968 the Children's Television Workshop (CTW) began producing one hour television programs aimed expressly at preschool children. The programs were aired nationally and designed to improve children's understanding in eight major test areas; body parts, letters, forms, numbers, relational terms, sorting skills, classification skills, and puzzles.

A recently released report "The First Year of Sesame Street: An Evaluation" summarizes the major findings of the first 26 week season, as reported by Samuel Ball and Gerry Ann Bogatz for the Educational Testing Service. The researchers report three basic findings about the use of television for preschoolers:

> "First, children who watched the most learned the most." "Second, the skills that received the most time and attention on the program itself were, with rare exceptions, the skills that were best learned." "Third, the program did not require formal adult supervision in order for children to learn in the areas the program covers."[31]

The report goes on to detail other interesting points concerning the learning potential of young children which will have bearing not only on the use of television but in education in general. It was reported that of the age groups tested, three-year-old children gained the most from watching the program while five-year-olds gained the least. There was also a general tendency for greater improvement in certain subject areas as opposed to others. The child gained more with more viewing in the

areas of letters, numbers, and classification tests with the least gain with increased viewing on the body parts test. While Sesame Street did not require formal adult supervision to be effective it was found that those who watched the program most, thus gaining the most, generally had mothers who watched and talked about the program with their children.

In terms of using Sesame Street for disadvantaged children, two important findings were revealed. In the case of rural children who scored relatively low on pretests, great gains were made with viewing. This suggests that the television medium has potential for helping to equalize the disparities between rural and urban educational systems. Second, in the case of Spanish-speaking children:

> "An extremely provocative, although highly tentative, finding suggests that Sesame Street may be particularly effective for teaching some skills to children whose first language is not English and who do not test well or perform well in school. A very small sample of children from Spanish-speaking homes in the Southwest made more spectacular gains than any other sub-group of children."[31]

In general, while disadvantaged children started out with much lower achievement scores on the skills test, those who watched regularly surpassed the middle-class children who watched only sporadically. "It thus appears that such television programs can reduce the distinct educational gap that usually separates advantaged and disadvantaged children even by the time they enter first grade."[31]

While Sesame Street has been shown to be effective in teaching certain skills to young children through the television medium, it has recently come under criticism by educator John Holt. According to a recent review:

> "Holt believes that, for all its apparent early success, 'Sesame Street' will prove a disappointment in the long run. 'From the point of view of education, learning, instruction' he writes, 'much of what is done on 'Sesame Street'...seems to me to be clumsy, misleading and just plain wrong, typical of the worst things done in schools.' He faults the show for using visual tricks 'to sweeten the learning pill,' then falling back on spoken words for 90 percent of its teaching. And he maintains that the program relies far too much on adults explaining things to children, instead of building up the kids' self-esteem by allowing them to find things out for themselves. On 'Sesame Street,' Holt complains, 'we rarely see children doing anything'."[32]

Mrs. Cooney, president of the Children's Television Workshop, replies to Mr. Holt's criticisms as follows:

> "John Holt's criticisms of the show she finds a good deal more relevant. 'We have arrived at many of the same conclusions that he did,' Mrs. Cooney says. 'For example, we want to have children answer questions on "Sesame Street." Holt is not saying, 'Let's not use TV,'; he's saying, 'Let's make it better.' We agree'."[32]

Sesame Street was developed to a large extent with the idea of reaching disadvantaged children in urban areas. Its production settings and atmosphere are largely urban in nature so that children from inner city areas may relate to it more easily. It is also primarily a one dimensional approach to learning, relying on television as its basic presentation method. In contrast, our next review deals with a program which uses television as one of four presentation methods.

3.1.2 Early Childhood Education Project

Beginning in 1968 the Appalachia Educational Laboratory[30] in Charleston, West Virginia, started using television as part of a program designed to reach children in rural areas where access to preschool programs is generally unattainable due to lack of facilities and poor transportation. The AEL program is being tested and developed to include four dimensions of instruction.

The first is a daily television program for home viewing. The second involves a home visitation program by specially trained paraprofessionals who have weekly personal contact with both parents and children to help aid and reinforce the child's learning. The third aspect involves a mobile classroom which visits the children's area once a week. This is designed to give the child an opportunity to work and play cooperatively with other children. Finally, the fourth part of the project uses a summer transition program, similar to Headstart, for those children entering school in the fall.

While at present only 300 children are involved in the AEL's testing and development, research shows that 95% of rural Appalachian families own television sets and therefore are potential users.[30] Other school districts have already shown interest in using this approach to preschool learning. However, even though at this time it appears to be a more comprehensive approach to solving the education problems of young children, it has not yet been refined enough to determine if its per pupil cost will be economical enough to warrant widespread use.

3.2 Elementary and Secondary Education

On the level of primary and secondary schooling, education has been faced for many years with the choice as to which road it will take to meet the rising demands made upon it. Chart No. 1 outlines the situation and summarizes the possible solutions generally available to public school systems.[33]

3.2.1 Hagerstown, Maryland

One of the first school systems to choose the road of innovative scientific improvement by utilizing ITV to meet its changing needs was Hagerstown, Washington County, Maryland. Of the 352 teachers in the elementary school system in 1956, 97 had no B.A. degrees and 75 only emergency teacher certificates.[33] A survey of teachers' skills showed

Chart No. 1*

A CHOICE OF DIRECTION

THE PRESENT SITUATION

More children to educate.

More knowledge needed by everyone.

More years of education sought by each generation.

More competition for tax funds.

Greater demands by teachers for higher wages and benefits.

Greater demands by parents for better utilization of resources for improved education.

An emerging awareness of students to their rights to a relevant education by qualified instructors.

WHICH ROAD?

DESTINATION

Adapting To Emergencies

Increase standard class sizes.

Eliminate courses and services.

Hold double sessions.

Lower standards in all of selected aspects of programme.

Employ teachers with lower qualifications.

Reduce training teachers receive.

Increase number of hours that teachers work.

Base salaries largely on supply and demand.

DESTINATION

Making Scientific Improvement

Conduct experimental studies.

Utilization of teacher assistants.

Reorganization of administrative patterns.

Functional definitions of teacher roles and competencies.

Utilization of material aids to instruction.

Improved utilization of physical plant.

Revision of curriculum.

Practices for better recruitment and retention of teachers.

*This chart which was originally presented by H. R. Casseier [Ref. 33] has been updated and revised by the author.

that most lacked training in arithmetic, science, arts, and music. For these reasons a grant from the Fund for the Advancement of Education established an ITV system linking 48 elementary and secondary schools by coaxial cable so that 18,000 pupils in 1200 classrooms could receive programming from any one of six studios simultaneously. By 1959 over $1.5 million was spent on ITV in Hagerstown.

As a result of these expenditures, the junior high school system used from seven to eight teachers less than would ordinarily be the case.[33] In elementary school, three teachers were able to give satisfactory education via television in art and music which would otherwise have required 33 teachers representing instructional benefits equivalent to $171,600 for an actual expenditure of $17,680. In general, the ITV system has enabled Hagerstown to upgrade and increase its educational effectiveness without undue increases in its staff. Production staff was drawn from teachers already working in the system and technical staff from junior college students eager to practice their talents.

In the past, studies have shown that students generally learn equally as well with TV as without. However, extended evaluation of the Hagerstown project has shown that pupils often achieve better in television classes than in conventional classrooms.[34,35] The two most important factors contributing to the success of ITV are: first, that to date, television has been used more extensively over a longer period of time in Washington County than anywhere else; and second, that television teachers there try to use the medium to its greatest potential by not employing it to repeat traditional classroom methods but to provide the classroom with instructional information the teacher cannot provide.[34] This thorough integration of the television medium into the everyday curricula has led to a high degree of utilization and the successful adaptation of technology into the educational process.

3.2.2 The South Carolina ETV Commission

In comparison to the Hagerstown program where TV is used on a county basis primarily for instructional purposes, the state of South Carolina has committed itself to providing a statewide system of ETV geared to reach as many levels of the population as possible. Five broadcast stations serve as a base for both a closed circuit network and an open broadcast system. On the closed circuit level, 3200 channel-miles of telephone company facilities capable of carrying six video channels simultaneously, 24 hours a day, link 287 schools, hospitals, police departments and other institutions.

During school hours, the closed circuit system is reserved solely for transmission to secondary schools. Because secondary schools have a curriculum of from 35-50 courses, multi-channel transmission and reception is exceedingly important. Demonstration projects in four counties have shown that only multi-channel distribution is capable of resolving the scheduling problems which previously limited television's effectiveness on the secondary level.[36] While almost half the secondary schools are equipped with closed circuit systems, multi-channel service is available to only 12% at this time.

