

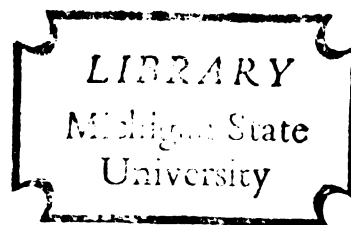
A DESCRIPTIVE STUDY OF THE USE OF
TELECONFERENCING VIA TWO-WAY CABLE TELEVISION
IN RACIALLY IMBALANCED SCHOOLS

Dissertation for the Degree of Ph. D.

MICHIGAN STATE UNIVERSITY

LAWRENCE N. REDD

1976



This is to certify that the
thesis entitled
A DESCRIPTIVE STUDY OF THE USE OF
TELECONFERENCING VIA TWO-WAY CABLE TELEVISION
IN RACIALLY IMBALANCED SCHOOLS

presented by

Lawrence N. Redd

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of the requirements for

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ABSTRACT

A DESCRIPTIVE STUDY OF THE USE OF TELECONFERENCING VIA TWO-WAY CABLE TELEVISION IN RACIALLY IMBALANCED SCHOOLS

By

Lawrence N. Redd

Efforts to achieve educational equality are frustrating and complex. Historically, race has been very much a part of the resistance to educational equality efforts. The Brown decision, the Elementary and Secondary Education Act, and the Civil Rights Act of 1964 have contributed tremendously to equalizing educational opportunity in public schools. However, large numbers of African American pupils remain segregated in public schools and many under-achieve in the fundamental areas of mathematics and reading.

The struggle for educational equality has resulted in a general agreement among educators that the role of parents is important to pupil achievement. Parents in Rockford, Illinois were instrumental in forcing the school district to extend educational opportunity to all of its elementary pupils. To meet both parental and public demands for educational equality, Rockford Public Schools established Special Interest Centers (SIC) for elementary pupils.

However, pupil attendance at the centers was limited to a total of only fifteen days during the school year.

The purpose of this study was to design and describe an instructional system which extends the social and academic experience of the science and mathematics Special Interest Center. The study describes the process of organizing educators, pupils and parents into an instructional system which uses two-way cable television as the prime communication channel among the system's human components.

The instructional system however, was not fully developed, and data concerning achievement of the system's goals and objectives was not quantitatively evaluated. Funds which financed the design of the system were provided by the National Science Foundation (NSF). Efforts to secure monies to develop the design into a functional instructional system failed due to the limited funds available from NSF. However, some conclusions about the instructional system were drawn from the observation methodology employed in the study.

Rockford, Illinois is an appropriate city in which to develop educational teleconferencing via two-way cable television. First, there is community and school support for teleconferencing. The science and mathematics program at the Special Interest Center provides an opportunity, to

evaluate achievement among various socio-economic classroom populations, educators and parents.

A second conclusion was drawn about teleconferencing via two-way cable television. Two-way cable television is an electronic communication channel through which it is possible to conduct science education experience. On one occasion pupils and adults teleconferenced with each other. They used two-way cable television to share and exchange audiovisually information regarding a science education experiment.

Another conclusion was that two-way cable television, specifically teleconferencing, is not a legal substitute for racial desegregation of Rockford Public Schools. The schools which do not meet Illinois guidelines for desegregation are in violation of the state's statutes. The Rockford Public Schools teleconferencing plan is designed to support integration efforts outside of the legal question of public school desegregation. Much emphasis is placed on teacher and parental use of cable television.

The proposed use of two-way cable television in the instructional system described in this study is a relatively inexpensive method of extending equal educational opportunity. Initial equipment cost is estimated to be \$33,016.00. When amortized over seven years, the equipment cost is \$4,716.57.

Lawrence N. Redd

Finally, it was concluded that the proposed plan, described in this study, to extend equal educational opportunity in the Rockford Public Schools, meets all of the criteria identified by Elwood Miller (1965) as necessary to be classified as an instructional system.

Reference

Miller, Elwood G. "A Descriptive Study, Evaluation and Analysis of Instructional Systems Development Activities in Selected Departments at Michigan State University During the Period 1960-1963." Ph.D. dissertation, Michigan State University, East Lansing, 1965.

A DESCRIPTIVE STUDY OF THE USE OF
TELECONFERENCING VIA TWO-WAY CABLE TELEVISION
IN RACIALLY IMBALANCED SCHOOLS

By
Lawrence N. Redd

A DISSERTATION

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Department of Secondary Education
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1976

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1976

Dedication

To Betty Ann, Ronald and Terri Ann.

You are my soul and inspiration.

ACKNOWLEDGMENTS

I wish to express my appreciation and gratitude to the members of my committee for their scholarly advice and guidance. I am especially indebted to Dr. Thomas F. Baldwin who encouraged me to develop my work in educational teleconferencing when the idea was in its most embryonic stage. He devoted much time and provided valuable consultation.

Much gratitude is also extended to Dr. Paul W. F. Witt for his probing and helpful questions and overall scholarly advice throughout my program. I am also indebted to Dr. Bruce Miles who succeeded Dr. Witt as my committee chairman. I appreciate greatly his encouragement and assistance.

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To Betty Ann, my wife, and my children, Terri Ann and Ronald, I extend my heart itself for your unyielding support, sacrifice and understanding. And to Drs. Joseph McMillan and David Lewis, I will always be indebted for their encouragement and confidence in me.

Last but certainly not least, I wish to thank the many fine people of Rockford and Rockford Public Schools, especially James Thomas, Oscar Blackwell and Donald Swanson, without whom this study would not have been possible.

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THE ROCKFORD CABLE PROJECT

The use of two-way cable television in Rockford Public Schools is an outgrowth of the Rockford Cable Project initially designed by a research team from Michigan State University. The design for applying two-way cable television to the educational needs of Rockford, Illinois was not funded by the National Science Foundation (NSF) and remains undeveloped and untested. This study, therefore, is descriptive and theoretical.

In 1972 the Federal Communication Commission ruled that all cable television systems built after that year must have two-way transmission capability. Some existing systems already had two-way capability. In 1974 the National Science Foundation allocated funds to sponsor projects to evaluate two-way cable television services. Seven research teams throughout the United States submitted research proposal packages to the NSF to evaluate the practical operation of two-way cable television in selected United States cities.

Each proposal package contained several applications or designs for delivering social services to citizens via two-way cable television. Among all proposals, three applications were finally selected and funded by the NSF for

development. The NSF did not give specific reasons why some applications were not selected for development. Understandably, it was financially impossible to fund each application. However, controversy may have figured into the consideration of the Rockford educational application.

Some NSF decision makers may have believed that two-way cable television in education could conflict with integration efforts. The possibility of conflict arose among members of the MSU research team and also members of the Rockford Public Schools board of education. Similar considerations may have surfaced in the NSF.

This study presents a rationale for using two-way cable television in education and describes a method for using a two-way cable television in Rockford, Illinois to achieve pupil equal educational opportunity. The issue of using two-way cable television to achieve equal educational opportunity is fully discussed.

CHAPTER I

INTRODUCTION

The Problem Statement

Educational equality efforts in Rockford, Illinois have accentuated some important human relationship objectives which are inherent in transportation and telecommunication. A court suit initiated by Rockford citizens forced Rockford Public Schools to confront desegregation, and precipitated some profound problems for the school district. The district court, in demanding that desegregation plans be submitted to it by all interested parties, deemphasized busing in its instructions. The court instructions thereby placed extreme limitations upon transportation as a tool to be used in Rockford desegregation efforts. Busing pupils across town to achieve integration is one tool that has been widely used in equal educational opportunity efforts. Using two-way cable television to transport the minds of pupils across town is new, and adds quite another dimension to equal educational opportunity efforts. Given the limited busing plan developed by Rockford Public Schools, accepted by the Federal District Court, and not appealed by

Rockford plaintiffs against segregation, the problem then, is how to effect educational equality by use of two-way cable television.

The Problem in General

Educational equality in public schools has proven to be a lengthy, complex and frustrating problem for many school districts. Beginning in the 1930's, the NAACP determined that achievement of educational equality under the separate but equal policy was next to impossible because southern white boards of education purposefully controlled both environments unequally. The NAACP objective was to dissolve public school segregation policy, which was inherently unequal, and achieve equal protection of the law. The 1954 Supreme Court decision, Brown v. Topeka, represents a landmark achievement of brilliant strategy and tenacity to acquire equal educational opportunities for African American learners. Desegregation of schools is the most significant and major innovation to equalize educational opportunity in public schools. But more than twenty years after the Supreme Court ruling against "separate but equal" public schools, large numbers of African American elementary school pupils remain segregated in southern and northern schools and many test below national reading and mathematics achievement norms, two fundamental academic areas.

The often abstract political and economic dynamics which constrain some school boards from extending equal educational opportunity were elucidated by Samuel Bowles in the late 1960's:

Rising Negro achievement levels confers definite benefits on those directly involved, and on many not so directly involved. But if we view the individual gain from education in relative rather than absolute terms, equality of educational opportunity is a two way street. Some stand to benefit by it and others stand to lose. The competition for places in good colleges and the competition for good jobs must cause many white parents to regard the narrowing of racial discrepancies in educational opportunity with mixed feelings or worse.¹

An educational opportunity paradox does exist within the United States. In 1973, the Journal of Intergroup Relations reported on polls which indicated "two thirds of Americans supported the idea of school desegregation, but 69 percent say no to busing. In other words the principle is supported, the practice is not."²

The paradox is less complex when the principle and practice of desegregation are analyzed against the varying conditions of North and South. In the South, the original target of the Supreme Court ruling, not only did state laws support segregation but schools were kept separate by

¹Samuel Bowles, "Towards Equality of Educational Opportunity," Harvard Educational Review, Winter 1968, p. 98.

