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Instructional media is relevant in developing countries which have limited resources to invest, yet wish to make major advances in the education of their population. The results of a study comprising 11 reports on the use of media for educational purposes are highlighted in this summary which cautions that no single media can solve all problems. It advises that learning is more dependent on the use of a medium rather than the type. Media types discussed are television, computer-assisted instruction, film, radio, programmed instruction, filmstrips, slides, transparencies and audiotapes. The report includes information on the project's learning and cost analyses, and a description of instructional technology projects in the field. The field projects are described in terms of one of four goals: 1) to reform the national educational system, 2) to extend formal schooling to previously unreached populations, 3) to enrich regular school programs, and 4) to extend the programs outside the formal education system, usually to adults. The Appendix summarizes the research findings on three Mexican technology projects and two instructional television projects in American Samoa.

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TELEVISION AND ITS LOWER COST ALTERNATIVES:

A SUMMARY OF RESEARCH

Bureau for Technical Assistance
U.S. Agency for International Development

March, 1974

This report was prepared for the Bureau for Technical Assistance by Dr. Laurence Wolff, on the basis of research reports published by members of The Institute for Communication Research at Stanford University, who were under contract to A.I.D. to study the uses and potential of instructional technology in developing countries. The research at Stanford was carried out during the years 1971 to 1973 under the general direction of Dr. Wilbur Schramm.

International Technology Group
A.I.D., Office of Education and Human Resources
Washington, D.C.

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SUMMARY: TELEVISION AND ITS LOWER COST ALTERNATIVES

I. THE PURPOSE OF THIS REPORT

In 1971 the Bureau for Technical Assistance of the U.S. Agency for International Development contracted with members of the Institute for Communication Research of Stanford University, under the direction of Dr. Wilbur Schramm, to do a number of studies on television, radio, and other aspects of instructional technology.

The purpose of the contract was to study and analyze the potential of instructional technologies in developing countries, with particular reference to (1) intermediate technologies such as radio, audio-cassettes, and printed materials, (2) use of the media as a basis for extending educational opportunities to out-of-school populations, and (3) ways in which the media may be combined to complement and reinforce each other.

The study was completed in 1973, with the publication of the last of 11 reports. The most important of these reports provides an overview of evidence concerning the use of media for educational purposes. These reports may be useful both to researchers and to educational leaders considering or involved in instructional technology projects. But the research findings are very extensive and the reports are too long and numerous for decision-makers in A.I.D. and in developing countries to read in their entirety.

Thus, this short report has been prepared for quick reading. It highlights the more relevant results of the study and provides information on individual reports, which are available on request from the Office of Education and Human Resources, Bureau for Technical Assistance, A.I.D.

The main section of this report summarizes information concerning the use of media for educational purposes and is based on six of the eleven Stanford University research studies. Appendix 1 summarizes the research findings on three Mexican instructional technology projects (based on four studies), and Appendix 2 summarizes information on the instructional television project in American Samoa (based on one study).

Below are listed the eleven reports of the research project:

1. "Notes on Instructional Cross Media Comparisons," by Wilbur Schramm, December, 1971, 51 pages. A discussion of problems and strategies in comparative research of instructional technology projects.

2. "Notes on Case Studies of Instructional Media Projects," by Wilbur Schramm, with John Mayo, December, 1971, 41 pages. A discussion of the uses and procedures of the case study method in media research.

3. "Big Media, Little Media," by Wilbur Schramm, March, 1973, 333 pages. An overview of evidence concerning the use of media for educational purposes.
4. "ITV in American Samoa--After Nine Years," by Wilbur Schramm, March, 1973, 55 pages. An evaluation of the instructional television project in American Samoa.
5. "The Mexican Telesecundaria: A Cost Effectiveness Analysis," by John K. Mayo, Emile G. McAnany, and Steven Klees, March, 1973, 152 pages. An evaluation of the instructional television project for extending secondary education in Mexico.
6. "A Report on the System of Radioprimaria in the State of San Luis Potosi, Mexico," by Peter L. Spain, March, 1973, 127 pages. An evaluation of the instructional radio project for primary schools in San Luis Potosi, Mexico.
7. "The Radio Schools of the Tarahumara, Mexico: An Evaluation," by Sylvia Schmelkes de Sotelo, March, 1973, 66 pages. An evaluation of the instructional radio project for rural primary schools in Tarahumara, Mexico.
8. "The Effectiveness of Alternative Instructional Media: A Survey,"* by Dean Jamison, Patrick Suppes, and Stuart Wells, February, 1973, 72 pages. An overview of research on the effectiveness of traditional classroom instruction, instructional radio, instructional television, programmed instruction, and computer-assisted instruction.
9. "The Cost of Instructional Radio and Television for Developing Countries," by Dean Jamison with Steven Klees, March, 1973, 57 pages. A description of a method to evaluate per student costs of instructional radio and television and the application of that method to television projects in Colombia, American Samoa, El Salvador, Mexico, and Ivory Coast and radio projects in Thailand, Mexico, and Indonesia.
10. "Teacher Observation in Mexico," by Judith A Mayo, May, 1973, 38 pages. An evaluation of teaching methodology in a television project for ~~secondary schools and~~ in regular secondary schools in Mexico.
11. "Radio's Role in Development: Five Strategies of Use,** by Emile G. McAnany, September, 1973, 28 pages. A summary of the uses, problems, and potential of radio in aiding rural development.