To reach the 950 elementary schools, an open broadcast network is felt to be a more efficient and economical mode of transmission. Fewer lessons are offered at the grade school level and the flexibility of a multi-channel system is not yet felt to be necessary at this point. At present, 95% of the state population can be reached by this single-channel, open-broadcast network.

At the end of the 1969-70 school year, public school ETV enrollments in South Carolina totaled 472,362.[36] Over the years, ITV has gradually assumed the major responsibility for instructional content for arithmetic, and mathematics for grades 4-12, and physical sciences in the high school program.[37] In 1970, 62 series were available for transmission to public schools covering the field of mathematics, science, language arts, foreign languages, art, music, and social studies.[36] Using the closed circuit system, the University of South Carolina provides a complete MBA program and is planning to offer continuing education courses to teachers, guidance counselors, and nurses.

3.2.3 The Chicago Cluster System

As a counterpoint to the centralized instruction provided by the Hagerstown and South Carolina systems, activities in the Chicago School System point out how ITV can be decentralized to meet specific needs within a large system.[38] Although district-wide ITV has been in use in Chicago schools for some time, five inner-city ghetto schools which share certain ethnic and cultural characteristics decided to join together to create programming more relevant to their needs.

The project which is now about five years old includes two closed-circuit channels and twenty-eight TV teachers who present 30 television series to 7000 students in grades K-6. Pre- and post-tests comparing pupils' achievement with previous achievement levels in the same school, as well as schools without television, show a "marked improvement" in pupils' attitudes towards learning and achievement.[38]

At present, equipment is being installed in 26 public schools and 15 parochial schools to form four more clusters involving 30,000 students. This decentralization allows each group to originate its own curriculum. All clusters are presently in Negro communities but differ in rural vs. urban background, regional dialect, and housing conditions. Decentralization has led to a noticeable improvement in teacher performance and increased professional interest.[38]

The estimated cost of the decentralized cluster approach is about $21 per elementary student annually. This is about 3.85% of the total $546 per pupil annual cost in Chicago.[38] Advocates of the project feel that the choice between centralized and decentralized production facilities need not be required. It is felt that an elaborate central studio could be used to produce special segments, single concepts, science demonstrations, etc. which could be distributed to clusters for coordination with local situations. The use of VTR equipment at the cluster level makes it possible for local control of display time and provides for repetition of programs when necessary for scheduling.

3.3 Higher Education

3.3.1 Chicago City Junior College Program

Under a supporting grant from the Fund for the Advancement of Education, the Chicago City Junior College System instituted a series of televised credit courses for off-campus students. Since 1956, over 120,000 TV students have registered for courses and to date, 1500 television students have completed degrees.[37]

During the first three years, the average credit enrollment per semester was 1,261 persons for 2,321 course registrations, equivalent to a full-time enrollment of 456 college students. To handle this increase a conventional college would have required a professional staff of at least twenty-five and a building of moderate size to render equivalent service.[39] This does not take into consideration that the average not-for-credit enrollment per semester was 3,550 individuals for 5,521 course registrations.[39]

While the majority of instruction was transmitted via television, the amount of face-to-face interaction and feedback was related to the course objectives. In some cases this was limited to twice weekly telephone conferences.[37] In the case of foreign language, telecourses were supported with eight bi-weekly, two-hour sessions for conversation and drill. Lecture courses generally held two one-hour conferences and two one-hour examinations.[39]

A survey of enrollment[39] shows that the TV college was reaching those who might never have otherwise continued their education. Two-thirds of the adult enrollment were working toward an Associate in Arts degree. About a third were interested in teaching. Two-thirds were women. The average age of all students was between 32-35. Many were homemakers, the physically handicapped, and by 1969, 29 convicts in state prisons had earned degrees.[37,39]

In the early stages of the project the cost per credit student of ITV instruction remained higher than for the classroom cost for an equal number of units of credit instruction.[39] However, in recent years the cost of a credit hour on TV is down to $23.43 as compared to $37.21 for on-campus instruction.[37]

3.3.2 Michigan State Program

M.S.U. has utilized closed-circuit TV on campus for instruction since 1964. At present, four studios distribute instruction to 135 viewing areas located in classrooms, laboratories, and dormitory classrooms via an eleven-channel RF distribution system.[40] Total M.S.U. credit hour output for 1968-69 via CCTV was 86,376 student credit hours, or 5% of the total graduate and undergraduate credit hours produced by the university for the year.[41] CCTV carried 13.3% of all freshman and sophomore student hours produced by the university.[41] A total of 113 courses used CCTV on a regular basis and 158 on an occasional basis.[40]

Several of the courses at M.S.U. have television enrollments of about 800 students each term; teaching these courses by traditional methods would be almost impossible except in the largest auditorium classes. Besides replacing large lecture classes, television is being used in such areas as teaching Fortran, music appreciation, electrical engineering, chemistry lab techniques and typing.

M.S.U. has had difficulty in assessing costs of ITV instruction because each course has different influencing costs. Two careful studies indicate that ITV makes large lecture courses cheaper than traditional instruction when enrollments exceed 500.[40] In courses with fewer students, repetition of the course on video tape can justify high initial cost. At the end of two years of repetitive use, the cost of an ITV music course was down to $6.29 per credit hour versus $11.98 per credit hour for non-TV instruction.

3.2.3 Oral Roberts University

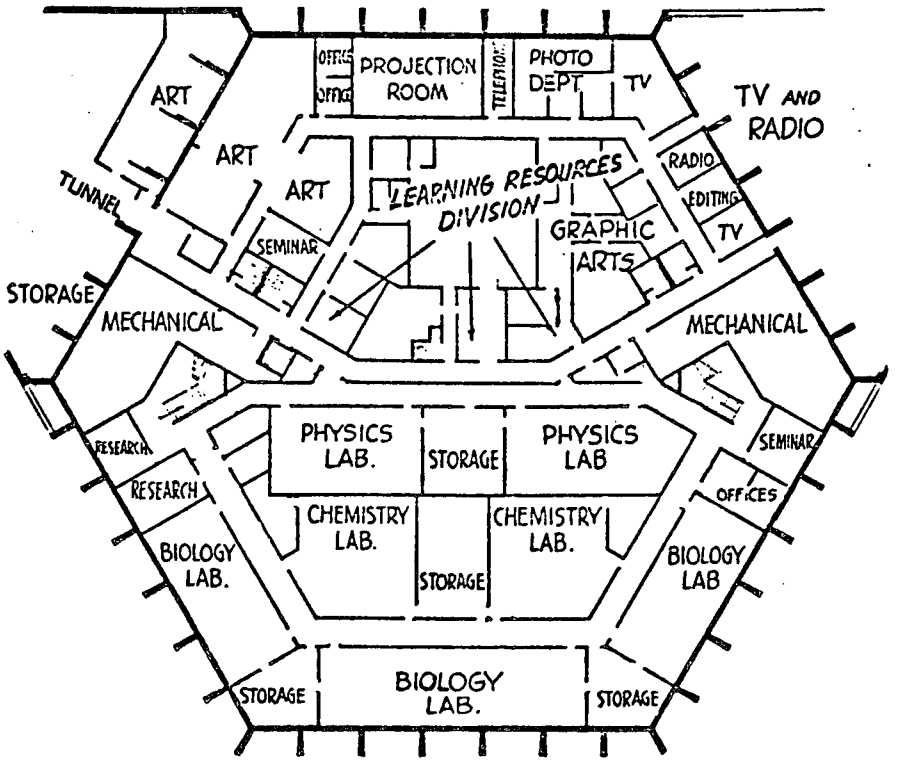
What has been described as one of the most advanced users of educational technology is Oral Roberts University, a private non-sectarian coed institution in Tulsa, Oklahoma.[42] O.R.U. has consolidated most of its instructional resources into a single multi-purpose six story building which includes a 500,000 volume library, a closed-circuit television production center and an FM radio station. This Learning Resources Center, designed by RCA, is equipped with a complete computer-controlled, dial-access audio-video system. The facility allows a student sitting in his carrel to select prerecorded audio or video programs, and to view programs originating in classrooms or laboratories. Lecture halls, classrooms, and laboratories are also equipped with TV receivers so that large groups can see and hear playbacks of recorded lessons or so that the instructors can integrate supplementary material into their presentations.

Special laboratories are equipped with "Tele Roamer" units which allow close-up views by students of experiments being performed by an instructor. The Center also includes a performance-analysis studio where a student of drama, speech or music can get an instant replay of his performance for analysis and evaluation. Each teaching station is equipped with an automatic self-folding lectern, an overhead transparency projector, a 35-mm slide projector, an audio tape recorder and a magnetic chalkboard, thus giving the instructor flexibility in presenting his material.

Oral Roberts University is one of the best examples of an educational institution which has adopted and implemented instructional technology in all aspects of the learning process from individual instruction to mass distribution.