²Eleanor Blumenberg, "The Yellow Peril," Journal of Intergroup Relations, Summer 1973, p. 38.

utilizing the school bus to transport white and black learners of relatively integrated communities to completely separate schools. Often black students were bused past white schools and vice-versa.

While the South struggled with its adoption of the desegregation innovation, the North generally supported the new law of the land issued by the Supreme Court.

In the North, communities were relatively separated racially. Whereas Southern white school boards had controlled black schools by segregation laws, Northern intra-system school districts often showed curious geographical boundary patterns which resulted in white and black youngsters attending separate schools. Northern African Americans argued that school boards were gerrymandering attendance areas, a stratagem which resulted in unequal educational opportunity for their children.

When evidence began emerging to support the position that separate but equal customs were also being practiced in the North, the innovation of desegregation entered its roughest waters of resistance. Many Northern school districts realized they were not willing to adopt equal educational opportunity policies. Some white citizens continued the suburban movement, some stayed and shifted communities, and others forced court action to halt the adoption of desegregation. Whereas the South had used the school bus

to maintain segregation, the North was generally refusing to extend the use of the bus to integrate its schools. One white parent in California, when asked about the use of the school bus, replied: "For overcrowding or any other such reasonable reasons for which children ride buses. But not for integration."³

Well before the Supreme Court said that busing is a viable desegregation tool (Swann v. Charlotte-Mecklenberg, 1970) non-Southern white parents who opposed the use of school buses for the purpose of integration had made their positions known. In Philadelphia, Boston, Los Angeles and Pontiac, Michigan, protests and even violence against school busing were well documented. Not only did the Nixon administration assume a position of inaction with regard to desegregation, but also President Gerald Ford sided with white parents of Boston who were in protest against the busing of children to desegregate the public schools.

The Problem in Rockford

Desegregation for Rockford Public Schools developed a legal footing in the early seventies. The "Rules Establishing Requirements and Procedures for the Elimination and Prevention of Racial Segregation in Schools" was issued on November 22, 1971, by Michael J. Bakalis, Superintendent of

³Lillian Rubin, Busing and Backlash (Berkeley: University of California Press, 1972), p. 7.

Public Instruction, State of Illinois. Consequently, the State of Illinois set statewide desegregation standards delineated for each school district. To be in compliance with the Bakalis directive, a school in District #205, Rockford Public Schools, had to house a minority population which ranged from 0 to not more than 30 percent.⁴

Minority enrollment in Rockford Public Schools during the 1971-1972 school year was 5,362. Minority students attending schools in which minority attendance exceeded 50 percent of the enrollment was 2,386 or 44 percent of the total school district's minority population.⁵

In 1973 a survey of Rockford Public Schools, conducted by the American Association of University Women and the League of Voters, revealed conditions which might be termed racial isolation. The survey discovered some elementary schools which suffered from a lack of materials, a lack of up-to-date texts, and buildings that were somewhat crowded and lacking in special purpose rooms. The deficiencies were confined to elementary schools located in the city's southwest quadrant, an attendance area of high minority enrollment.

The survey also revealed that 43 percent of the learners enrolled in Rockford elementary schools that did not

⁴U. S. District Court, Northern District of Illinois, No. 70C16, p. 5.

⁵Ibid., p. 4.

comply with State of Illinois integration requirements were identified as underachievers in the fundamental areas of mathematics and reading. Data indicated that a high percentage of the minority enrollment in grades nine through twelve correlated with high minority dropout rates.

School attendance boundaries appeared to be drawn so as to foster minority populations, and in 1973 the number and percentage of minority pupils attending schools which had 50 percent or greater minority enrollments were not significantly different from the 1971 figures.

The school district also employed a low percentage of minority teachers. Of the 1,679 school teachers in 1972-73, approximately 100, or 5.95 percent of them were members of a minority.⁶

Unappeased by the school district's movement toward compliance with the 1971 "Rules Establishing Requirements and Procedures for the Elimination and Prevention of Racial Segregation in Schools," a cross-section of Rockford citizens and community organizations instituted a class action suit naming School District #205 defendant.

Supreme Court Efforts to Solve Problem

The Supreme Court decreed that segregated public schools are inherently unequal and can never be made equal.

⁶Ibid., p. 9.

Subsequent to that ruling the Court declared that all vestiges of dual school systems must be eradicated. The adoption rate of these laws appears related to U. S. presidential leadership, however.

The Brown decision of 1954 placed responsibility for equal educational opportunity in the hands of local school boards. In Brown II, 1955, the Court held:

School authorities have the primary responsibility for elucidating, assessing, and solving these problems; courts will have to consider whether the action of school authorities constitute good faith implementation of the governing constitutional principles.⁷

In some instances local board members did not adopt the new law of the land for personal and social reasons. In other instances, the political structures did not permit compliance with the law. Board members who assumed compliance positions could be voted off the boards in favor of persons pledging to maintain a segregated system.⁸ Perhaps the most extreme case of local school board resistance to compliance with the court ruling was in Prince Edward County, Virginia. To avoid integrating white and black pupils the public schools were closed. White students attended

⁷Brown et al. v. Board of Education, 349 U. S. 294 (1954).

⁸Robert L. Carter, "Equal Educational Opportunities for Negroes," With All Deliberate Speed, ed. by John McCord (University of Illinois Press, 1969), pp. 56-84.

segregated private schools financed with public funds.⁹

In contrast, local authorities in many districts moved swiftly to comply with the ruling against de jure segregation. Washington, D.C., Louisville, Kentucky, and St. Louis, Missouri, were initial models of desegregation efforts.¹⁰ In St. Louis and some northern districts white populations began showing a tendency to shift from the central part of the city toward the periphery. The remaining central city's black populations tended to expand outward, finally reaching the boundaries of the peripheral white communities. Some whites on the city fringe area moved to avoid the expanding black communities, "taking up residence in suburban districts that had a greater chance of remaining lily white."¹¹

Consequently, in the 1960's legal efforts to achieve educational equality were broadened to include both de jure and de facto segregation. Although laws had been passed to deal with segregation by law, segregation by "custom" was another dimension. Population shifts to avoid integration resulted in pervasive patterns of de facto segregation throughout the country and as a result:

⁹J. Rupert and Edward Peeples, "Prince Edward County, Virginia," Phi Delta Kappan, May 1964, p. 394.

¹⁰Henry Bullock, Education of the Negro in the South (Cambridge: Harvard University Press, 1967), p. 239.

¹¹Ibid., p. 239.

. . . in 1964, a decade after the Supreme Court ruling against segregated education only 9 percent of the children in the southern and border states attended integrated schools. Patterns outside the south are not notably dissimilar.¹²

Responsibility for resolution of educational segregation rested again with the Supreme Court. In Swann v. Charlotte-Mecklenburg, Chief Justice Burger observed that problems encountered by district courts and courts of appeals in dealing with segregation clarified the responsibility of the Supreme Court to amplify some sort of guidelines for desegregation for school authorities and for court assistance. Burger wrote that the desegregation process:

. . . has been rendered more difficult by changes since 1954 in the structure and patterns of communities, the growth of student population, movement of families, and other changes, some of which had marked impact on school planning, sometimes neutralizing or negating remedial action before it was fully implemented.¹³

Consonant with the 1954 adjudication, the Court decreed that the only avenue to equal educational opportunity for all races was in the elimination of all vestiges of dual school systems.

The Swann v. Charlotte-Mecklenburg ruling firmly established physical transportation as one means to be used

¹²Herbert Horatio Humphrey, Integration v. Segregation (New York: Cowen Co., 1964), pp. 2-3.

¹³Swann et al. v. Charlotte-Mecklenburg Board of Education, 402 U. S. 15 (1970).

in intra-district desegregation efforts. Chief Justice Burger foreshadowed the limitations to which busing would be used in desegregation efforts among autonomous districts:

Rural areas accustomed for half a century to the consolidated school systems implemented by bus transportation could make adjustments more readily than metropolitan areas with dense and shifting population, numerous schools, congested and complex traffic patterns.¹⁴

The Charlotte-Mecklenburg School System is one school district encompassing the city of Charlotte and the county of Mecklenburg, North Carolina. Almost 90 percent of the black students attended city schools and more than 90 percent of the white students attended county schools. The Supreme Court made clear, in the Swann case, that intra-district busing should be used as a tool to achieve desegregation.

Adoption of the Swann ruling by local districts appeared somewhat socially weakened by previous Nixon administration public statements and generally apathetic enforcement of public school desegregation deadlines. In his book, The Federal Retreat In Desegregation, Horace Barker presents a damaging case against Richard M. Nixon, then president of the United States.¹⁵

¹⁴Ibid., p. 14.

¹⁵Horace Barker, The Federal Retreat In School Desegregation (Atlanta: Southern Regional Council Inc., 1969), p. 51.

President Gerald Ford drew additional criticism when the Swann ruling was applied to the desegregation of Boston public schools. Some saw his statements "against forced busing" as lending support to those resisting Court law.