* Also published in the Review of Educational Research, Vol. 44, 1974, pp. 1-67.

** Published as a report of the Information Center on Instructional Technology, Academy for Educational Development, 1424 16th Street, N.W., Washington, D.C. 20030.

II. INFORMATION CONCERNING THE USE OF MEDIA FOR EDUCATIONAL PURPOSES

A. Overview

The Stanford research summarizes the available information about the use of the media in education. It emphasizes the instructional media in developing countries, which have limited resources to invest and want to make major leaps forward toward the education of their population.

The major source for this section is the book-length report, "Big Media, Little Media," by Wilbur Schramm. His report contains information on scores of research studies, including those completed at Stanford through the contract with A.I.D.

According to Dr. Schramm, the media may be divided roughly into two types, those which are "big" and those which are "little" in cost and complexity, as follows:

<u>BIG MEDIA</u>	<u>LITTLE MEDIA</u>
television	radio
computer assisted instruction	programmed instruction
films	filmstrips, slides, transparencies, and other "visuals"
videotape	audiotape

The major policy conclusions of Dr. Schramm and his associates are:

The most important need for developing countries is to conceptualize their educational problems and then to choose the most cost-effective system - which may include various media - to solve those problems. No single medium can solve all problems, and variation in learning is more dependent on how a medium is used rather than which one is used.

While a number of developing countries have recently invested heavily in a "big" medium - television - there is evidence to suggest that use of the "little" media, especially radio, has not been adequately explored.

The sources for these conclusions are:

Analytical studies of costs and of learning, described in Sections "B" and "C".

Surveys of field projects built around instructional media, described in Section "D".

Research in the use and effectiveness of instructional media is by no means complete. Section "E" describes some methodological strategies to improve research quality and relevance.

B. Learning Analysis*

In learning analysis researchers attempt to develop an experiment which will compare the amount of learning which occurs among different media. As of 1972 over 500 experiments of this type have been recorded. Typically, they compare learning from media with learning through conventional teaching. The greatest number of studies deal with instructional television, and a considerable number with film and computer assisted and programmed instruction.

Researchers often find it difficult to eliminate extraneous factors, such as teacher personality or children's intellectual ability, which may intrude on the study of the relative teaching effectiveness of a medium.

The following are the major conclusions of these studies:

Traditional Classroom Instruction. Researchers have been unable to identify a component of traditional classroom instruction which consistently affects students' achievement. While many studies describe educational practices which appear to affect student outcomes significantly, other studies show that these same practices have little or no effect. There appear to be two exceptions: teacher verbal ability seems to affect student achievement and small classes seem to affect both learning and attitudes of young children. But this conclusion does not mean that schools make no difference, since school attendance clearly does affect student achievement.

Instructional Radio. The few good evaluations of instructional radio suggest that, supplemented with appropriate printed materials, it can teach most subjects as effectively as traditional classroom instruction or instructional television. Because of the potential role of radio in developing countries, much more survey and experimental research on it is needed.

Instructional Television. The numerous research studies of instructional television suggest that it can teach all grade levels and subject matters about as effectively as traditional classroom instruction and it may do relatively better at lower grade levels.

* This section is based on "The Effectiveness of Alternative Instructional Media: A Survey," by Dean Jamison, Patrick Suppes, and Stuart Wells and "Big Media, Little Media," by Wilbur Schramm.

Experiments focussing on the medium alone and not on changes in methodology and subject matter almost always show that there is no difference between ITV and traditional instruction.

Programmed Instruction. The numerous evaluations of programmed instruction over the past 15 years suggest that it is generally as effective as traditional classroom instruction and may result in decreasing the amount of time required for a student to achieve specific educational goals. Students may lose motivation when faced with programmed instruction alone over a long period of time.