Figure 1*

DESIGN PLAN OF ORAL ROBERTS LEARNING RESOURCES CENTER



3.4 Continuing Education

3.4.1 Lowry Technical Training Center

Probably one of the largest users of educational technology is the United States Military. At the Lowry Technical Training Center in Denver, Colorado, students have a 6-hour academic day divided equally into television and laboratory instruction.[43] The TV instructor discusses, explains and demonstrates the equipment and skills needed to understand and operate exceedingly complex equipment. The students then spend the rest of the day in the lab repeating the previously discussed procedures under the guidance of assistants and the general supervision of the TV instructor who visits the classroom.

It is felt that television used as a demonstration tool for complex technical work is much more effective than construction of large and expensive models for demonstration. In addition, by using two TV monitors, one with an overview of the project and the other with a close-up of the specific area under discussion, the student is better able to understand complex relationships.

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*Figure taken from Connochio, T. D., ref. no. 42.

One of the primary reasons for utilizing TV was to solve the basic problem of a shortage of qualified instructors. Due to the constant turnover of men, only 20% of the instructional staff was truly qualified in terms of both classroom and field experience. By putting this 20% in front of the camera and using the remainder as assistants-in-training, the problem was solved.

During the development of the Lowry program, many other important advantages of using television became apparent, including: increased instructor self-awareness; standardization of curricula; benefits of rehearsal; higher instructor morale; ease of cross-training; ease of supervision; savings of time in showing training films; ease of using special effects; and recording capability.

3.4.2 Community Oriented TV Programs

The National Education Association has sought for some time to find ways to utilize television to help solve many of the problems of urban life. They have asked questions about television's ability to contribute to understanding the problems of urban communities. How can it be used to bring about constructive local action? How can it be used for adult education and community development? In a report "Using Television for the Improvement of Urban Life", many of these questions are asked and answered, and procedures are outlined for the effective utilization of television. Also discussed in the report[44] were current action-oriented community TV projects. These include, Operation Alphabet, a 100-lesson television series designed to raise adult illiterates to a basic third-grade level and to instill in them enough self-confidence to enroll in public adult education classes. Another program, Focal Point, Baltimore: A Continuing Conference on Community Progress, is designed to teach leadership training techniques. The program combined 26 TV programs on current urban problems, with discussion groups and leadership conferences.

In St. Louis, Metroplex Assembly, a new kind of "Town Meeting", used television to bring together concerned people to view and discuss programs on current problems in the St. Louis area. After viewing each program, groups call in questions to a panel of experts who return to the air to answer questions via television an hour later. In Boston, Leadership Training Project, a ten-week series, was presented to improve the quality of leadership in voluntary community organizations. Using the television program as a base, nearly 400 study groups were formed and directed by trained leadership counselors.

3.5 Summary

After reviewing the on-going programs it becomes obvious that television can be and is used to meet a wide spectrum of both formal and informal educational needs. The Sesame Street and Appalachia Educational Laboratory programs demonstrate not only television's instructional potentials but also its ability to cut across the barriers of social status, poverty and racial prejudice to ease disparities in educational opportunity.

Again on the elementary and secondary levels it becomes obvious that television cannot only raise the quality of instruction but also serve as an agent of change to promote improved administration and teaching methods and better utilization of physical resources. In terms of higher education, the effects of television have brought about substantial savings in cost and extended the range and influence of the university beyond the campus into the community. The flexibility of the television medium is demonstrated by its ability to facilitate communications within the community, stimulate interest and action on local problems, and even promote a two-way dialogue between community groups and the experts capable of giving them leadership.

The question must now be asked that if television's potential as an instructional tool is so great and if it has the capability of reaching beyond traditional educational barriers, why then in its almost two decades of existence has it had only a marginal impact on the educational structure and institutions of this nation? The failure of American education, as a whole, to accept, utilize, and optimize this new technology is a complex problem which must be understood if our educational systems are to meet the rising demands placed upon them by society and industry's need for better educated and informed individuals. Section III of this report will try to deal with the multiple problems of underutilization and resistance to instructional television.

SECTION III

4. UTILIZATION OF AND RESISTANCE TO INSTRUCTIONAL TELEVISION

4.1 Deterrents to Effective ITV

The purpose of this section is to investigate the basic reasons for resistance and underutilization of ITV in education with primary emphasis on the public school system. Chart No. 2 lists the major deterrents to effective utilization of television as compiled by a survey of instructional television in sixteen urban centers.[3] While Chart No. 2 reveals broad areas of discontent, a more detailed examination of the problems involved in delivering instructional television programming to the student is necessary. The examination can be broken down into three phases of interest: the production of the material in the studio, the distribution

Chart No. 2*

DETERRENTS TO MORE EFFECTIVE USE OF BROADCAST TELEVISION BY CITY

	PROGRAM CONTENT	RECEPTION	SCHEDULING	TEACHER USE	TIME, STAFF, MONEY	POLICY	
Baltimore	6	11	7	3	1	2	30
Boston	8	5	1	4	1	2	22
Buffalo	9	5	3	5	1	—	23
Chicago	2	—	3	1	1	—	7
Cleveland	11	14	6	2	1	—	34
Detroit	3	5	7	7	—	2	24
Los Angeles	11	11	10	13	2	—	47
Memphis	4	3	4	2	—	—	13
Milwaukee	11	1	4	6	2	—	24
New York	2	5	8	4	5	—	24
Philadelphia	2	—	1	9	4	1	17
Pittsburgh	7	11	10	4	2	3	37
San Diego	2	5	6	8	2	—	27
San Francisco	12	10	8	1	3	—	34
St. Louis	14	13	7	5	—	4	48
Wash. D.C.	—	—	—	—	—	—	—
No. of Responses out of 218 Interviews	105	98	85	74	25	14	*401*

Most frequently mentioned deterrent
2nd most frequently mentioned deterrent
3rd " " " " " " " "

*Taken from Benton, C. W. [Ref. No. 3]

of material from the production center to the classroom, and finally the utilization of the program in the classroom by the teacher or student.

4.2 The Production Phase

In interviewing teachers on their attitudes towards ITV, it was found that it was not the use of the television medium, but the content and quality of the programming that they most frequently criticized.[3] Teachers reported that the principal block to ITV utilization was the inability to obtain enough high quality software in sufficient quantity to maintain continuous use.[45] There is little doubt that a few school systems have been able to develop some especially outstanding program material. However, when the entire program needs of a school system are examined, total fulfillment on the local level appears to be almost impossible.

4.2.1 Software Requirements

In his study of the costs of educational media systems, Sovereign[46] estimates that between 1,000 and 1,600 program hours are required for a year of educational use in regions which vary in size from a local school district to a region of approximately 10 million students. These calculations are based upon an assumed television use during 10% of the students actual classroom time. Sovereign's estimates and those which follow in this Section exclude higher education.*

Much larger estimates of programming requirements are arrived at if one follows the approach of Wagner[45], who estimated that a minimum of 50,000 hours of instructional television would be needed to satisfy the needs of a national system. The fundamental differences which account for the increase over Sovereign's estimates in Wagner's study are 1) it is assumed that one-third of the average elementary school day is devoted to televised instruction and 2) that a variety of teaching approaches will be required. For example, in the illustrative calculation shown in Table 1, it is assumed that three ability tracks and two pedagogical approaches will be required for grades 1-12 to satisfy the nation's pedagogical needs. This increases the program requirements by a factor of six over a one-track, one pedagogical approach curriculum. The total elementary and secondary requirements in Table 1 come to 6660 hours of course material for the 180-day academic year. In Hagerstown, Maryland[35], it was reported that televised instruction constituted 10-14% of classroom time in elementary school, 35% in grades 7 and 8, and 17% in grades 9-12, somewhat higher than Sovereign's estimates but nowhere near one-third utilization at all grade levels. However, the Hagerstown data does show the potential utilization level if adequate software can be produced and scheduled.

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*Throughout this Section rough quantitative estimates are made to give insight to the magnitude of the problem. They are not to be taken as representing a detailed analysis of software production requirements.