District Court Efforts in Rockford

Judge William Bauer of the Federal District Court in Rockford received the segregation suit filed by a local citizens coalition against Rockford Public Schools. The Court required that the school board "come forward with a plan that promises realistically to work . . . until it is clear that state imposed segregation has been completely removed."¹⁶ Petitioners reserved the right to appeal district court decisions to circuit courts in the face of evidence which suggests an unrealistic plan submitted by a local board but approved by the district court. Petitioners against Rockford Public Schools chose not to appeal Judge Bauer's decision.

Rockford area citizens and community organizations filed a class action suit against Rockford Public Schools in 1973. Efforts to achieve equal educational opportunity in Rockford Public Schools have since been directed under the auspices of the Federal District Court. The plaintiffs

¹⁶Green et al. v. County School Board, 391 U. S. 430 (1967).

sought to redress alleged deprivation of their civil rights caused by racial discrimination and imbalanced educational opportunities existing in the defendant School District.

The Court's Memorandum Opinion and Order (August 16, 1973) set forth the following criteria which it held important to proper evaluation of any school desegregation program:

1. Minority isolation
2. High minority enrollment correlated to high minority underachievement
3. Attendance boundaries drawn so as to foster minority isolation
4. A low number of minority teachers
5. School facilities and high minority schools.¹⁷

The court found Rockford Public Schools making good progress in only one of the aforementioned areas. The board had instituted a five-year plan to increase its minority teaching staff and was "moving at a good pace."¹⁸ Judge Bauer ordered desegregation plans to be submitted by interested parties. He also articulated five evaluation principles, one of which addressed transportation of pupils:

While bus transportation has been an integral part of the public education system for years, and was perhaps the single most important factor in the

¹⁷U. S. District Court, Northern District of Illinois Western Division, No. 70Cl6, pp. 4-9.

¹⁸U. S. District Court, Northern District of Illinois, No. 70Cl6 (coded copy), p. 9.

transition from the one-room school-house to the consolidated school, "busing" should be reluctantly used to solve the problem of school segregation. Such "busing" poses numerous problems and inconveniences on parents, students and school officials. Thus the busing of school students in order to solve school segregation should only be utilized when all other remedial measures appear impractical and ineffective.¹⁹

Rockford Public Schools, the Rockford Education Association (REA), and the plaintiffs each submitted desegregation plans to the court. The plaintiffs supported the plan submitted by the REA. The REA's desegregation plan called for redrawing elementary school boundary lines and instituting mandatory busing at all school levels. The court did not adopt the REA plan.

The court accepted the Rockford Public Schools plan which called for no cross-busing of pupils. Voluntary enrollment policies remained in effect from previous 1973 desegregation efforts involving both junior and senior high school students.

The main thrust of the Rockford Public School's plan, however, involved desegregation efforts in elementary schools. Segregation in elementary schools was the main concern of the plaintiffs. The core of the board's elementary plan called for the development of Special Interest Centers.

¹⁹Ibid., p. 10.

Special Interest Centers are designed to foster special academic programs in (1) reading and language arts, (2) science and mathematics, (3) social studies, and (4) environmental education. The centers are housed in designated sections of existing regular elementary schools and are equipped with a wealth of materials and hardware not available in other schools. For example, the mathematics-science center has a small museum, mini-computer, simple microscopes, and a small pond on the school grounds where pupils can study ecology and gather biological specimens. The centers are also staffed with teachers who specialize in specific academic disciplines.

Learners are bused to the centers and integrated racially into work groups. Students spend a total of fifteen days of the academic year at three centers on a voluntary basis. Visitations are broken down into three five-day segments which are spread throughout the academic year.

The court was not totally persuaded by Rockford Public Schools that Special Interest Centers would realistically achieve equal educational opportunity. The court, therefore, requested a hearing near the end of academic year 1974-75 to evaluate the centers' functions:

. . . the vast majority of the School Board's plan involves student participation in special interest centers which only provide integration one twelfth of the time. While special interest centers may be both educationally attractive and sound, it remains

to be proved whether they are the best means of sufficiently integrating the School District.²⁰

Parents have the option to refuse to permit their child to be bused to a Special Interest Center. Because the Special Interest Centers are housed in specified wings of existing elementary schools, they place additional resources in certain elementary schools. These schools are not in the quadrant initially identified as facility-deficient by the American Association of University Women and Voters League survey.

The court left open the possibility of future legal action against Rockford Public Schools with the review demand. However, plaintiffs against Rockford Public Schools did not appeal the District Court ruling or seek further court action in 1975.

Some parents, educators, and other members of the Rockford community believe that the amount of time spent at the center is much too inadequate for low achievers to make significant improvement in their academic performance. Neither is there time for meaningful and productive social contact among pupils from various schools. Indeed, the board of education is amenable to extending experiences pupils receive at the science and mathematics Special Interest Center.

²⁰District Court, No. 70C16, p. 33.

Purpose of the Study

The purpose of this study is to design and describe an instructional system which extends Special Interest Center academic and social experiences among parents, pupils, and educators. The system's goal is to improve academic achievement in science and mathematics and create positive social attitude change among the three groups (parents, pupils and educators), interconnected via two-way cable television.

It is technologically possible to use two-way cable television to conduct academic activities and cross-cultural communication among parents, educators, and pupils of diverse backgrounds, allowing them to share similar and contrasting experiences, and to discuss information intrinsic to the educational setting.

Using cable television, pupils located in elementary school A can both view and talk with pupils geographically located across town in elementary school B. Both schools A and B can interact with the teachers in the science and mathematics Special Interest Center. The two-way electronic communication process between geographically separated groups (two or more) is called teleconferencing.²¹

²¹G. W. Jull and C. A. Billowes, "Human and Technical Factors in Teleconferencing Services." (A paper presented at the International Symposium on Subscriber Loops and Services: Ottawa: May 20-23, 1974), p. 1.

Teleconferencing allows time spent on science and mathematics at the Special Interest Center to be extended to enhance learning opportunities. For example, after spending one week at the center, pupils return to their regular elementary schools (home schools). Special Interest Center teachers using two-way cable television can continue to instruct home school teachers and pupils in science and mathematic activities. Pupils in different schools can interact and exchange both academic and social experiences via two-way cable. In a similar manner, parents of children attending schools A and B can also interact audiovisually from their respective neighborhood schools, with each other and with the Special Interest Center teachers.

Community citizens, including parents of various racial and socio-economic backgrounds, can also present one-way educational programs in an attempt to change stereotyped attitudes which some adults might harbor against groups or individuals that are different from themselves.

Setting of the Study

The public school district where this study is being done, Rockford, Illinois, sprawls across the Blackhawk Prairie, ninety miles northwest of Chicago. With a population of 147,370, Rockford exemplifies the middle-size northern city. The town maintains a stable and diversified

industry. Over 300 different types of products are manufactured in Rockford, including furniture, automobile parts, and precision machinery and instruments.

Rockford has a mayor-councilman form of government which is progressive. The local councilmen and businessmen appear to work closely together to maintain and strengthen the general and business communities. Together they sponsored a national search aimed at systematically developing the local cable television company, Rockford Cablevision, into a national model. One African American is on the council.

Although Italians were early settlers, the city's present most visible ethnic populations are of African, Mexican and mainly Swedish descent. The major hospital in Rockford is Swedish-American. The pluralistic culture naturally generates some social and cultural problems normally associated with larger urban cities. Theoretically, at least, problems relating to the confluence of cultures in Rockford are manageable and solvable.

Much of Rockford's problem with school segregation stems from the city's relatively segregated cultural communities. The segregation of these cultures in the community produces a notable amount of school segregation, particularly in elementary schools. The voting community of Rockford, however, manifested its opposition to busing as a means of

equalizing educational opportunity, by electing three members to the board of education who ran on platforms opposing busing for integration.

Rockford Public Schools (1975-76) has a student population of 39,230. The minority enrollment which totaled 6,803 students or 17.3 percent of the student population can be broken down by culture as follows: American Indians 122 or 0.3 percent; Black 5,946 or 15.1 percent; Oriental 74 or 0.2 percent; and Spanish 661 or 2 percent.²²

Rockford has 1,819 teachers; there are 101 minority teachers. Only one American Indian is employed by Rockford Public Schools. There are two Orientals, three Spanish Americans, and ninety-five African Americans.

Rockford Public Schools superintendent stated that the annual (1974-75) per student cost in high school was \$1335.54. Per student expenditure at the middle schools was \$1300.05 and elementary costs per student was \$1194.68.²³ The 1974-75 Illinois average was \$1376.00 for all students and the national average for all students was \$1255.00.²⁴

²²Appendix #1, Status Report In Respect to Integration of Rockford Public Schools, Rockford Public Schools, 1975, p. 1.

²³Statement by Arthur Johnson, Superintendent of Rockford Public Schools, telephone interview, August 6, 1976.

²⁴Statement by Dr. Ki-Suck Chung, Michigan Department of Education, telephone interview, August 5, 1976.

The Education Committee acts as the interface between the schools and the seven-member board of education. Special curriculum and educational innovations are directed through the five-member Education Committee to the Board of Education. Additionally, the board employs a director of integration to assist in the management of desegregation efforts.