Computer-Assisted Instruction. The research up to now suggests that computer-assisted instruction is effective as a supplement to regular instruction at the elementary level. It may help to improve achievement scores, particularly for disadvantaged students. At the secondary and college levels, CAI is at least as effective as traditional instruction and may result in savings of student time.

The following are some of the general conclusions of these experiments:

- Students usually learn as much from an instructional medium as from classroom teaching.
- There is no general learning superiority for "big" media over "little" media.
- The addition of another channel of instruction, for example, ITV plus programmed instruction, usually improves learning.
- Motivated students learn from any medium if it is competently used and adapted to their needs.
- There is no clear evidence that media are more effective for some people than for others.

In short, it appears that people can learn from any medium, and variation in learning is more dependent on how a medium is used rather than which one is used.

C. Cost Analysis*

In cost analysis researchers compare the costs of the different media. The results of these studies are often heavily dependent on assumptions built into them about the size of the audience and the expected length of the project as well as on the statistical treatment of the cost of capital investment. Studies have been done of radio and television, computer-assisted instruction, programmed instruction, filmstrips, etc.

* This section is based on "The Cost of Instructional Radio and Television for Developing Countries," by Dean Jamison with Steven Klein, and "Big Media, Little Media," by Wilbur Schramm.

The Stanford University team did its own study of the costs of eight radio and television projects, with the results as follows:

Table 1
Per Student Costs of Eight
Radio and Television Projects

<u>Project</u>	<u>Yr. of Infor- mation Source</u>	<u>No. of Students Using Project</u>	<u>Student Hour Cost*</u>
<u>Television</u>			
Colombia	1965	275,000	\$.062
American Samoa	1972	8,100	1.10
Mexico	1972	29,000	.069
El Salvador (secondary school)	1972	48,000	.143
Ivory Coast	1970	745,000**	.040
<u>Radio</u>			
Thailand	1967	800,000	.014
Mexico	1973	2,800	.058
Indonesia***	1971	1,200,000	.0041

- * Based on a 7.5% social discount rate
- ** Planned for 1980
- *** Based on a planning study rather than an operating project

The size of the audience greatly affects per student costs of radio and television. For instance, among the television projects analyzed, American Samoa has by far the highest student hour costs. Since the project is already reaching nearly all students in grades 1 to 9, it has limited opportunities for cost-cutting. The Mexican radio project, which also has relatively high costs compared to Thailand and Indonesia, could achieve significant economies if it expanded. These costs depend upon local salary scales, of course, so cannot be strictly compared.

The major conclusions about costs of radio and television are:

- The costs of instructional television can be expected to range from 1.5¢ to 15¢ per student per hour, depending on the number of students being served. The lower limit of 1.5¢ can be reached only if almost a million students located in a relatively small region use the system.

- The costs of instructional radio can be expected to range from 1/3¢ (for several hundred thousand students) to 3 or 4¢ (several thousand) per student per hour. This is about one fifth of the cost of television.

- Because of heavy investment in the first years, a radio or television project must operate at least 10 to 20 years to allow unit costs to fall to reasonable levels.

Overall, it appears that the "smaller" media are low in cost with a small receiving population, ITV may be reasonable in cost with a sufficiently large population, and radio is probably usable with both small and large populations. While CAI is still expensive, there is evidence that its costs are rapidly decreasing as the technology improves.

D. Field Projects

The choice of media for instruction does not depend solely on analyses of learning and costs. The decision maker usually needs to ask himself whether he can get financial aid for one particular medium, whether there is electricity in rural areas for some of the media, whether repair and distribution logistics will be difficult, and whether the chosen medium will have the maximum impact over a particular span of time. For these considerations it is necessary to look at the "macro-evidence" concerning actual instructional technology projects.

Field projects utilizing instructional technology fall into four major categories based on their purpose: (1) reform of the national educational system, (2) extension of formal schooling to previously unreached populations, (3) enrichment of regular school programs and (4) extension of programs outside the formal educational system, usually to adults.

1. Media for National Educational Reform*

Up to now only four countries have used instructional media to reform the national educational system, as follows:

* The next three sections are based on "Big Media, Little Media," by Wilbur Schramm.