TABLE 1

ANNUAL SOFTWARE COST ESTIMATE

FOR INSTRUCTIONAL SATELLITE SYSTEM

LET TV = 1/3 of 6 HOURS PER DAY CLASSROOM USE

FOR SIX-GRADE SCHOOL = 60 HOURS PER WEEK OF PROGRAMMING
= 2160 HOURS PER YEAR

FOR SECONDARY SCHOOLS 100 COURSES OFFERED

IF EACH 45 MINUTE COURSE UTILIZED 15 MINUTES OF TV:

NEED 25 HOURS PER DAY OF PROGRAMMING

OR = 4500 HOURS PER YEAR

TOTAL = 2160 + 4500 = 6660 HOURS PER YEAR

IF ASSUME 3 ABILITY TRACKS AND 2 ALTERNATIVE PEDAGOGICAL APPROACHES:

= 40,000 HOURS PER YEAR

AT A PRODUCTION COST OF $40,000 PER HOUR:

COST OF 40,000 HOUR INVENTORY = 40,000 HOURS x $40,000 PER HOUR

= $1.6 BILLION

IF ASSUME A REPLACEMENT RATE OF 20% NEW MATERIAL PER YEAR:

ANNUAL COST = $320,000,000 PER YEAR

4.2.2 The "Cottage Industry" Approach to ITV

The quantity problem leads directly to the quality problem: how to produce enough high quality programming to make extensive use of the medium worthwhile. The major deterrent to quality software in the past has been that program production was basically a "Cottage Industry", with each school system or even individual schools within a system trying unsuccessfully to satisfy their local needs. Table No. 2 shows that in terms of program sources, UHF/VHF* systems relied most on national ITV sources followed by local production, whereas CCTV** systems relied most heavily on local production, and ITFS*** was almost equally divided between local production and national sources.

TABLE 2††

PROGRAM SOURCES - ITFS, CCTV AND VHF-UHF: 1970

	ITFS	CCTV	VHF-UHF†
	%	%	%
Local Production	42.1	54.6	27.0
Direct Exchange	2.1	2.1	4.1
State Networks	6.1	1.8	16.4
Regional Networks	1.6	3.2	5.6
PTV Scheduled Service	0.6	6.1	4.6
PTV Library Service	0.8	3.4	2.2
National ITV Sources	41.7	13.9	35.8
Others	5.0	14.9	3.6
Totals	100.0	100.0	100.0

†ITV on VHF-UHF Educational Broadcasting stations represented 48.5% of total broadcast time.

††This table was compiled by the author from data found in Reference No. 53.

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*Ultra High Frequency/Very High Frequency

**Closed Circuit Television

***Instructional Fixed Television Service

Much of the programming produced at the local level is wasted repetition of live broadcasts with little or no critical evaluation. Determining quality is, in many cases, a highly subjective process. There is not always a correlation between the teacher or student liking and enjoying the program and its instructional effectiveness.[14] Investigators have found that "students simply 'turn off' a program they don't respect, while teachers resist having to use or relate to it". The question is not "whether a program is really good or not, it must seem to be good, or it will not be utilized."[45] In any case there seems to be a lack of formal procedure for evaluating both the educational value of program material and its impact on the student.

To a great extent the localism which perpetuates the "Cottage Industry" approach to ITV is based on the historical attitude most American schools have about their institutional images and their pedagogical approaches to education. Many systems place control of ITV production and planning in the hands of local teachers because they fear the teachers would not accept material produced outside of the local district. However, it has been shown that in school systems where the administrators alone made the decisions to adopt television, the teachers use the medium as frequently as when the decision was made jointly between teachers and administrators.[49] In addition, studies have shown that involvement of classroom teachers in the production process can actually be counter-productive in both program quality and teacher acceptance.[45] It was found that most teachers neither desire nor have the talent to get involved in ITV production. Many teachers have found it difficult to coordinate program specifications and personal pedagogical beliefs with professional production views and practices. The result is often frustrated teachers and poor quality materials.

As school systems gain more experience with ITV they begin to understand the rationale and economics against local production.

> "There is great economic waste in the present development of instructional television for public school education, with almost every school group which is currently involved in television producing all of its own programming. Our schools do not each produce, separately, all their own textbooks, but utilize those that are produced and distributed nationally or regionally. The time must soon come when our schools can satisfy their needs for the instructional resources they use via television distribution facilities without each separate school having to duplicate what every other major system in the country is also doing."[48]

4.2.3 National Production Requirements and Cost

If one accepts the estimate of programming hours for a national system as shown on Table 1, 40,000 hours, the cost to produce this quantity of high quality material becomes sizable. Although until recently, instructional television programming costs have been of the order of $1,000-2,000/hour or less, there has been a growing realization

that quality instructional and public television requires budgets that are more nearly those of commercial television.* If we take the figure of $40,000 per hour, which is the estimated production cost of Sesame Street[50], a software production estimate of 1.6 billion dollars is obtained for a large-scale ITV system. If one assumes an annual requirement of 20% new programming per year to maintain an inventory of 40,000 hours of current program material, this represents an investment of 320 million dollars per year. Other proposed estimates of cost range from $3,000 to $10,000 to $30,000 per hour for high quality programming which in some cases could even include various two-way response systems.[47] These figures are sizable ones which could be potentially attractive to commercial as well as non-commercial audio-visual producers if an economical and efficient distribution method could be found to market the materials.

It is instructive to compare the above costs with costs associated with storage on video tape. It is highly unlikely that any single school could afford to produce or store the estimated 6,660 hours of material. Even at the district level, the cost of storing this amount of tape would be sizable. For example, if one uses professional quality 2" Quad tape, the tape cost is $200 per hour of programming. This cost could be reduced to $60 per hour if 1-1/2" Helical Scan tape is used and might even be reduced further with the advent of tapes for low-cost home video recording units and the development of new high-energized video tapes. If we use the $60 per hour figure, the tape cost for 6,660 hours of programming (one track, one pedagogical approach) is $400,000. For some 20,000 school districts in the U.S., this represents an investment of 8 billion dollars.

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*The following testimony by Father John Culkin speaks eloquently to this point:[51] "The programing that the student sees on commercial television costs approximately 80,000 dollars.... The production cost for the average half-hour program being watched by students in school is less than 150 dollars. So he lives on whatever appears on commercial television, not just entertainment, and which is produced for him by people with 80,000 dollars per half hour and then he goes to school where the real important things are supposed to be happening and he sees programming which costs 150 dollars per half hour to produce and there is a difference not only in the budgeting but in the quality and competence and zap of the programs. ...all I am suggesting is that we bring the educators into the real world where they can be the slightest bit competitive for the attention of the student. It is not even a real ball game now. What you get for 150 dollars per half hour is not very good instruction and it is not very good TV and all the rhetoric in the world about these new media and their power to do things for kids will be completely useless unless we implement this very unromantic area of television called school television because nobody cares very much about it."

4.2.4 Barriers to Program Sharing and Exchange

To solve the problem of producing enough programs, many institutions have turned to outside sources for material. Referring back to Table 2 we can see that ITFS and CCTV systems, those primarily concerned with instructional television, still rely mainly on local production. This is because the use of commercially produced programs is principally blocked by their high cost. Even when schools do buy commercial programs they often find the material dated in content, of low quality, or so watered down for general appeal that it is practically useless.

Program sharing and direct exchange is also kept to a minimum because large scale exchange of material is both costly and frustrating due to the complex copyright laws. Few schools have the technical resources or the money to produce all the visual aids necessary for quality programming. For example, a biology program with a sequence showing the movement and digestive processes of the amoeba would be difficult and expensive to produce on the local level. To solve the problem, commercial film clips of these difficult scenes are integrated into the program after paying a fee and securing permission from the dealer. Problems arise when the program is exchanged between school districts and it again becomes necessary to secure permission from the owner of the film clip to use the program. In 1967, Dade County, Florida paid more than $30,000 in performance rights for films and in Miami, schools had to deal with 480 different companies with 480 different policies.[45] In addition, there are no standard policies on editing permission or the rights of a school to dub a film or video tape with a local narrative. In addition to the rights of the film clip owner, there is also the question of the residual rights and compensation of the local television teachers when their programs are transferred to or reproduced in another school system.

There is also a serious problem with the incompatibility of the technical hardware made to deliver the program material.

> Most educational hardware is not custom-built for education but a (lucrative) spin-off from the consumer industry. Evaluation of hardware is getting more and more complex and many media people do not have the requisite engineering background. If the media man has successfully located the material, retrieved and evaluated it, scrounged enough dollars to buy or rent it, the chances are then that he cannot use it. His videotape recorder, for example, may not be compatible with the machine on which the material was recorded in the first place. In a Connecticut school district of 22 schools there are EIGHT different audio systems--all incompatible with each other.[52]

4.2.5 Summary

It appears that it is not the television itself but also in part the quality of the material presented which determines utilization. Poor programming is "turned off" by students and shunned by teachers.

School systems have generally found it almost impossible, both financially and administratively, to produce quality material in enough quantity to meet their needs. When institutions try to expand their range of programming they are blocked on the commercial level by high cost and poor quality. Due to complex copyright laws which demand permission from the film clip dealers before clips can be transferred and the lack of standard policies among dealers concerning fees, utilization rights, editing and dubbing, any large scale exchange of programming between school districts is both time consuming and expensive.

The use of different types of recording equipment during the production stage has made compatibility of materials a serious problem at the utilization phase. This often prevents program-sharing between institutions and is expensive in that it reinforces uneconomical local production.