Rockford decision makers, educational administrators, government officials, and business leaders project pride toward their city and appear progressive in their efforts to develop its resources. The voting public, however, is conservative on the issue of busing to achieve equal educational opportunity. Rockford, the second largest city in Illinois, is one of the few cities in the United States with a functional two-way cable television system. That is one of the major reasons this study takes place in Rockford.

Definition of Terms

Teleconferencing: Electronic two-way voice and video communication between two or more groups.

Special Interest Center: Specially equipped schools with a variety of human and non-human resources where learners receive intensive and exceptionally well designed instruction. High and low achievers are grouped heterogeneously.

Cable Television: A communications system which distributes broadcast television signals, original programs, and services by means of coaxial cable (also known as CATV, Community Antenna Television).

CATV: See Cable Television.

Distant Signal: The over-the-air signal of a commercial or educational TV station which is extended or received beyond the predicted Grade B contour of that station.

Educational Channel: FCC rules require cable systems in the top 100 television markets to set aside one channel for educational uses, to be available without cost for the "development period." The development period of a CATV system runs for five years from the time that subscriber service began, or five years after the completion of the basic trunk line.

Government Channel: FCC rules require cable systems in the top 100 markets to set aside one channel for local government use to be available without cost for the "development period."

Half-inch Videotape: Magnetic tape used to electronically record sight and sound for instant playback. It is capable of storing video information for replay and can be erased and re-recorded numerous times. Although half-inch is most commonly used for low-cost programming, videotape comes in three-quarter-, one-, and two-inch widths.

Public Access Channel: FCC rules require systems in the top 100 markets to set aside one channel for use by the public. The public access channel is free and available at all times on a first-come, first-served, nondiscriminatory basis for noncommercial use by the public.

Trunk Line: The major distribution cable used in CATV. It divides into feeder lines which are tapped for service by subscribers.

Two-way Capability: The term used to refer to the capability of coaxial cable to carry signals in both directions, from the headend to the subscriber and in reverse.

Headend: The electronic control center generally located at the antenna site of a cable system which amplifies, filters, and converts incoming broadcast TV signals to cable system channels.

Equal Educational Opportunity: The equalization of learning outcomes among pupils of different racial or socioeconomic backgrounds within a given school district.

Instructional System: The assembly of teachers, learners, parents, time, space, objects, and ideas in a purposive organization in order to perform a desired operation such as bringing about controlled behavior change.

Academic Achievement: The attainment of specified goals and objectives as determined by the formal educational institution.

The Overview of the Study

This study is presented in five chapters.

Chapter I contains the statement of the problem and presents a brief overview of efforts to solve the problem. It describes the purpose and the setting of this study. Definitions of terms to be used in subsequent chapters are provided.

Chapter II, the rationale for the study, presents the roots of educational inequality, and the historical efforts toward equal educational opportunity. The potential for two-way cable television and nature of Special Interest Centers are also presented.

Chapter III contains the background and description of the instructional development system approach used in the study. The utilization of the method is presented step-by-step.

Chapter IV presents the plan for using CATV to extend Special Interest Center experiences. Prototype scripts and guidelines for implementation of the plan are provided.

Chapter V contains a summary of the study, conclusions, and recommendations for further research and investigation.

CHAPTER II

RATIONAL FOR THE STUDY

Separatism and Equal Educational Opportunity

Reconstruction of Southern state governments following the Civil War resulted in free public education for Africans without legally imposed segregation laws. Rayford Logan, in Betrayal of the Negro, traces a series of complex political events and legal decisions at both the state and federal levels which shifted a section of the United States society towards legal segregation. Perhaps the most significant legal decision was the 1896 Supreme Court ruling in the case of Plessy v. Ferguson.¹ In that case the Court held constitutional the doctrine that schools could be separate but equal.

With increasing frequency Americans of African descent and other visible minorities were stymied in efforts to acquire and maintain public school facilities and resources comparable to those of whites. When resources were

¹Rayford Logan, Betrayal of the Negro (London: Collier Books,), p. 121.

provided, African Americans made educational improvements. As resources decreased so did educational achievement.

During the "separate but equal" era equal educational opportunity was determined almost entirely by the section of the United States in which pupils resided. Educational opportunity in agricultural states was inferior to that in industrial states; rural education was generally considered to be inferior to urban education; and education in southern states was thought to be unequal to nonsouthern states. For African American pupils of the South, particularly in the rural South, the barriers to equal educational opportunity were especially severe. Nineteen so-called Southern states and the District of Columbia required by state and local laws that black children attend schools apart from white pupils. State laws also required that substantially equal accommodations be furnished each race, but that was seldom the circumstance.

Professor Charles H. Thompson, addressing the World Federation of Education Association in 1935, expounded upon the inequity of instructional resources among African American pupils residing in the South.² In 1930, in those states where separate schools were mandatory, the average per capita expenditure for white pupils was \$44.31 compared

²Charles Thompson, "Education of the Negro in the United States," School and Society, November 9, 1935, p. 625.

to 28 percent of that amount, \$12.57, for black pupils. Expenditures ranged from substantially equal amounts among children in the District of Columbia to only 12 percent as much for each black child in Mississippi. Black schools, controlled by white boards of education, manifested the following state of inequitable conditions:

- 1) Schools had a shorter academic year by one and one-half to two months.
- 2) Schools had less equipment, and equipment was of poorer quality than in white schools.
- 3) Teachers in black schools were less well trained.
- 4) There were fewer teachers and they were paid less than in white schools.
- 5) The average black teacher had 40 percent more children to teach.
- 6) Some 40 percent more classrooms were needed if black pupils enrolled were to have facilities even approximating those of white pupils in the same communities.³

The increase in disparity of per capita expenditure between white and black schools was compared over a thirty-year period by Thompson. In 1900 the disparity between white and black school expenditures was 60 percent. By 1930 the rate had reached 253 percent. Thompson concluded his description of educational inequities by identifying the crux of the problem as the policy of maintaining separate white and black schools:

³Ibid., p. 626.

Not only does it permit and encourage gross discrimination, but as an instrument of social policy it connotes and enforces an inferior status which in itself is the very antithesis of equal opportunity, educational or otherwise.⁴

Race and Federal Aid to Education

Efforts by the federal government to improve and equalize educational opportunity among states and socio-economic groups have been extensive and complex. The question of race, addressed by Thompson and others, was not unrelated to congressional inability to pass a general aid-to-education bill. Targeted federal grants and loans were provided local districts for such things as school construction, maintenance, and in some cases, teacher salaries.

General federal concern over the national status of education accrued after the high illiteracy rate was revealed as a consequence of the World War I draft. In 1938, the advisory Committee on Education substantiated inequity of educational opportunity among states.⁵ Congressional bills to equalize educational opportunity among states through federal aid were introduced that same year.

⁴Ibid., p. 638.

⁵Brown et al. v. Board of Education, 347 U.S. 486 (1954).

General aid-to-education bills were plagued by various political, social, and economic issues. Senators Pat Harrison and Elbert P. Thomas of Mississippi and Utah respectively introduced a general aid bill in 1938. The bill proposed federal aid proportionately to the varying needs of the states. Versions of the bill were still being debated in 1943.⁶

Almost from the very beginning, race became a factor in federal government general school aid to local districts:

S 643 reached the Senate floor in October 1943 and was debated for six days. Finally, the adoption of the amendment by Sen. William Langer (R-N.D.) which stipulated how states should spend their funds for white and Negro schools, lost the bill the support of several Southern Senators.⁷

Race was also a part of general aid bill debates in 1948 and again in 1949. Senator Tom Connally (D-Texas) introduced an amendment to S.472 to prohibit any "provisos in future appropriations for the school program" (the implicit purpose was to preclude anti-segregation amendments).⁸ Senator Henry Cabot Lodge's proposed amendment to an education aid bill, which would have denied funds to states maintaining segregated schools, was defeated in 1949.

⁶Federal Role In Education (Washington: Congressional Quarterly Service, 2nd ed., 1967), p. 17.

⁷Ibid., p. 17.

⁸Ibid., p. 19.

Social Efforts to Achieve Educational Equality

In 1935 the NAACP and Fund for Public Service joined together to form a social-economic base. The aim of the coalition was to foster a doctrine favorable to civil rights.⁹ It was from that base of funds and subsequent social campaigns that successful legal challenges were launched against the separate but equal doctrine.

Segregated public education was determined by NAACP leaders to be the most vulnerable link in the separatists' chain. To dismantle the policy, initial strategy involved legal challenges in South-North border states such as Maryland and Missouri. Nor was education perceived as a monolith. Racial segregation in graduate and professional schools was identified as the target point.

During the '30's and '40's the NAACP won favorable Court decisions (Murray v. University of Maryland; Gaines v. University of Missouri; and Sweatt v. Painter, in Texas) and established legally the impossibility of a separate but equal doctrine in graduate and professional education. Legal decrees from those cases established a sound base from which to challenge de jure segregation in public schools, both secondary and elementary, in Southern and border states.

⁹Henry Bullock, A History of Negro Education in the South (Cambridge: Harvard University Press, 1967), p. 226.