Table 2
Media Projects for National Educational Reform

<u>Place</u>	<u>Starting Date</u>	<u>Levels Served</u>	<u>Medium Used</u>	<u>Number of Students</u>
Niger	1964	First five grades	ITV	800 (1973)
American Samoa**	1964	All primary and secondary grades, plus preschool and adult services	ITV	8,100 (1972)
El Salvador	1969	7th, 8th, 9th grades; now expanding to primary school, teacher training and out-of-school education	ITV	62,000 (1973)
Ivory Coast	1971	First two grades; expanding a grade at a time to cover all six primary grades; also in-service teacher training	ITV	60,000 (1972)

These four projects are similar in many ways:

- Their purpose is to "modernize" the content and method of public education and to expand enrollment.
- They have substantial outside support from national and international lending and technical assistance agencies.
- They rely upon television for core teaching.
- They support the classroom teacher through provision of classroom materials, feedback from classroom to ITV, in-service training, and curriculum revision.
- They took at least three to four years from inception to actual broadcasting.

The projects are different in the following ways:

- American Samoa introduced ITV in one year to nine grades, while the other projects expanded slowly over a period of years.

* The project in American Samoa was the subject of a separate study by Stanford and is discussed in more detail in Appendix 2.

- Niger uses untrained monitors rather than regular teachers in the classrooms.

- El Salvador provides long-term (nine months) retraining to all regular teachers, while the other countries have only short term training.

- The Niger program is small and independent of the Ministry of Education, while the others are integrated into the Ministry.

The per student costs of the programs vary greatly, depending on the number of viewers. In Niger, where there were only 800 viewers in 1969, the cost was about \$1,200 to \$1,300 per student per year; in El Salvador, with 48,000 viewers in 1972, it was \$24.35.*

The results of the programs also vary greatly. In Niger the program still served only 800 primary school students in 1973. But the quality of the programs for these students was high and there was almost no dropout in the ITV classrooms. In American Samoa the spoken English of students improved considerably. In El Salvador enrollment in junior high school increased greatly, teaching methodology became more "modern," and students' scores on general learning and achievement tests increased significantly. In Ivory Coast data are not yet available on the results of the project.

While there is no direct evidence that a medium other than ITV could not be used for national educational reform, it appears that the high visibility and complexity of television make it a strong catalyst for institutional change.

Other major conclusions for the future based on these four projects include:

- The need for heavy outside assistance at the beginning of the project.

- The need for strong support from top government officials.

- The possibility of significant resistance from the educational establishment or from teachers.

- The need to proceed toward more focussed use of the chosen medium rather than blanket use. ?

- The need to integrate the medium fully into the system of instruction.

- The need to phase the introduction of the medium year by year rather than introduce it to all grades simultaneously.

* El Salvador figures are from "The Cost of Institutional Radio and Television for Developing Countries" by Dean Jamison and Steven Kleez, p. 27.

2. Media for Extending the School

At least 30 countries have used the media to extend the school through correspondence, radio, television, and mixed media at all educational levels and in both industrial and developing countries. Some examples include the "Open University" of Great Britain, the "NHK Gakuen" of Japan (a radio-television correspondence high school), the radio correspondence schools of Australia, the telesecundaria of Mexico, and the Kenya radio correspondence in-service course for teachers.

The number of students in these programs range from a few thousand to over 1,000,000 in non-credit courses in France, Netherland, and Sweden. The majority of the students are young adults.

Some of the more common aspects of these programs include:

- attempts to get the student more actively involved in learning by providing him with self-help materials;
- flexible entrance standards; and
- a trend toward multi-media use, especially radio or television with correspondence.

There is significant dropout of students in such systems, often as much as 70%, from the beginning of the course to the end. But those who do finish usually do as well in regular school courses as those who studied in the regular classroom.

In most cases the cost per student of the media programs is lower than that of comparable formal classroom teaching, for example in the following estimates:

Table 3
Estimated Costs for Projects Utilizing Media
Compared with Conventional Classroom Instruction

	<u>Media Cost Per Student Year</u>	<u>Conventional Cost Per Student Year</u>
Mexico Telesecundaria	\$ 151	\$ 200
British Open University	1,200	2,000-2,400
Australian Radio Correspondence School	310	600-1,200 (boarding school)
German Telekellog	143	400-500
Japan NHK Gakuen	308	540
Kenya Teachers Program	100	200-400 (boarding school)

The principal conclusions from study of these projects are:

- They usually cost less than conventional classroom instruction.
- Students usually learn as much from them as from conventional classroom instruction.
- They offer opportunities to students which would ordinarily not be available because of cost, logistics, or staffing problems.
- They work in both industrialized and developing countries.
- Both radio and television may be effective, but radio usually costs about 1/5 as much as television.
- They require good study materials and a system of feedback from the field to the broadcast station.

The Stanford research project evaluated in detail three instructional technology projects in Mexico designed to extend the school. The projects are discussed in Appendix I.