4.3 The Distribution Phase

The distribution phase of the ITV process, that is, the actual delivery of the program material to the classroom teacher, may prove to be the major bottleneck to ITV expansion in the future. The primary problem is making the program material available to the teacher at the right time in the educational process. The distribution of programs from the district production center or library can be accomplished through three basic methods of transmission: UHF/VHF, ITFS, and CCTV.

4.3.1 UHF/VHF

ETV stations broadcasting in the UHF/VHF frequencies are generally single-channel, community-oriented operations which broadcast instructional programming to local schools during the day and public service and cultural materials to the community the rest of the time. Table No. 3 shows that the budget allocations for ITV programming vary depending on the ownership of the stations.

TABLE 3

ITV BUDGET ALLOCATIONS IN 1970[53]

UHF-VHF Stations Ownership	Average Annual ITV Budget
Community	$202,800
State	150,560
School	134,000
College	89,730

Community owned stations reported larger ITV budgets than most of the others with a mean for all UHF/VHF stations of $153,019.[53] The average expenditures per pupil for 1966-67 in sixteen urban areas, most of which use UHF/VHF transmission, were $1.15 for elementary schools and $.82 for secondary schools.[3] When submitting hourly program cost estimates, excluding recording and transmission cost, the median cost reported by 75 stations in 1968 was $910; however, 25 of the 75 stations estimated $2,000 per hour or more.[54]

In 1970 social and behavioral sciences, physical sciences, and language arts made up about 65% of ITV programming*.[53] In 1968 almost 70% of the ITV hours broadcast used the video tape format followed by local live presentation which accounted for 15% of the ITV time broadcast.[54] The average length of ITV lessons for K-12 was 22 minutes with an average number of lessons per course of about 46.[54]

The two major barriers inhibiting expanded UHF/VHF ITV distribution are scheduling and transmission cost. Most UHF/VHF ITV systems are one or two channel systems which are generally satisfactory as long as all classes of the same course can be given at the same time. On the elementary school level, where one teacher generally has the same children all day, the school day is flexible and little difficulty in scheduling is found. However, the secondary level teacher's schedules are highly structured to meet specific curriculum demands. The increased level of management necessary to coordinate students, faculty, and physical resources at irregular intervals of utilization (especially in schools where a high level of individualized student instruction is valued) makes single channel transmission difficult. The problem is complicated when different schools, with different educational approaches and academic goals are found in the same system. Basically, single channel ITV transmission is too inflexible on a large scale unless all the schools involved are homogeneous in curriculum, time structure, and educational approach.

4.3.2 ITFS and CCTV

In order to solve the scheduling problem many institutions have turned to multiple channel (usually four) ITFS systems and closed circuit short haul cable distribution. Instructional Television Fixed Service and Closed Circuit Television cover those closed television systems whose signals require special receivers (ITFS at 2,500 megacycles) or connecting cables (CCTV). The most recent indepth survey of ITFS/CCTV system was published in 1967.[55] This study defined closed circuit television as follows.

> "Televised instruction or information only made available to specified locations for specific individuals or groups. A CCTV operation is closed circuit as long as it is not possible for unauthorized TV monitors to intercept and reproduce the programs or information being presented. The use of a combination of a portable video tape recorder and/or accompanying single camera and television monitor

*See Appendix, Table A, for complete breakdown of programming areas for 1970.

sometimes used for observation or magnification purposes is also considered CCTV. Televised instruction or information being received directly into the classroom from VHF and UHF noncommercial and commercial television broadcast stations (and not distributed over an intermediary CCTV or 2500 MHz system) is not considered CCTV."[55]

In 1967, 717 institutions had been pinpointed as having operational ITFS/CCTV systems, and at the time 62 other agencies were planning systems for operation by 1968.[55] Table 4 shows that the emphasis for using ITFS/CCTV lies mainly in the areas of public and higher education.

TABLE 4

PER CENT INSTITUTIONS USING CCTV/ITFS - BY TYPE[55]

PUBLIC K-12	45.4%
NON-PUBLIC K-12	1.7%
JUNIOR COLLEGE	7.9%
HIGHER EDUCATION	43.3%
OTHER	1.7%
	100%
	(717 Institutions)

In 1970 the "One Week of ETV"[53] report did a statistical analysis of ITFS and CCTV systems based on the 1967 ITFS/CCTV survey and a follow up questionnaire from 43 ITFS and 35 CCTV installations. This study showed that ITFS and VHF/UHF systems were more heavily used in the primary and intermediate grades while CCTV was used most on the high school and college level.* This is because school systems generally have dispersed and multiple elementary schools which lend themselves to UHF/VHF and ITFS broadcasting techniques while closed circuit cable distribution is more applicable to centralized high schools and colleges. However, advances in multiple channel cable distribution systems are beginning to show that cable may be the primary distribution system in the future.[56] The final distribution system a school system uses will be primarily determined by its scheduling and reception needs.

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*See Appendix, Table B.

4.3.3 Scheduling and Reception Problems

Scheduling appears to be one of the major obstacles to ITV use. This is especially true where broadcasting is centralized and delivery channels are limited. If the teacher cannot get the material at the time it is needed in the learning process, it has little value to her. The South Carolina ETV Commission devotes its entire six channel CCTV cable system to secondary education during school hours because it is the only way to satisfy the scheduling requirements.[36]

In addition to the actual classroom display time, the ETV system must also provide access time for the teachers to preview the programming. Teachers preference for the ideal previewing time varies greatly, with the majority of elementary users preferring to view the programs a week before the series begins and secondary teachers a month or even a season before the series begins.[57] Elementary teachers generally feel 20 minutes is the ideal program length while secondary users prefer 30 minute programs.[57] As to the number of ITV showings a week, elementary users prefer once and secondary users twice a week.[57]

Teachers in Delaware were asked: "If video tape recorders were available, making it possible to record a program and show it when you want it, would you use DETV programs more often?" (See Table 5). In reply approximately 75% of both users and non-users of ITV programs on the secondary level replied they would use ITV more often. On the elementary level over 50% could make use of VTR's. This response denotes the importance teachers place on convenience of ITV scheduling and points out the role low cost video cartridge recorders may play in the future of ITV.

TABLE 5

TEACHER RESPONSES CONCERNING USE OF VIDEO TAPE RECORDERS[57]

	USERS		NON USERS	
	Elementary (N = 241)	Secondary (N = 56)	Elementary (N = 84)	Secondary (N = 274)
	%	%	%	%
Yes	58.5	75.0	75.0	74.1
No	35.7	19.6	15.5	13.9
No response	5.8	5.4	9.5	12.0
Total	100.0	100.0	100.0	100.0
Number (No responses deleted)	227	53	76	241

One of the major complaints voiced by teachers in the Television in Urban Education study[44] was that sets were unavailable or difficult to find. The National Education Association recommends one TV per 24 elementary students and one set per 20 viewers on the secondary level or at least one set per teaching station.[58] Of the sixteen cities surveyed, the television set to students ratio ranged on the elementary level from a low in Boston of 1.35 sets per 500 students to a high in Philadelphia of 9.44 sets to every 500 students. On the high school level the figures were much worse with San Francisco reporting only .42 sets per 500 students and Detroit with a high of 2.83 sets per 500 students.[3] A statistical analysis[49] of the placement of the TV set in the school showed that a set placed in a classroom is used three times as much as when the set is shared with an adjacent classroom, four times as much as when in departmental storage, and almost ten times as much as when in central storage. A study of teacher attitudes in South Carolina summarizes the effects a shortage of sets has on ITV utilization:

> "The net effect of the inconvenience in getting a TV set into the classroom...is to decrease the use of televised instruction. This means that regardless of the merits of a particular ETV series, and in spite of how badly it may be needed, a teacher may not use it simply because of the trouble it takes to do so."[36]

4.3.4 Summary

Administrative, pedagogical, and time scheduling problems all act upon the choice of the proper ITV distribution system. Channel capacity is limited for VHF/UHF transmission. ITFS is being used to increase channel capacity but advancements in multi-channel cable systems appear to make cable the primary distribution system for urban and suburban areas in the future. Teachers appear favorable to using video tape recorders to help solve the scheduling problems. However, a severe shortage of TV receivers appears to be a major barrier to increased utilization.

4.4 The Classroom Utilization Phase

4.4.1 Understanding the Statistical Data

To determine the actual impact of ITV in terms of students and teachers actively using the medium in classrooms is extremely difficult. Different methods of evaluation with various degrees of reliability are used by each reporting agency. The roughest form of evaluation is to determine the utilization level in terms of the number of classroom guides ordered by the various schools for a particular course or series. A St. Louis study evaluating the use of ITV in public schools found that the average number of guides ordered was almost seven times greater than the average number of teachers who reported that they watch a program and was fourteen times the number of programs actually watched by teachers

as tested by an on-site survey.[60] Another important point brought out by the St. Louis study showed the unreliability of using questionnaires to determine utilization. Of those teachers who reported, in writing, that they used television instruction in their classroom, less than 50% were actually doing so when checked by on-site surveying teams.