In the early 1950's the NAACP guided a series of cases involving public schools segregation through the court system. The cases were from Delaware, South Carolina, Virginia, and Kansas. Black children in each of the cases had been denied enrollment and attendance in "white" schools because of state laws which either required or permitted segregation. The suits were centralized by the U. S. Supreme Court into one general case and became known as Brown v. Topeka.¹⁰

Integration and Equal Educational Opportunity

The U. S. Supreme Court decision in Brown v. Topeka declared segregated schools unconstitutional:

We conclude that in the field of public education the doctrine of "separate but equal" has no place. Separate educational facilities are inherently unequal.¹¹

The decision represented a major step nationally toward a movement to irradicate separatism from public education and society. However, the desegregation ruling was only one important plateau, in a series of efforts, in the struggle to achieve equal educational opportunities for pupils.

The court decree of 1954 did not clarify entirely what was meant by equal educational opportunity. The ruling

¹⁰Brown, op. cit., p. 486.

¹¹Ibid., p. 495.

established an additional assumption for equal educational opportunity which focused in part on pupil outcome:

. . . what is important for the evolution of this concept of equality of opportunity is that a new and different assumption was introduced--the assumption that equality of opportunity depends in some fashion upon effects of schooling. By doing so it brought into the open the implicit goals of equality of educational opportunity--that is, goals having to do with the results of school--to which the original concept was somewhat awkwardly directed.¹²

Eventually equal educational opportunity became synonymous with integration.

Arguments before the Supreme Court against segregation in 1954 did not emphasize only learning outcomes of school as a basis for declaring separate schools unconstitutional. The impossibility of educational equality under the separate but equal doctrine had been established in the cases of graduate and professional schools. Testimony was directed primarily at inferiority manifestations among blacks resulting from separatism. Consequently, pupil achievement was not used directly as a criterion of educational inequality.

The 1954 Supreme Court decision used the effects of separatism cited by a lower court in Kansas as a criterion for equal educational opportunity:

Segregation of white and colored children in public schools has a detrimental effect upon the colored

¹²James S. Coleman, "Responsibility of Schools in the Provision of Equal Educational Opportunity," National Association of Secondary-School Principals, May 1968, p. 181.

children. The impact is greater when it has the sanction of the law; for the policy of separating the races is usually interpreted as denoting the inferiority of the group. A sense of inferiority affects the motivation of a child to learn. Segregation with the sanction of law, therefore, has a tendency to (retard) the educational and mental development of negro children and to deprive them of some of the benefits they would receive in a racial(ly) integrated school system (p. 494).¹³

As a result,

. . . integration itself emerged as the basis for a new concept of equality of educational opportunity. Thus the idea of effects of schooling as an element in the concept was introduced but immediately overshadowed by another criterion of racial integration.¹⁴

The Civil Rights Act and Educational Equality

Desegregation efforts moved slowly for ten years in the South. In large northern urban areas socio-economic population shifts negated much anticipated progress. By the mid-1960's some observers concluded that schools were more segregated than at the time of the court decision ten years prior.¹⁵

Consequently, the Civil Rights Act of 1964 provided additional assistance at the national level for educational

¹³Brown et al. v. Board of Education 347 U. S. 493 (1953).

¹⁴Coleman, op. cit., p. 181.

¹⁵Nancy St. John, School Desegregation Outcomes for Children (New York: John Wiley and Sons, 1975), p. 118.

opportunity. Social and political conditions external to the educational setting surrounded passage of the act. John F. Kennedy's death, the civil rights movement, and the efforts by the Johnson administration to unify the nation after the Kennedy assassination coincided with the passage of the bill. The Civil Rights Act itself provided economic pressure and guidelines for local district desegregation.

Title VI of the 1964 Civil Rights Act barred discrimination against any person due to national origin, color, or race in any program or activity receiving federal funds. The objective of achieving equal educational opportunity was made specifically clear:

Title VI of the Civil Rights Act prohibits the extension of federal financial assistance to any dual or segregated system of schools based on race, color or national origin. To be eligible to receive or to continue to receive such assistance, school officials must eliminate all practices characteristic of such dual or segregated school systems.¹⁶

Section 402 of the 1964 Civil Rights Act directed the Commissioner of Education to conduct a national survey "concerning the lack of availability of equal educational opportunities for individuals by reason of race, color, religion or national origin."¹⁷ The study was conducted and released in 1966.

¹⁶"The Federal Role in Education," op. cit., p. 55.

¹⁷Toward Equal Educational Opportunity, ed. Francesco Cordasco (New York: AMS Press, Inc., 1974), p. XI.

The study, Equality of Educational Opportunity (The Coleman Report) surveyed the effects of historical and cumulative educational inequality. It indicated the existence of greater segregation in 1964 than in 1954.

The 1965 Education Act and Educational Equality

One year after the Civil Rights Act of 1964, educational equality efforts received the largest financial support package in the history of the nation. In 1965, a general aid-to-education bill, the first ever to clear Congress, was enacted. The bill became known as the Elementary-Secondary Education Act (ESEA). The cost of the program for the first year was estimated at \$1.3 billion.¹⁸ One billion dollars was allocated to aid pupils of low-income families over a three-year period. Another portion of the bill, not restricted to impoverished areas, provided grants over a five-year period for textbooks and library material purchases. Centers were established for cultural and remedial programs that individual schools could not afford. Grants for educational research and funds to strengthen state departments of education were administered over a five-year period.

Passage of the Elementary and Secondary Education Act (ESEA) signified a federal commitment to both state and

¹⁸ "The Federal Role in Education," op. cit., p. 34.

racial educational equality:

Through the appropriations since made available under Title I, educators in big cities have been able to increase expenditures on inner-city schools beyond the city-wide average in these districts, though there is still some way to go to reach the minimal and insufficient goal of equalling the average expenditure per student characteristic of the more respected suburban school district.¹⁹

Result of Equal Educational Opportunity Efforts

The petitioners in the 1954 Supreme Court case of Brown v. Topeka seemingly believed that if pupils were integrated, methods of discrimination against black pupils would be greatly reduced in terms of resources, materials, facilities, and teachers. They believed the condition of the formal school setting was closely related to academic achievement.

Emphasis by the petitioners on negative self-concept appears to have been a legal and constitutional approach to dismantling educational segregation nationally. After segregation was declared unconstitutional, the concept of equal educational opportunity seemingly shifted to include both self-concept and academic achievement.

Deprivation of human and non-human educational resources had been perceived as one of the main barriers

¹⁹Daniel Levine, "Unequal Opportunities in the Large Inner-city High School," National Association of Secondary School Principals, November 1968, p. 46.

against educational equality for over three decades. It was the initial focal point of attack by foes against separate but equal schools. Nonetheless, some findings of the Coleman Report (called for in the Civil Rights Act) were shocking:

. . . minority group students and students of low socio-economic status score significantly lower than their white middle-class counterparts on a variety of verbal and numerical tests. . . . twelfth grade Negroes in the urban Northwest read at the ninth-grade level and do mathematics at the seventh-grade level. Southern Negroes, Mexican Americans, Puerto Ricans, and Indian Americans achieve at even lower levels.²⁰

It seems reasonable to conclude that the shift toward self-concept and academic educational equality was greatly stimulated, if not made official, by the results of the Coleman Report. At any rate:

. . . the ghettos' demands for educational reform now embrace both a concern for the psychological health and racial integrity of the children as well as for their achievement on grade level.²¹

The Civil Rights Act also increased the rate of public school desegregation through busing.

Prior to enforcement of the 1964 Civil Rights Act only 1.17 percent of the black students in eleven southern states were attending schools with whites. By 1968, four years

²⁰ Harvard Educational Review, Editors, Winter 1968, p. 85.

²¹ Mario Fantini, Community Control and the Urban School (New York: Praeger Publishers, 1970), p. 186.

after Title VI enforcement 20.3 percent of the southern region's black pupils were in desegregated schools.²²

Although the Nixon administration relaxed enforcement of Title VI on school districts generally, desegregation significantly increased and, as a result of the 1964 Civil Rights Act, guidelines by the federal government for desegregation were established for local districts.

Current Views on Achievement of Educational Equality

The Brown decision, ESEA, and the Civil Rights ACT, including the Coleman Report, have directly and indirectly contributed to a general agreement among professional educators on factors significant to the achievement of equal educational opportunity.

There seems to be little disagreement about the school having major responsibility for academic achievement among pupils. In conceptualizing equal educational opportunity as "outcome," Coleman says ". . . the responsibility to create achievement lies with the educational institution, not with the child."²³ Wilson Riles states:

It should not be required that a parent take his child by the hand and go in search of civil rights. Instead, it is incumbent upon a board of education

²²Horace Barker, The Federal Retreat In School Desegregation (Atlanta: Southern Regional Council, 1964), p. 1.

²³Coleman, op. cit., p. 189.

to arrange the contact between children of all races and backgrounds to the end that they learn the skills of citizenship commensurate with the demands of the era of which they are a part.²⁴

Both Coleman and Riles perceive public education as the place for pupils to acquire both academic and social achievement. However, Robert Campbell maintains that failure of the public school system should be shared by all parties to the educational process: "Clearly everyone who is party to the process must be accountable. Just as school people must be asked very pointed questions, so must society and the student."²⁵

Significantly, the Coleman Report reported that "disadvantaged" pupils increase their learning skills and self-esteem when they associate with other pupils of higher socio-economic background.²⁶ David K. Cohen of Harvard supported that portion of the Coleman Report. While recognizing that parents and teachers are important factors in the academic achievement process Cohen maintains that:

Everything we know, from research and as a matter of common experience, suggests that there is a

²⁴Wilson Riles, "Equal Educational Opportunities in a Changing Society," California Education, June 1965, p. 11.