3. Media for Enrichment of Formal School Programs

The objective of projects of this sort is to improve instruction of individual subjects rather than to provide systemwide quality improvement or expansion. Some examples include weekly ITV programs for six subjects in Zambia, ITV in science and social studies in isolated school villages in Japan, ITV for science instruction in India, ITV in primary schools in Colombia, radio programs in social studies, English, and music in Thailand, and programmed instruction in Rhodesia.

There has been little research of these projects, especially in low-cost media such as film strips or cassette tape recorders, but by and large they do seem to help improve student learning. One multi-media use, that of filmstrips plus radio or tape cassettes, has not yet been significantly tested in developing countries.

4. Media for Non-Formal Education*

Media projects in non-formal education attempt to provide learning opportunities in subjects such as literacy, health, agriculture, and community self-help which have not been obtained in formal schooling. The audience is usually adults, who may listen or watch individually or in groups. The setting is often rural. Radio is the medium most often used.

There are three types of organized listening groups in non-formal education, as follows:

* This section is based on "Radio's Role in Development: Five Strategies of Use," by Emile G. McAnany, and "Big Media, Little Media," by Wilbur Schramm.

The Deciding Group. In this case a group of adults listens to a program, often in agriculture, health, or home care, discusses the concepts presented under the guidance of a group leader, and then takes individual or collective action. Examples include those of India and Ghana. The small amount of research on these groups suggests that group members are influenced to change their behavior. But many of these programs suffer from a lack of field support and feedback which limits their effectiveness.

The Study Group. In this case a group of adults, usually illiterate, joins in classes which are led by a volunteer "monitor" and which provide literacy and "basic" education. Radio Sutatenza in Colombia, which began 25 years ago, is the most successful example of this type of program. Currently it serves 20,000 radio forums. It also has an extensive publishing program to supplement the forum activities.

The Discussing Group. In this case a group participates in defining its own problems to get a sense of its power to mobilize for change. The approach is non-directive and the goal is community organization. Examples of these programs can be found in Niger, Togo, and Senegal. These programs seem to work best when there is significant social ferment and desire for change in the rural areas.

In addition to broadcasting to an organized listening group, the media may be used to provide development messages to the general populace which may include information on vaccination campaigns, on nutritious foods (such as INCAPARINA in Central America), or on available agricultural and health services. The mass media appear capable of providing information, influencing audience knowledge and attitudes, and getting them to change some instances of behavior, as when the rural population accepts a large scale vaccination campaign.

The potential advantages of radio for all these tasks are:

- Cost: the costs of radio are usually about 1/5 those of television, and radio production does not require high levels of technical training.
- Coverage: radio already reaches much of the rural population.
- Effectiveness: research up to now suggests that radio is as effective as television and traditional classroom instruction.
- Localness: the lower expense of radio allows for the creation of local stations closer to the needs of the population and providing a greater opportunity for flow of information from the field to the station.

Some of the problems in the use of radio include the facts that:

- Efforts to use radio for rural development have been fragmented and incomplete.
- Most radio projects are poorly planned and administered.
- Radio is reaching only a minute fraction of its potential audience:
- There is little evidence concerning the cost-effectiveness of these projects.

The main conclusions about the role of the media in non-formal education are:

- Rural forums and discussion groups can effectively use the mass media, especially radio, to provide an impetus for change.
- For maximum effect, non-formal education needs multi-media combinations, including print materials and interpersonal contact.
- For maximum effect, non-formal education needs to be linked with sufficient available services in the subject area of broadcasts.

E. Research Problems and Suggestions*

The measurement and comparison of the effectiveness of the media requires consideration of a number of alternative strategies. A general problem of this type of research is that it compares systems of instruction with different elements, rather than the media themselves. A second problem is that the researcher must make a compromise between "realism" and experimental control. If he emphasizes scientific reproducibility, he may describe a situation that never occurs. If he tries to answer questions of practical policy, he may not be able to generalize his results.

An example of a well designed and carefully controlled experiment is one of a series done at Pennsylvania State University in the 1950's to compare classroom instruction with closed circuit television instruction. In this case two teachers alternately taught randomly assigned students the same material through television, in a television studio room, or directly.

A good example of a field project was done in Ecuador around 1963. Researchers wanted to persuade people in rural communities to adopt certain new practices such as building latrines, submitting to smallpox

* This section is based on "Notes on Instructional Cross-Media Comparisons," by Wilbur Schramm, and "Notes on Case Studies of Instructional Media Projects," by Wilbur Schramm with John Mayo.

vaccinations, etc. They asked media experts to devise a radio program, a program utilizing audio-visual aids, and a program combining the two, and they provided different material over each channel of communication. They also had to make compromises in choosing the experimental and control locations.