A figure often used in evaluating ITV is the number of student enrollments, i.e., the product of the number of students times the courses in which they are enrolled. This method is misleading because the same student may often be enrolled in four courses, and hence counted four times. This figure often reflects the growth of courses available to the student not the actual increase of individual students being reached by ITV. Table 6 taken from a South Carolina state survey[36] shows that the number of enrollments is almost three times greater than the number of individual students actually using the service.

TABLE 6

Schools Using	Individual Students	ETV Enrollment	Individual Teachers	Classes
676	165,463	472,362	5,524	17,452

The general situation as to the validity of utilization data is best summarized in a statement by researchers surveying ITV utilization in sixteen urban centers:

> "Amount of use. Data from all sources indicate that large numbers of pupils view School TV in the Great Cities. Two qualifications are necessary. First, the share of regular users compared with total enrollment varies tremendously from city to city. Teachers who use programs regularly employ television from 15 minutes (minimum) to one hour 20 minutes (maximum) per week. Some "regular users" tend to use fewer lessons in a series as the year goes on. Second, the evaluation methods used by ETV stations and school departments to give an accurate accounting of use--largely consisting of questionnaires voluntarily answered by teachers and the quantities of teachers' guides requested--are inexact, unreliable, and coarse. These statistics result from collection of data, however incomplete. They are more accurate than guesstimates of system-wide use made by administrators and teachers. We asked for guesses and got them. All they prove is that hardly any of the people we interviewed know what use of television in their school system had been reported--or that they do not believe the reports."[3]

4.4.2 ITV Enrollment Projections

Due to the difficulty in obtaining realistic data on actual classroom use of ITV, much of the statistical data is reported in hours of ITV broadcast by the various transmission agencies. This type of data is easily obtained and is generally accurate in measuring the growth and level of activity of the broadcasting agency but in no way can it be used to illustrate the utilization level in the classroom. Just because material is broadcast does not mean it is being used by the teacher. Having thus qualified the statistical data which is to follow, we will proceed with the above understanding.

Table 7 is a compilation of data gathered by the National Center for School and College Television[61] published in 1968.[62]

TABLE 7

INDIVIDUAL STUDENT ENROLLMENTS, GRADES K-12

1961-62 School Year	2,250,000
1965-66 School Year	6,550,000
1966-67 School Year	8,250,000
1967-68 School Year	9,990,000

In 1967 total student enrollment, i.e., the different individual students or "student exposures" to ITV, for all educational levels was 20,625,000.[61] Of these 97%, (20,045,000), were at the elementary and secondary level.[61] Higher education accounted for 465,000 "student exposures" and all other remaining levels for 115,000.[61] NCSCT estimates that by 1975 one of every four students from K-12 in the U.S. will be using television as part of their instructional format.[61]

More specific and somewhat optimistic data on utilization of ITV in urban cities is illustrated in Tables 8 and 9. The sources for Table 8 are the school television personnel and ETV stations themselves. Table 9 data is a "Guesstimate" of "Regular Users" based on survey interviews of teachers and administrators.[3] In viewing Tables 8 and 9 one gets the impression that many of the cities reported on are extensively using ITV as a regular every day part of the classroom instruction. However, Table 10 shows that the actual percentage of classroom time used for ITV is in reality less than 3%. In view of this remarkably low figure it would be a great advantage to examine utilization in terms of the relationship of ITV to its users, the teachers and students, in the classroom.

TABLE 8

PERCENTAGE OF ELEMENTARY AND SECONDARY ENROLLMENTS REPORTED AS REGULAR USERS OF ITV[3]

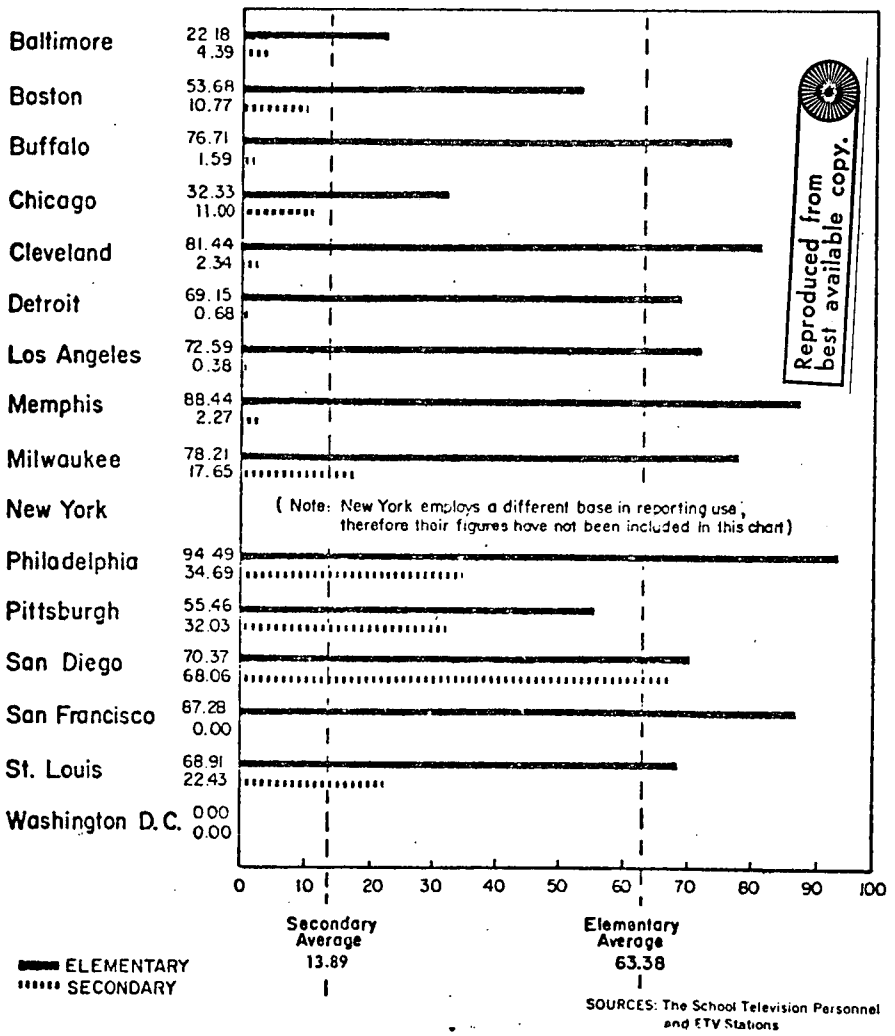

TABLE 9

INTERVIEWERS' AVERAGE "GUESSTIMATES" OF "REGULAR USERS"* OF ITV[3]

CITY	ELEMENTARY	SECONDARY
Baltimore	57%	13%
Boston	18%	16%
Buffalo	55%	25%
Chicago	14%	20%
Cleveland	31%	7%
Detroit	29%	2%
Los Angeles	43%	2%
Memphis	95%	1%
Milwaukee	64%	6%
New York	80%	1%
Philadelphia	60%	17%
Pittsburgh	59%	14%
San Diego	34%	3%
San Francisco	63%	5%
St. Louis	21%	3%
Washington, D. C.	--	--

100% equals enrolled students

*Regular user was defined as using ITV on an average of at least once per week.

TABLE 10

PERCENTAGE OF TOTAL SCHOOL HOURS
FOR WHICH INSTRUCTIONAL TELEVISION IS AVAILABLE[3]
(K-12)

Assuming that there are 180 days in an average school year and that approximately five hours per day are devoted to instruction, each grade has a possible 900 hours of schooling per year. Considering all grades (K-12), this would give a total of 11,700 hours of school time that must be filled with some type of learning experience. On this basis, the average number of original (excluding repeats) broadcast television instructional hours for all of the Great Cities is 320 per school year. Thus ITV is seen to provide less than 3% of the total possible hours of classroom instruction for the Great Cities. The city-by-city breakdown based on this assumption is:

Baltimore	.67%
Boston	1.19%
Buffalo	1.94%
Chicago	3.03%
Cleveland	2.26%
Detroit	10.00%
Los Angeles	1.83%
Memphis	3.08%
Milwaukee	1.83%
New York	2.02%
Philadelphia	4.29%
Pittsburgh	2.34%
San Diego*	2.31%
San Francisco	2.41%
St. Louis	2.86%
Washington, D. C.	----
AVERAGE (excluding Washington)	2.80%

*Telecasts began in February, 1967

4.4.3 Teacher Training

Of the three phases in the ITV process, the utilization stage, where the actual learning transfer takes place, has been found to receive the least attention and the least financial support of the three.[45] It appears that school boards feel more secure when allocating funds for tangible production and hardware equipment than when paying for teacher training and classroom utilization aids. Teacher training has been found to be an important factor in the overall success of an ITV project. Many teachers, especially at the elementary levels, are inept in the simple manipulations of television controls. Most good training courses cover all the basics from plugging in the TV to lighting and arranging the room. More important, however, are lessons orienting the teacher in theories of media coordination and its adaptation to instructional goals. In short, if the teacher does not know how to utilize and optimize the technological tool, not only is her time wasted but so are the thousands of dollars invested in production and equipment.