²⁵Robert Campbell, "Accountability and Stone Soup," Phi Delta Kappan, November 1971, p. 177.

²⁶James S. Coleman et al., Equality of Educational Opportunity (Washington, D. C.: Department of Health, Education and Welfare, 1966), pp. 302-12.

third set of processes--those involving social and academic interaction among students--which have a powerful cumulative influence upon the development of academic competence.²⁷

The basic concept is that association and interaction must exist between lower- and upper-class pupils. In the mixed setting, achievement among lower-class children appears to increase and does not interfere with the achievement of upper-class pupils.

Equality of Educational Opportunity also revealed that the pupil himself has an important role to play in his own academic achievement. Coleman found that the student's view of his own ability to succeed academically was more highly correlated with actual achievement than many other factors such as physical facilities of the school.²⁸

Mildred Buck and H. R. Austin worked with eighth graders, looking for factors related to school achievement. They argue that a critical factor in pupil achievement is self-responsibility. Those economically disadvantaged youngsters who believe that they are personally accountable for their success and failure are likely to manifest greater initiative in seeking higher grades, intellectual rewards,

²⁷David K. Cohen, "Policy for the Public Schools' Compensation and Integration," Harvard Educational Review, Winter 1968, p. 118.

²⁸Coleman, op. cit., p. 275.

and teacher approval.²⁹

Another major direction of equal educational opportunity resulting from mid-1960's efforts is the area of parental involvement in school affairs. Operation Head start, an ESEA program funded under Title I, became the shining star of compensatory education. The program built in a parental involvement component which some educators seem to think is most responsible for its pupil academic achievement success record.³⁰

Former U. S. Commissioner of Education Harold Howe is cited in Community Control and the Urban School as having broadened the very concept of compensatory education to include parental involvement:

But, like some other educational leaders, Howe had begun to broaden the definition of compensatory education to include stronger parental participation - in his words, "new involvement of parents and community in the affairs of the schools."³¹

Parents play an important role in developing pupil self-esteem and increasing academic achievement by supporting classroom instruction with in-home activities. Peter Schrag sees schools in the suburbs which boast of achievement success as really doing very little other than

²⁹Mildred Buck and Harvey R. Austin, "Factors Related to School Achievement in an Economically Disadvantaged Group," Child Development, December 1971, p. 1823.

³⁰Fantini, op. cit., p. 28.

³¹Ibid., p. 31.

sanctioning academic skills acquired outside of school.³² For parents of underachievers this is an important question to investigate. Francis Welsing of Howard University lays a large share of blame for low academic achievement of many African American pupils on their parents. Welsing feels that the Supreme Court decision of 1954 caused black parents to assume equal educational opportunity for their children had been achieved for all time. As a result black parents ceased to fortify pupil self-esteem in the home. Consequently, says Welsing:

I now look back upon the 1954 Brown decision that is yet to, if ever, become fact, as one of the greatest deceptions of Black people perpetuated during the entire twentieth century here in America. For the gap between the quality of education being offered to Black and white children is widening, not narrowing.³³

Other social scientists have also investigated the role of the African American family in building member self-esteem, and examined the relationship of that self-esteem to learning. Alvin Poussaint states:

Its [racism] devastating effect has been modified because most black children have received some psychological protection in their families and in the community. This is an important point to recognize because too many social scientists believe that blacks' self-concept depends entirely on their

³²Peter Schrag, "End of the Impossible Dream," Saturday Review, September 18, 1970, p. 92.

³³Francis Cress Welsing, "Build a World Without Racism," Integrated Education, January-February 1975, p. 20.

interaction with whites, and that is not the case.³⁴

Ralph Larkin supports this position. He concluded that families of minority pupils reinforce and cultivate their child's self-esteem:

. . . The most interesting fact to note is that all the minority group children are more family oriented than the majority white children. The reason for this phenomenon may well be that the family in minority cultures provide the child insulation from the majority white culture. In the case of the minorities studied herein, the majority culture presents them with a negative image of themselves. It seems that the family, and to a lesser extent, the community, provide the minority group child with positive images of himself. For example, mass media present the Chicano child with a negative image of his Mexican-American ancestry through the use of such characters as Pancho, the Frito Bandito, and Zorro (in which the hero was anglo and the villains were mostly of Mexican descent). The family may provide a bulwark against such images through the daily interaction of children and parents.³⁵

The importance of the family to school achievement was directly correlated by Buck and Austin in their 1971 study. They found that mothers of adequate achievers in school tended to report fewer negative responses about their children and rated them more competent.³⁶

A number of empirical research studies have suggested that social and academic achievement of pupils can be

³⁴Alvin Poussaint, "Building a Strong Self Image In the Black Child," Ebony, August 1974, p. 138.

³⁵Ralph Larkin, "Class, Race, Sex, and Preadolescent Attitudes," California Journal of Educational Research, November 1972, p. 221.

³⁶Buck and Austin, op. cit., pp. 1813-1826.

improved by involving parents in the educational process of the child at home following classroom instruction.

Claudia Johnson and Roger Katz reviewed extensively literature related to parents' serving as change agents for their children's social behavior. Child behavior disorders were identified and categorized as follows: (1) antisocial and immature, (2) school phobia, (3) speech dysfunction, (4) encopresis and enuresis, (5) seizures, (6) self injuries, and (7) oppositional behavior. Methods of parent training consisted of didactic instruction, group training, laboratory training, and combinations of home and laboratory training.

Results from the numerous studies reviewed by Johnson and Katz indicated that parents can be used effectively to modify their children's disruptive behavior. They noted, however, that programs do not always utilize parents.

Failure to systematically program generalization treatment effects was frequently encountered. Although generalization training was occasionally reported, results suggest that behavioral improvement does not necessarily generalize across situations until environmental support is provided to maintain it. Consequently, it may be necessary to involve parents as well as teachers, siblings, and other socializing agents in order to facilitate generalization of training across diverse stimulus settings.³⁷

³⁷Claudia Johnson and Roger Katz, "Using Parents As Change Agents For Their Children: A Review," Journal of Child Psychology and Psychiatry and Allied Disciplines, June 1973, p. 181.

Jacqueline Koven and Michael LeBow studied how parents were taught to remediate the academic problems of their children. Mothers of three young boys (ages 7-8) were taught to dispense, systematically, tokens. The tokens, which could be traded for favored objects, were contingent on correct reading and spelling responses of the children. Quick mastery was awarded more reinforcement than was slow learning. After two months it was found that one pupil had lost appreciably more academic gain than the other two boys. However, Koven and LeBow concluded:

Overall results of the program attests to the value of training parents to work with their academically deficient children. In relatively little time, one professional may teach many parents, who then may teach their children for extended periods. Eventually, some of the parents may become trainers of other mothers and fathers, greatly extending the influence of the effective procedures.³⁸

In 1972 Richard Goldman designed a parent involvement program to be used in selected follow-through communities which had participated in Head Start programs. The targeted communities consisted of (1) an inner city, (2) a rural farm area, (3) an isolated mountain area, and (4) an Indian reservation. The primary goal was to teach parents specific skills that would prevent children from encountering academic and social problems. Goldman described the program:

³⁸Jacqueline Koven and Michael LeBow, "Teaching Parents to Remediate the Academic Problems of Their Children," Journal of Experimental Education, Summer 1973, p. 73.

The parents training was directed by a professional who had extensive experience in both the community and the school. Parents worked in groups of five to 10 in the school for a period of 6 to 8 weeks, to learn the initial skills (Phases I and II). . . . After completion of the training, the parents met once a month in the community to share ideas and discuss successes and problems (Phase III). The training included strategies that continually involved the parents in their learning: role playing; working with children; self-evaluation of progress; etc. The skills to be mastered were stated in specific terms, so that the parents could trace their progress.³⁹

The parents involved in the Goldman study demonstrated that they could learn and use a new pattern of interaction with their children to enhance academic achievement. Subsequently, Goldman adapted the parental involvement program to a similar educational problem in Israel.

Earl Schaefer found that academic levels among pre-schools significantly increased when homes were turned into learning centers through an academic outreach program:

Well, in a sense all homes are learning centers. But some obviously are more effective than others. When we start to think of families as well as schools as educational institutions, we need to begin to elevate our attention and resources to families and how they function. Too many professionals see the family as the problem rather than as part of the solution. I think we're going to have to look instead at the strength in families, at the skills they already possess, the support they need.⁴⁰

³⁹Richard Goldman, "Cross-cultural Adaptation of a Program to Involve Parents in Their Childrens Learning," Child Welfare, October 1973, p. 523.

⁴⁰Earl Schaefer, "Home Tutoring," Childhood Education, October 1971, p. 3.

School-community struggles in Pontiac, Boston, Louisville and other cities during the mid-1970's evolved around parental input into the educational process. Conflict between school and community over acceptable avenues to pupil equal educational opportunity reaffirms the position that parents have not delegated all tasks of education to the schools.

Children form a mutual bond between parents and teachers. Parents are naturally concerned about their own particular child. On the other hand, teachers must be concerned about many pupils within the classroom. Communication between school and home can minimize the natural differences that parents and educators have regarding the pupil. Thus, a triad relationship is formed between parents, pupils, and educators. The child, until entering school, has been taught principally by his parents. Upon entering school the child suddenly has two teachers. The teacher must understand and consider both the child and parents. Parents are equally concerned about their child and the school relationships with their child. That psychological triad is important to pupil academic achievement.⁴¹

⁴¹Leslie Chisholm, Guiding Youth In the Secondary School (New York: American Book Company, 1945), p. 299.