The problems of field studies may include the following:

- The administrator of a project may be so committed to a project that he may not be likely to consider alternatives.
- There may be both moral and political pressure to extend a reform to all groups rather than to retain some "controls".
- The cost of providing comparative treatments may be too great.
- Random assignment and control may be difficult.

Some strategies which the field researcher should attempt include:

- Defining the trade-off between "realism" and scientific experimentation.
- Providing rapid feedback to improve the new system as it develops.
- Developing criteria other than simply achievement tests and attitude scales.
- Studying cost more completely.
- Evaluating components of the system to get the most efficient combination of resources.
- Considering non-quantitative results, especially through case studies.
- Trying to incorporate replications of other field studies in his study.
- Using "quasi-experimental designs", in which non-equivalent control groups are equated by statistical treatments.

The Case Study Method. The case study method is another valuable and often overlooked strategy in media research. The purpose of a case study is to illuminate a decision or set of decisions in order to suggest hypotheses for further testing or to help guide further decision making. Its sophistication varies with the time and resources put into

it. It may be a swift and short journalistic account or it may be a thoughtful overview and interpretation of what was done and what was learned.

A case study has certain advantages: it can be done after the fact, and it can cover a sweep of time and space. But it cannot provide assurance that its conclusions are reproducible in other situations. In addition, it places a great responsibility on the researcher.

The sources of data for a case study come from interviews, observation, documents, and secondary analysis. Documents are particularly important and often overlooked when one is doing a case study over a short period of time.

APPENDIX 1. THREE MEDIA PROJECTS TO EXTEND EDUCATIONAL OPPORTUNITY
IN MEXICO

The Stanford team evaluated three technology projects which were designed to expand formal education to the rural areas of Mexico. These projects are summarized in the following table:

	PROJECT		
	<u>Telesecundaria</u>	<u>Radio primaria</u>	<u>Radio Schools of Tarahumara</u>
Medium	television	radio	radio
Location	Federal district and 7 neighboring states	State of San Luis Potosi	Tarahumara mountains in the State of Chihuahua
Educational Level	secondary	primary	primary
Estimated Audience	28,976 students (1972)	44 schools (1972)	1,081 students (1971)
Controlling Authority	Federal Secretariat of Education	Federal Secretariat of Education and Department of Education of San Luis Potosi	Jesuit missionaries

A. Telesecundaria*

Telesecundaria began experimentally in 1966 under the Federal Secretariat of Education and in 1972 served 28,976 students in the Federal District and in seven neighboring states. Its purpose is to provide secondary education (grades 7 to 9) to students who are too distant from regular formal secondary schools.

Telesecundaria classes usually meet in space provided by local communities, rather than in formal, large scale buildings. The classroom coordinators are drawn from the ranks of 5th and 6th grade primary school teachers rather than regular certified secondary teachers. Guidebooks are provided to the coordinators and inexpensive workbooks are sold at low cost to the students.

* This section is based on "The Mexican Telesecundaria: A Cost Effectiveness Analysis," by John K. Mayo, Emile G. McAnany, and Steven Klees, and "Teacher Observation in Mexico," by Judith A. Mayo.

Programs from Mexico City are broadcast over time donated on commercial television between 7:45 a.m. and 2:00 p.m. Monday through Friday and Saturday morning programs are provided to the coordinators. Teleclasses average 20 minutes in length, with the remaining 40 minutes of each class divided between preparation and follow-up activities supervised by the classroom coordinators.

The Stanford researchers utilized a number of techniques to evaluate television instruction, and to compare it to conventional classroom instruction. Their findings are described below:

Input characteristics. Telesecundaria schools tend to be small and flexible institutions rarely serving more than 75 students, while conventional schools are large formal institutions customarily serving more than 500 pupils. Telesecundaria schools do not possess as many facilities or learning aids as conventional schools. Telesecundaria students are generally older and of lower socio-economic status and Telesecundaria teachers generally have less training than teachers in conventional schools.

The cost per student in conventional schools in 1972 was \$200 compared to \$151 for telesecundaria. If the conventional system were extended to the rural areas where most Telesecundaria classes are located, then its costs would be from \$240 to \$431 per student, because in the rural areas there would normally not be a large number of students per school to provide economies of scale.