4.4.4 Attitudes

The basic attitudes of those persons who are actively involved in the learning process often determines the extent to which media are used and the benefits derived. This is not to say that there is a one-to-one relationship between the effectiveness of ITV and the attitudes of the teachers and students towards it. When considering attitudes many factors come into play. Many times student attitudes also reflect how students feel towards the teacher and the subject matter, not just the TV medium.[59] In addition, studies by Schramm[14] show that the amount learned from a course relates highly with the degree of enjoyment the student received from the course. These factors seem to hold true across the board to include even college students who appear to determine their attitudes towards ITV on what they consider "favored" subjects and/or "favorite" professors.[59]

To a great extent, teachers' attitudes toward the use of television are the same as they are to any form of educational innovation. "Old fashioned" teachers (not necessarily older in age) are generally equally against using such innovations as the "new math" as they are television. However, as pointed out by Gordon[59], the one possible maxim that can be applied to any resistance to instructional innovation, television or otherwise, is, "When the amount or quality of what students learn suffers because of an innovation, it is high time to go back to the old way of doing things."

It is exceedingly difficult to determine the attitudes of students and teachers at different instructional levels for specific subject areas taught by television. This is due to the scarcity and inconclusiveness of the data available and to many of the factors just reviewed. However, some broad generalizations can be based on the available data.

On the preschool level, teachers whose classes watched Sesame Street were divided in their opinions about the appropriateness of its use in the classroom. Some reported it as a worthwhile addition to the school day, while others felt strongly that the program took up valuable time that could be better used in other activities.[31] This divided reception of Sesame Street is not generally shared by others who used the program outside of the formal learning context: in the home, the impromptu nursery school, etc. In these areas, the context for which Sesame Street was designed, the reception was overwhelmingly favorable.

On the primary and secondary level, data based upon responses from 1,203 elementary students and 2,845 high school students exposed to different types of ITV indicate that 75% of the younger children believe they learn more in television classes.[59] Hagerstown reports[34] that when asked, "Do you think you learn more about science with TV or without TV?", 72.21% selected television. When asked what they liked about television, they reported: 20.8% experiments, 19.2% learned more, 18.0% television has things unavailable in the classroom, 14.7% liked the subject content, 10.5% liked the visual aids. On the high school level students appeared more skeptical with only a third believing they get more from television than from regular instruction.[59]

Teachers attitudes toward ITV appear to be more favorable on the elementary level than the secondary.[59] One hypothesis for this is that on the primary level any relief from the constant demands of the children is welcomed.[59] Another hypothesis proposes that the teachers of younger children realize that their students are accustomed to watching TV and that they learn from it and therefore these teachers incorporate it more into their presentations. The older the child becomes the less sensitized he becomes to the medium followed with the correlating reduction of usage by teachers in education.[49]

In many cases the position the teacher takes in relation to ITV is based primarily on how the program is administered in the school and classroom. Is the television used as a teacher substitute, i.e., by distributing programming direct from a district center bypassing teacher control, or as a supplementary teaching aid under control of the classroom teacher?

4.4.5 Direct ITV

Direct ITV was instituted in an attempt to distribute quality instruction more effectively through the use of a so-called master teacher. However good the idea was to begin with, the combination of a classroom teacher and a master teacher sharing the same class has not always proved profitable.

Many classroom teachers are hostile towards ITV because they see it as a threat to the professional image and as an invasion of their authority in the classroom. Some teachers feel that mechanized instruction is harmful to the student because it hinders direct contact and socialization

between students and teachers. In addition, some teachers are still highly distrustful of modern techniques and educational experimentation. Whatever the reason, if teachers are indifferent or hostile towards the medium, the end result may be worse than before.

Many times, the basis of hostility towards an ITV system is found in the manner the system was initiated. Studies have shown that administrators are more likely to be favorable towards instructional television than are teachers.[14] Direct television teaching means the transfer of the "what and how of education" from the teacher to an ITV director. When the planning and design of the educational process are moved from the school and classroom to the district headquarters, the teachers and even the principle find their jobs become standardized with little opportunity for innovation and improvisation. It is not surprising that hostility is generated under those conditions. "Technology is resisted in education because it builds up new power centers and weakens traditional ones."[52]

4.4.6 Supplementary ITV

In an attempt to overcome the rigidity of direct television, educators are developing new ways to utilize the media in ways which redefine the professional and educational role of the teacher.

> "If the quality of ITV programs is empirically established in terms of student learning, good teachers and principals will utilize them if their traditional roles, autonomies and statuses are re-defined in professionally and personally satisfying ways, including associated career and emolument considerations."[45]

It appears that, to assure proper utilization, ITV should play a modifying role and not threaten the position of the teacher. This is not the case with direct ITV. Direct live transmission bypasses the classroom teacher as the controlling agent. There is no way to preview material and little chance to adapt the program to any special classroom needs. The technical solution to this problem lies in videotaping programs as they come into the school one or two days before they are scheduled for classroom use. In this way, teachers could preview, evaluate, and prepare for programs before they are presented to the students.

Pedagogically, the problem of standardized content, inherent in direct TV teaching, could be solved by providing a series of alternative telecourses from which the classroom teacher could select those which best suit the need of his students. With the utilization of VTRs recording at the school level and the ability of the teacher to select material from alternative choices, there is a return of control to the teacher while still maintaining the upgraded instructional input of television material. In essence, the studio teacher becomes the client of the classroom teacher who is shopping for the best wares. In this way the teacher becomes a coordinator of professional opinions, thus "legitimizing" the use of television as part of his traditional role.

In addition to student and teacher attitudes, the opinions of the general public must be taken into consideration. With the exception of Sesame Street, ETV in general has not been able to compete with commercial television for the viewing audience. Differences of as much as $400 versus $80,000 for an hour of ETV versus commercial programming are common. In addition, television was introduced into this country, and is still considered by the general public, as an "entertainment" medium, not as an instructional one. The average citizen is still apprehensive of the value of using television in his local schools, especially when this medium is only used to present "enrichment" and "administrative" materials to students.

> "To many Americans, instructional television means today cut-rate education, entertainment pretending to be schooling, time-wasting in the halls of ivy and dilution of education."[59]

4.4.7 Summary

In evaluating the statistical impact of ITV, reliable data is in short supply because of contradictory and misleading methods used to collect utilization statistics. It is predicted that by 1975 one of every four students from K-12 in the U. S. will be using television as a part of his instructional format. However, this does not mean that ITV will play an important role in instruction. In 1967 utilization was on the average less than 3% of classroom time. The reasons for this underutilization vary from lack of funds to trained teachers in the principles of ITV use to strong teacher resistance due to uncertainty as to the proper role the television will play in the learning. In addition, the general public still questions the utility of using a television, which generally is thought of as an entertainment medium, for instructional purposes.

SECTION IV

5. A SUMMARY ANALYSIS AND OUTLINE OF PROBABLE TRENDS IN ITV UTILIZATION

The final goal of this report is to develop basic guidelines which will ultimately lead to the optimal utilization of ITV. The following discussion is based on data reviewed in the preceeding three sections and draws heavily from ongoing research being conducted at Washington University's Center for Development Technology. In analyzing ITV utilization three broad problem areas can be defined: programming, distribution, and teacher utilization.

5.1 Programming

5.1.1 Away from Local Production

First, let us assume that the major block to meaningful ITV utilization, as determined by teacher attitude surveys , etc., is the lack of enough high quality programming to maintain continuous use of the television medium as part of the everyday curriculum. This assumption places the blame for underutilization of ITV on the production phase. In the past, fragmented local production of materials has prevented extensive use of the medium. However, a steady trend, especially for VHF/UHF stations, has reduced the level of local production from 77.9% of the hours broadcast in 1962, to only 27.2% in 1970.[53] From the period of 1968 to 1970 ITFS and CCTV have reduced local programming from 57.9% and 72.4% of their broadcast time to 42.1% and 54.6%, respectively.[53,54] This broad reduction in local production is due to increased utilization of national and regional production and distribution sources such as NIT, GPITL, and MPATI. The sharper drop by VHF/UHF stations can be attributed to the continuing effort of the Public Broadcasting Service to interconnect and supply community ETV stations with quality programming. While ITFS and CCTV show marked reductions in local programming, they are primarily instructional systems which have specific local subject requirements which still rely heavily on local production. More extensive use of national sources and program exchanges with other institutions is blocked by copyright problems, a lack of universal technical standards, and the high duplicating and mailing cost of video tapes.