Teleconferencing

In each instance where educators instruct their pupils or where professionals teach parents how to teach their children, communication is an essential part of the teaching process. Teaching and communication are similar in that both are complex processes and each endeavors to influence the behavior of an organism.⁴² More specifically, both teaching and communication are concerned with (1) who, (2) says what, (3) through what channel, (4) to whom, (5) with what effect.⁴³ Communication and teaching are also different processes, but communication is the vehicle through which school-community and teacher-pupil-parent interaction is conducted.

Face-to-face communication is conducted via the natural and widest communication channel bandwidth. Verbal and non-verbal cues are transmitted simultaneously and each communicator has optional 360° panavision. Television, a specific type of electronic communication medium, narrows the natural and broad face-to-face communication channel bandwidth.

However, television can be used as one method of delivering organized bodies of knowledge from teacher to learners

⁴²James J. Thompson, Instructional Communication (New York: American Book Company, 1969), p. 18.

⁴³Sydney W. Head, Broadcasting In America (Boston: Houghton-Mifflin Company, 1976), p. 466.

for the purpose of extending learning opportunities, an extension which might not otherwise be possible.

Traditional education by television, with the one-way communication channel of the medium, is limited. It does not permit two-way, face-to-face interaction between the message sender and receiver. For parents, pupils, and educators to reach decisions regarding pupil outcomes, the participants must interact verbally and non-verbally to exchange or share information; parents, pupils, and educators must confer among themselves and with each other. Traditional television does not have conferencing capacity.

In an unpublished report entitled "Teleconference-Canada," released by Governors State University of Canada, a conference was said to have three important properties:

1. A purpose for the interaction
2. Acceptance of interaction procedures by all parties
3. An outcome contingent upon communicated information.⁴⁴

The report goes on to say:

A conference is basically an interaction among two or more participants. It will have an ostensible objective, which may be formalized in a statement or informally understood; although participants may have quite different real objectives. The interaction will occur in the physical environment of certain facilities, which include meeting rooms,

⁴⁴"Teleconference-Canada" (College of Environmental and Applied Sciences, Governors State University, 1975 (unpublished), p. 5.

communication equipment, secretarial services, etc. The formal interaction of the participants will be governed by some form of procedures which may be a comprehensive set of rules of order or consist of nothing more than unwritten understandings. Interaction among participants consists of formal and informal communication. The communication has effects on the individual participants and there is normally some explicit result or outcome of the conference as a whole which can be stated.... Conferences are not simply discrete events the boundaries of which can be easily drawn. . . . A conference is a brief segment of events in an on-going stream of interaction among participants.⁴⁵

While the above conference description implies face-to-face interaction among individuals or groups, electronic technology has extended the one-way audio visual human communication process. Cable television makes it possible for people who are geographically separated to confer with each other via two-way television. The electronic extension of face-to-face conferencing is properly called teleconferencing:

A process of communication involving an audio and/or audio-video system that connects two or more specially-designed environments through an interactive network so that physically-separated groups can take part in task oriented conferences.⁴⁶

A cable television system with two-way video-voice capability compensates for the one-way communication limitation of traditional television. The two-way system permits video - voice interaction among parents, educators, and

⁴⁵ Ibid.

⁴⁶ Ibid.

pupils, and allows instructors to expound upon unclear points raised by pupils.

Charles Tate, in Cable Television In The Cities, defines cable television as "a method of distributing television signals through a wire rather than those signals through the air."⁴⁷ Three major features of a cable system are a series of antennae, the headend, and coaxial cable.

The antenna tower is usually placed on a high altitude location. Conventional over-the-air television signals are picked up by the antennae from stations up to a hundred miles away. The signals are fed by cable or microwave to the cable system's headend. The headend is electronically equipped to filter, amplify, and simultaneously distribute all of the separate signals to subscriber television sets via coaxial cable lines.

A major attribute of cable television is its signal delivery vehicle, coaxial cable. Although the actual cable size ranges from less than one-half inch to one inch in diameter, its radio spectrum space is enormous. Perhaps the most vivid example of the tremendous signal-carrying capacity of coaxial cable was provided by former FCC Commissioner Nicolas Johnson. Comparing coaxial cable to

⁴⁷ Charles Tate, ed., Cable Television In The Cities (Washington: Urban Institute, 1971), p. 7.

telephone cable is like comparing "Niagra Falls to a garden hose," said Johnson.⁴⁸

A telephone line is capable of carrying a signal frequency of 3,500 cycles per second. In contrast, coaxial cable's frequency capacity is 300,000,000 cycles per second. It is for this reason coaxial cable is often referred to as broadband. Theoretically, it is possible for a cable television system's coaxial cable line to transport over forty separate television channels--each of 6,000,000 cycles per second, plus the entire FM radio band width, as well as a large amount of other data.

Cable television systems are not limited to the redistribution of television signals. Other program origination sources may also be carried over the coaxial cable to subscribers. Local studios, completely television equipped can cablecast via coaxial cable to a set of subscribers.

Signals emanating from the non-broadcasting studio travel "upstream" to the headend and "downstream" to the receiver set or sets. Cable television systems can be built with reverse amplifiers. The subscriber receiving signals can also send signals. That function creates two-way cable television.

⁴⁸Robert Steiner "Visions of Cablevision" (a report to The Stephen H. Wilder Foundation, December 1972), p. 19.

A minimal amount of research is presently available on two-way audiovisual cable television, and very little research exists which compares face-to-face and video conferencing. Nonetheless, teleconferencing has been used as a communication channel for human interaction in private industry and higher education. It seems reasonable that parents, elementary-school educators, and elementary-school pupils can teleconference as effectively as businessmen, professors, and college students.

Private Industry and Teleconferencing

In the private industry sector, the Boeing Company linked 250 men via a two-way audiovisual electronic communication system for simultaneous instructional sessions. A Bell Telephone two-way audio system was used for human interaction. Graphics and other still visuals were transmitted via Xerox Corporation's Long Distance Xerography (LDX) system. Offices at Seattle, Cape Kennedy, New Orleans, Houston, Huntsville, and Washington, D. C. were electronically connected.⁴⁹

Each terminal was equipped with a set of three epidiascope rear screen projectors with screens placed in the

⁴⁹Warren C. Wetmore, "Boeing Network Cuts Apollo Work Costs," Aviation Week and Space Technology, February 10, 1969, p. 43.

front of the room. The audio was amplified over a public address system in the offices. Each office location site had a conference chairman. It was his responsibility to switch or cut into or out of the audio network. Persons who interacted via the audio network identified themselves by name and location.

Persons participating in the Boeing teleconference sessions were generally acquainted with each other. A new participant had his or her picture flashed on the screen via the LDX system. Teleconferencing via two-way television was considered too expensive. Thus a compromise was made with telephone lines and the LDX system for graphic and other visuals. Boeing used the teleconferencing system extensively and reported increasingly satisfying results.

Teleconferencing via cable television has also been experimented with in the field of health care. Health care services have found two-way cable television to be an effective and efficient means of doctor and patient communication in certain circumstances. Some areas of the nation are oversupplied with health care services while others experience a serious shortage. A number of inner-city localities are looking to telecommunications to assist them in delivering health care service needs. Two-way cable television was used to deliver some health care services to residents in the urban setting of Harlem, New York.

A pediatrician's office in Mount Sinai Hospital was linked to a primary care pediatric facility, Wagner Child Health Station. The distance between the two sites is approximately one and one-half miles. The medical information is put into the system via the two-way cable television channel. At Wagner, specially trained nurses can treat patients whose needs fall under "treatment protocols" or under doctors' standing orders because many of the health problems presented at the Wagner Health Clinic occur "repeatedly." However, a problem outside of treatment protocols requires the nurse to use the two-way cable television system. Sometimes the nurse consults the doctor and other times the pediatrician looks at a child via television, and interviews the child's mother.

Psychiatrists and orthopedic surgeons also use the two-way television system to examine children and hold discussions with parents. Psychiatric services are delivered twice weekly, and the orthopedic surgeon looks once a month at children suspected of having orthopedic problems.

Formal evaluation data on the Wagner-Mount Sinai system were not yet available at the time of this writing. However, descriptive evaluation of the delivery of health services via two-way cable television indicated successful extension of health care:

Without the system, parents whose children need orthopedic or psychiatric services would have to bring them into the medical center. Frequently this means a waiting list, obtaining a sitter for children and double fares to and from the medical center. The Wagner cable link has been operational for more than 18 months. Because of it, costly on site physician time has been significantly reduced--four out of nine physician sessions are available by television--with no reduction in quality of care, or in community support, as evidenced by increased attendance.⁵⁰

Higher Education and Teleconferencing

In higher education the goal of teleconferencing has been, generally, to affect student academic achievement by extending educational experiences to students geographically separated from the professor and his immediate classroom of students. Educational teleconferencing was conducted at Pennsylvania State University in the 1960's. Two classes, each composed of eleven graduate students, met two days per week; one group met at the University Park campus, the other at the Capital campus. The instructor, except for one day, was always at the University Park campus. George Larimar and Ward Sinclair summarized the results on the two-way television experiment as follows:

Two-way television as a medium of instruction for a seminar appeared to produce 1) inhibition of interaction between students of the class at different

⁵⁰Cablins, October 1974, p. 11.

ends of the television channel and the teacher at the other end; 2) negative attitudes toward the course and its medium of instruction (i.e., via television); and 3) significantly lower grades by members of the class at end of the channel opposite the teacher.⁵¹

The major disadvantage of the experiment appears to have been that the instructor made no adjustments in his instructional process for adaptation of the material to the television distribution channel. Failure or unwillingness of the professor and others involved to make minimal adjustments to television cannot be eliminated as an important causal factor in the apparent failure of the two-way television experiment at Pennsylvania State University.