Output characteristics. Telesecundaria students did about as well as students in conventional classrooms in Mathematics, Spanish, and Chemistry achievement tests. Students in the urban states of the Distrito Federal and Mexico gained more than those in the rural states of Hidalgo and Morelos. In general ability examinations, Telesecundaria students scored lower than students in conventional schools. Parents' socio-economic background did not affect achievement of Telesecundaria students, while it did affect achievement of students in conventional schools.

Both types of students wanted more schooling and better jobs, although students in conventional schools were more likely to seek university training and professional careers.

In general telesecundaria students liked their program, although fully 19% said they could not see the television clearly. Although some observers outside the telesecundaria system consider it "second class", the students themselves defend the quality of their instruction and do not often transfer to the regular schools.

A follow-up study showed that telesecundaria graduates who did not further their education were holding menial jobs not commensurate with their aspirations.

Teacher observation. One of the most interesting methods of evaluation used was that of teacher observation. The researchers observed 97 ninth grade teachers selected from a random sample of telesecundaria and regular classroom teachers in four Mexican states.

The observation form for the study was originally designed and employed in El Salvador to observe the classroom behavior of teachers in that country's instructional television system. It is based on a theory proposed by C.E. Beeby that teaching methodology passes through four stages of development: (1) drill and memorization, (2) the strict sequencing of a formal curriculum, (3) greater enrichment and flexibility, and (4) the encouragement of critical thinking.

To measure teaching methodology, the observation form lists such activities as how much the teacher lectures, dictates, asks thought questions, uses learning aids, provides individualized instruction, permits students to ask thought questions or to have discussions, and encourages group work. The form divides activities by time periods and by the number of times an activity is engaged in.

The study showed that teachers in both types of schools lectured a great deal and did not permit much classroom participation. In mathematics they sent students to the blackboard often, but in Spanish they lectured even more than in mathematics and only rarely sent their students to the blackboard.

On the whole most of the teachers observed were in Beeby's second "stage", since they rarely allowed active student participation, did not use teaching aids, and did not supervise individual work or encourage group work. Those who did some of these things tended to have students with higher mathematics achievement.

Conclusion. From all this evidence, the telesecundaria appears to be accomplishing its objectives and at lower costs than the conventional system. Some changes which could be made to improve the system include:

- Administrative integration with the regular secondary school department in the federal secretariat of education.
- Use of video-tape (all programs are now live), to save and up-date the programs.
- Continued expansion, possibly to the nation as a whole.
- Retraining of teachers in more modern pedagogy and regular monitoring of their classroom behavior.
- Consideration of the possibility of developing public educational television rather than depending on donated time from a commercial TV channel.

B. Radioprimeria

The purpose of the radioprimeria, a pilot project of the Mexican Secretariat of Education begun in 1970, is to provide instruction in grades 4, 5, and 6 to rural schools which have had only the first three grades of primary school. The incomplete primary schools would provide one teacher for grades 4 to 6 who would be assisted by the radio programs. The programs are prepared regularly in Mexico City and then transported to a university operated radio station in San Luis Potosi where they are broadcast for 90 minutes a day.

The Stanford study of radioprimeria utilized the following methods to evaluate the radio schools in the context of educational needs in rural areas: direct observation; achievement testing; analysis of the costs; questionnaires and interviews.

The most important finding was that the radioprimeria was not fulfilling the function for which it was designed. In 1972 only about eight incomplete primary schools had established grades 4 to 6 to take advantage of the radio lessons. Another 36 complete primary schools were using radio, essentially as an adjunct to their regular teaching. In addition, only 18 of the 44 schools using radio had a functioning audible radio on the day they were visited. Since there was little or no supervision, the program personnel in Mexico City were not aware of these problems.

Another major problem was that, since 80% of the programs were prepared for all of grades 4 to 6, the students would hear most of the same programs over the three year period.

* This section is based on "A Report on the System of Radioprimeria in the State of San Luis Potosi, Mexico," by Peter L. Spain.

Other findings were as follows:

- Radio instruction produced achievement scores comparable to those of the children in direct teaching schools.
- The radioprimeria would cost about \$52.60 per student compared to \$118 for traditional instruction.
- About 75% of the radioprimeria teachers commuted from the city to the rural areas and did not like teaching in the rural areas. They were not very satisfied with the radio programs, but still favored their expansion.
- Parents favored schooling for their children principally as a means to move to the city and get better jobs.
- In the City of San Luis Potosi, there are not enough jobs for primary and secondary schools graduates.

Even though radioprimeria has survived for three years, as presently constituted it will not be able to aid rural development. According to the study, rural life will improve only when there is a coordinated attack on rural social and economic problems.