5.1.2 The Establishment of Local Programming Sources

The problems involved in local production have led many to suggest the establishment of large scale national or regional centers for the production of high quality instructional programs.[63] They feel that only through national centers can enough quality material be generated to satisfy the diverse needs of the U. S. educational system. However, it is not enough to just produce large amounts of programming. Simultaneous changes in legal and technical areas must accompany production increases.

A reassessment of the copyright laws must be made to determine reasonable fees for materials produced and distributed on a national level. Standards must be set for policies concerning the editing and dubbing of nationally distributed materials by teachers at the local level. In addition, standardization of all production, reception, and playback equipment is desirable to assure universal compatability of materials.

Even if large scale national production does become a reality along with the necessary legal and technical adaptations, there will still be considerable resistance to placing production of material for such a powerful communication medium under centralized control. Funding for such a production center would of necessity have to come in part from some federal source, especially if programming is to meet the quality and quanity estimates discussed in Section III. The use of federal money is, in the minds of many educators, synonymous with federal control. The idea of having a single authority, responsible to the federal government, determining the instructional content of a major educational resource is unthinkable to many local, county, and state politicians.

One possible factor which may counter the trend towards national production is the rapid development of low cost video recorder systems. For as little as $1500, a complete porta-pack VTR, camera, and monitor can equip the smallest school with a basic CCTV production system. Advances in video recorder/playback systems are making it possible to take production out of the expensive centralized ITV studies and putting it in the hands of local teachers and students to decentralize production to meet local needs. Where this trend will lead and to what extent it will counter moves toward centralization is difficult to predict.

5.2 Distribution

In contrast to those who feel that ITV's major problem is one of production, there are those who believe that there is at present a large body of quality programming, both educationally and commercially produced, suitable for ITV if some economic and efficient distribution method can be found.[64] Most institutions which use national and state sources for programming are forced to use the expensive and time consuming public mails to borrow or rent video tapes. It appears that the electronic linkage of schools to district centers, and district centers to regional or national program sources is the solution to the distribution problem.

5.2.1 "Piggy Back" Cable Distribution for Educators

Section III discussed the various electronic methods now in use; VHF/UHF, ITFS, and CCTV. Due to the scarcity of data and the lack of any regulatory agency for CCTV systems the author was unable to determine which of the distribution methods, VHF/UHF, ITFS, and CCTV was actually the primary delivery mode for instructional television. Of the three, CCTV cable distribution now appears to be the most promising for urban and suburban distribution between schools and district centers. Recent decisions by the FCC[65] ordering cable operators to expand community

oriented services have given educators access to cable distribution systems at minimal or no cost. However this "piggy back" access is generally limited to only a few channels and only in those areas where cable systems are in operation.

5.2.2 A Dedicated Educational Cable System

More important is a current study by Barnett,[56] which shows that in a city-school district of 150,000 students with 136 elementary and 40 secondary schools, a dedicated full time 40 channel educational cable distribution system can now be built for approximately the same order-of-magnitude cost per student as compared to only 4 channels by ITFS. With such a large scale channel capacity, multiple repetition of programs to meet the diverse scheduling needs of schools is easily accomplished. In addition, the cable system has potential advantages of the computer-aided-instruction and other municipal and civic uses which ITFS could never hope to match.

5.2.3 A Communication Satellite Distribution System

While cable appears to be the solution for district center to school transmission in urban and suburban areas, economical linkage of district centers to national and regional production and storage libraries still remains a problem. At present some networking is being done by the Corporation for Public Broadcasting and some state wide systems using AT&T long lines to interconnect various stations. An alternative to this costly and preemptible system is the possible use of communications satellites to distribute programming from a few central sources to district centers or even direct to individual schools in isolated areas. Several regional experiments to link schools in Alaska, the Rocky Mountain States, and Appalachia via satellite to video tape libraries have been proposed. However until recently little has been done to use the unique capabilities that a satellite system could offer to realistically cope with not only the technical problems of ITV transmission but also the multiple social, political and educational barriers which up to now have blocked ITV distribution on a national scale.[64]

5.3 Teacher Utilization

5.3.1 Teacher--Paraprofessional--Student--Technology Combinations

Assuming that even if there was abundant programming available which could be rapidly and economically distributed there would still be resistance to the television medium because it challenges the traditional professional position of the classroom teacher. At present, there appears to be no consensus as to the best pedagogical or economical combination of television and teacher in the classroom. Schools in the near future may find it economically and technologically feasible to begin experimenting with various teacher/technology substitution trade-offs. There are many such combinations listed below in Table 8.

TABLE 8

	T = Teachers	P = Paraprofessionals	S = Students	C = Technology
#1	T		S	C±
#2	T		S	C+
#3	T		2S	C+
#4	T	P	3S+	C+
#5		P	S or 2S	C+

In Table 8 paraprofessionals are non-professional people that are interested in education, have empathy for children and who can be easily trained to coordinate audio-visual media and/or computer aided instruction in the classroom. Technology (C) is illustrated as a weighting factor where (±) is representative of the present situation in which various technologies (films, slides, tape recorders, etc.) are used in the classroom but are only sporadically for enrichment purposes. A (C+) rating would be representative of the employment of a major technological investment such as a closed circuit ITV system or a series of computer aided instruction terminals in the classroom.

Situation No. 1 is generally representative of the present level of technology utilization in the schools. The ratio is one teacher (T) to twenty-five students (S) plus the indifferent use of technology (C±). In this case any financial outlay for equipment is strictly an add-on cost to the educational process with little realistic return in improved educational quality. In No. 2 an additional increment in the technological area is made, the installation of a closed circuit ITV system on the school or district level. In this example programming is used in a truly coordinated effort to improve instruction in selected areas of study. Generally, the teacher stays in the classroom and watches the program with the student so that he may help to answer any questions about the lesson. Here again the cost of increased technological utilization is additive in nature but justifiable (if properly programmed and administered) by increased quality in instruction. Situation No. 3 is similar to No. 2, except that the teacher (T) handles twice as many students (2S) by working with one group while the other is watching the programs. Here the cost of the technical increment is substitutive because it frees the teacher to work with more students.

Situations No. 4 and No. 5 use various combinations of teachers, paraprofessionals, and technology to increase learning effectiveness. No. 4 combines a teacher (T) and a paraprofessional to help administer the media system (C+) with a substantial increase in students. Here there is an economic trade-off between the additive cost of (C+) + (P) and (T)'s ability to manage more students (3S+). Situation No. 5 may become applicable at more advanced levels of instruction where programmed ITV is

used for individual instruction under the guidance of a paraprofessional who supervises the student's use of the media.

The multiple variables involved in the ITV process make it impossible to give any accurate estimate of the actual utilization level of ITV in the classroom either at the present time or in the future. There is a tremendous need for a substantial and unbiased research effort to determine the extent to and the manner in which the television medium and the individual programs themselves are actually implemented in the classroom. This in itself would help serve as a starting point to determine how best television can be used in classroom instruction.

5.3.2 Coordinated Advancement

In conclusion, it must be noted that increases in ITV utilization are not dependent on any single factor in the ITV process but the coordinated advancement of all three phases: production, distribution, and classroom utilization. While the trends toward national program sources and rapid electronic distribution point toward easy access of large amounts of quality programming, these advancements cannot be successfully implemented without a substantial change in education's traditional conception of the role of the classroom teacher. It is in the classroom that the battle for ITV, at least in the public schools, will be won or lost. It may develop that, due to increases in teacher militance and over supply of educational labor, ITV may find its most applicable format outside the formal school system as an alternative form of education in a de-schooled society.

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APPENDIX

TABLE A

Subject Area of ITV Programming, 1970[53]

numbers in ( ) indicate hours

SOCIAL & BEHAVIORAL SCIENCES	28.1% (1272)
PHYSICAL SCIENCES	18.7% (847)
LANGUAGE ARTS & LIT.	16.2% (731)
MUSIC	7.8% (352)
ART	6.5% (293)
MATH	6.1% (276)
FOREIGN LANGUAGE	5.3% (239)
HEALTH SAFETY & P.E.	4.1% (183)
OTHERS	7.2% (327)

A P P E N D I X

TABLE B

Grade Level - ITFS, CCTV and VHF-UHF: 1970[53]

	ITFS %	CCTV %	VHF-UHF* %
K-3	17.2	10.4	24.8
4-6	27.7	11.5	30.5
7-9	19.4	9.7	15.6
10-12	16.6	25.4	15.5
College/University	7.2	32.4	13.6
Adult (for credit)	4.3	0.4	
PTV	7.6	10.2	
Totals	100.0	100.0	

*ITV on VHF/UHF Educational Broadcasting stations represented 48.5% of total broadcast time.