C. The Radio Schools of Tarahumara*

Catholic missionaries founded the radio schools of Tarahumara in northern Mexico to provide the remote villages of the Tarahumara Indians with primary school education. In 1971 there were 46 schools with 1,081 students spread over 10 municipalities in their region. Most of the schools consisted of a single classroom containing students from grades 1 to 4.

The standard primary school curriculum is used and all instruction is in Spanish. Two teachers at the radio station teach all of the radio programs, which consist of 15 minute presentations by subject and grade. Each school which receives the broadcasts has one or two "auxiliary" teachers--persons with usually no more than a primary education.

The researchers tested and interviewed a sample of all the students in the schools. They found that over 60% of the students were mestizo (white) rather than Indian. They also found that, while achievement scores in general were similar to those of students in Mexico City, the mestizo students did significantly better than Indians and were also much less likely to drop out.

* This section is based on "The Radio Schools of the Tarahumara, Mexico: An Evaluation," by Sylvia Schmelkes de Sotelo.

Interviews with teachers and directors showed that the program had the following problems:

- Poorly defined goals and policies.
- Provision of the same urban oriented and academic curriculum to two culturally heterogenous groups, the Tarahumara Indians and mestizos.
- Low motivation by the auxiliary teachers.
- Little local participation in founding and operating the schools.
- Lack of proper supervision and evaluation.
- Lack of sufficient finances to enable authorities to do middle or long-range planning.
- Insufficient time on the part of central personnel to handle the radio schools.

In only 7 of the 24 schools visited was the radio working. Thus the bulk of the teaching was being done by the auxiliary teachers, and the radio, even when used, operated as an aid to the teacher.

These findings called into question the entire scope of the radio schools.

When the researchers presented their findings, the missionaries at first began to plan for a new kind of non-formal school, which would provide Indian adolescents and adults with an awareness of their situation and their need to improve their lot, based on the concepts outlined in Paulo Freire's Pedagogy of the Oppressed. Then the missionaries decided to continue to teach primary school children and to develop adult education as a separate activity. They appeared to be motivated by a desire not to abandon the work of the last 15 years, even though its value had been called into question.

As of the writing of the Stanford report, the new direction of the radio schools had not been determined.

APPENDIX 2. INSTRUCTIONAL TELEVISION IN AMERICAN SAMOA*

ITV in American Samoa was designed to help that territory leap from the era of the one room schoolhouse, rote learning, and untrained teachers to a modern educational system similar to that of the United States. The program began massively in 1964 with broadcasts to all eight primary grades, and expanded to cover the complete high school in 1965. The television studio built in 1964 was more elaborate than any other educational facility in the world. It included six open circuit VHF channels and four studios which broadcast about 6,000 new programs a year.

All the costs were borne by the United States government, which administered American Samoa as a trust territory, and in 1964 all the educational leaders and ITV administrators were mainland Americans. Until recently very little analysis or evaluation of the project had been done.

The results of the analyses in the Stanford report are as follows:

Costs. The cost of ITV is estimated at \$157 per student per year. This figure is high because only 8,100 students, the number of students in the public system, are served by the system.

Academic Achievement. There is evidence that Samoan high school graduates who go to the University of Hawaii do better the longer they have been in the television system. In addition, English tests given to children on Swain's Island, 100 miles away from the main islands of American Samoa and lacking any ITV, showed that their English was very poor compared to students receiving ITV.

In general, the present academic achievement of Samoans is similar to that of underprivileged blacks and Spanish speakers on the American mainland. This may be the result of culture-biased tests as well as of their having to learn a second language in school.

Attitudes. Both students and teachers become progressively less enthusiastic about ITV as they go from the lower grades to high school. This change may be a result of the greater competence of secondary school teachers and of the need for greater classroom decision making and student participation at the secondary level.

Conclusions. It may be necessary to reconsider the kinds of skills the children are being taught. The standardized tests used in Samoa measure academic skills, but very few Samoans will go to college. A more relevant curriculum might provide practical and specifically employable skills.

* This section is based on "ITV in American Samoa--After Nine Years," by Wilbur Schramm.

Specific media do have particular strengths. Now may be the time to cut back on the use of ITV and integrate it with other media and regular classroom teaching to produce the most effective instructional system.

Applications to Other Projects. Some general applications of the Samoan experience to other technology projects are:

- ITV should be introduced gradually grade by grade rather than immediately and massively.

- Strong leadership is needed at the top. In this case it was provided by Governor H. Rex Lee.

- A system essentially imposed from the outside may over a period of time become integrated into the local educational scene. In this case, by 1973 outsiders held only a few technical jobs and Samoans were running their educational system.