Brigham Young University is another educational institution which utilized a two-way electronic communication system to extend the opportunity of education for a greater number of students. Television signals were microwaved from a classroom located in Provo to students in Salt Lake City, forty miles away. Students in Salt Lake City asked questions of the professor via a telephone network line. The teacher could only hear the students from Salt Lake City through a studio speaker located at his end. However, Salt Lake City students could both see and hear the teacher located in Provo, via television. The two-way telecommunications system was described by Dean VanUitert:

⁵¹George Larimer and Ward Sinclair, "Some Effects of Two-way Television on Social Interaction," AV Communication Review, Spring 1969, p. 55.

The classroom in Salt Lake City is provided with an audio feedback to Provo by the telephone company. Students desiring to ask questions use a standard telephone with a push-to-talk switch. When they have a question, they squeeze the handle of the phone receiver, and, at a convenient moment, announce that they want to ask a question. The professor and all the students in Provo hear the question through the classroom PA system. With this capability students sitting in the B.Y.U. classroom; the students in Salt Lake City are not simply viewing just another TV class.⁵²

It was found that the use of the telephone as a feedback line made it difficult for the professor to determine when a student in Salt Lake City wanted to ask a question. A suggested remedy for this situation was that a red light (tally light) be placed on the professor's speaker stand to indicate that an "invisible" student was ready to ask a question. Students also had to accustom themselves to the phone talk-back system. Length of time for this acclimation was not specified, however.

These drawbacks in the system at Brigham Young University do not seem insurmountable, however, and the response of the participants was favorable. Not more than two students in each class indicated a preference for a nontelevised class again. A majority of students indicated the two-way audio and video class had been worthwhile and said they would consider registering for television classes again.

⁵²Dean D. VanUitert, "Microwave Expands Campus Borders," Educational and Industrial Television, November 1974, p. 60.

The University of Michigan has also experimented with two-way electronic communication channels to extend educational opportunity. Classes in reading and language arts originated from Ann Arbor, Michigan, and were distributed via closed circuit to two university extension classes in Detroit and Dearborn. In total, three classes were receiving instruction simultaneously. Extension classes in Detroit and Dearborn each had television sets and telephones to talk back to the Ann Arbor professor and her live class.

Three problems were reported. First, the students in the centers had to adjust to television as a learning device rather than a medium of entertainment. They also had to overcome their hesitation to become involved via the telephone hookup. Third, the class in the studio had to conquer the self-consciousness they experienced when they realized that they were appearing on the monitor as they made comments or asked a question.

Upon visiting the extension classes, the regular professor discovered that "normal" student interaction with the TV instructor which had been anticipated via telephone had been transferred to intra-group interaction at each center. Says Laura Williams:

I found that they talked among themselves about the presentation made by my substitutes and behaved much as they would if they were at home with friends viewing a program. They interacted with each other more

than the studio class does. Such interaction is an excellent aid to learning.⁵³

There are three basic reasons for using two-way mediated group interaction: (1) extending educational opportunity; (2) reducing the cost of human interaction occasions; and (3) reducing travel time of the interacting participants.

All but one of the reported educational teleconferencing studies expressed a positive general outcome with regard to their educational achievements. In each of the formal educational settings, the students and teachers experienced difficulty in adjusting to mediated interaction. This difficulty suggests a need for designated orientation sessions to the telecommunication system, prior to commencement of content study.

Secondary Education and Teleconferencing

Tulsa public schools experimented with teleconferencing during the 1973-74 school year. Students and teachers worked together to prepare programs which involved both secondary and elementary grades. Three objectives were established for the course:

1. To exemplify the three modes of cable transmission.
 - a. Transmission from studio to school
 - b. Transmission from studio to schools with audio response from schools

⁵³Laura Williams, "Hello Detroit! Televised Teaching in Action," Innovation, January 18, 1974, p. 7.

- c. Two-way transmission
 - (1) Two-way video with two-way audio
 - (2) One-way video with two-way audio
- 2. To determine the effectiveness of the three modes of cable television at different grade levels.
- 3. To determine the effectiveness of enrichment and supplementary materials provided by cable television.⁵⁴

There were nine two-way video with two-way audio productions and two one-way video with two-way audio productions.

Generally, students and teachers indicated favorable reactions to all three cable television transmission modes. Two-way transmissions were preferred by all students; elementary pupils were more responsive than secondary. Enrichment materials were favorably received by elementary pupils and moderately so by secondary students.

Teleconferencing as a method of desegregation in secondary and elementary public schools was legally ruled upon by the Fifth Circuit Court of Appeals in Texas in late 1975. During a desegregation suit which had been brought against the Dallas Independent School District (DISD), District Court Judge William Taylor advised the school board to investigate teleconferencing.

Teleconferencing had been previously recommended by Texas Educational Desegregation Technical Assistance Center

⁵⁴"Report of the Cable Task Force," Tulsa Public Schools.

staff member Peter Williams. The primary objective for using teleconferencing in Dallas was to alter the racially dual nature of the school system to a unitary one. Williams' plan called for the pairing of Anglo and minority (Mexican and African American) classes on a two-to-one basis. The classes would teleconference one hour each day and interact contiguously one day a week via a busing arrangement.

Judge Taylor, who had previously stated his position against "massive busing," said:

By the effective method of team teaching these classes will be linked together as one educational unit. The individual students will be on a personal "first name" basis with members of the other ethnic groups. Neither is this purely an educational program, although the use of television as an effective teaching method is gaining recognition throughout the country. This court is firmly convinced that such a one to one program of physical and electronic communication, when combined with the other desegregation tools of this Order, including a completely integrated secondary system, will be a truly effective tool in eliminating all vestiges of segregation, root and branch beginning with the cultural attitudes of elementary children who have not yet learned prejudice.⁵⁵

The plan, which was estimated to cost ten million dollars, was overruled by the Fifth Circuit Court on appeal by plaintiffs in the Dallas case. The appeals court stated that the television plan did nothing to change the race composition of elementary schools which were functionally

⁵⁵ Eddie Mitchell Tasby and Phillip Wayne Tasby by their parents and next friend Sam Tasby et al. v. Dr. Nolar Estes, General Superintendent of the Dallas Independent School District et al. Federal Supplement 342 (1971), p. 953.

dual. Using the Swann-Mecklenberg case as a guide, the judge said:

The district courts' elementary school "television plan" may not be justified because of the Supreme Courts' realization that some one-race schools may remain in a school system which has become unitary in character. The "television plan," does not attempt to alter the racial characteristics of the DISD's elementary schools. The plan, although novel in approach, is incompatible with all jurisprudence of the past twenty years as to public school desegregation, and hence fails to pass muster.⁵⁶

Several major differences appear to set Tulsa and Dallas apart with regard to teleconferencing. Tulsa employed an organized and systematic approach in discovering the comprehensive use of the system. There is no evidence that Dallas was systematic in its approach to two-way television. The district court judge was endeavoring to institute an untested innovation into a traditionally slow-adoption institution, the public school system. Tulsa, however, carefully organized and tested a prototype to gather results for additional evaluation as to how the tool could be used in their educational system.

The Williams teleconference plan appeared to grow directly out of efforts to maintain racially separated schools. It contradicted the socio-psychological ruling of Brown v. Topeka. The plan was clearly a substitute for integration.

⁵⁶ Eddie Mitchell Tasby et al. v. Nolan Estes et al., Federal Reporter, Second Series (1975), p. 104.

In Tulsa the teleconferencing plan was used for improving academic achievement. The plan did not involve the constitutional question of desegregation. Academic achievement, though a measure of educational equality, is not a constitutional or legal question.

The Rockford teleconference plan is similar to the Tulsa circumstance. The legal question of equal educational opportunity has been resolved. The community accepted Special Interest Centers as a method of legal desegregation of elementary schools. Special Interest Centers may have some merit for legal desegregation, but the teleconferencing plan described in this study has some use for integration which is apart from legal or court ordered desegregation. The teleconferencing plan in Rockford involves extending an already accepted equal educational opportunity plan. In addition the Rockford plan heavily involves parents in the educational process.

Rockford Special Interest Center and Teleconferencing

The Rockford Board of Education established Special Interest Centers (SIC's) in 1974 to meet the following goals for the district:

1. To provide additional opportunities for elementary school pupils (fourth graders).
2. To improve student attitudes toward academic pursuits.

3. To provide in-service teacher training through observation of new teaching techniques and participation in instruction.
4. To provide diversified interpersonal experience to elementary pupils and thus enhance mutual understanding across races, socio-economic classes, and geographic sections of the city.⁵⁷

Rockford's cable television company, Rockford Cable-vision, provides an electronic communication channel which can support instructional communication, facilitate mutual interaction among parents, pupils, and educators, and increase science and mathematics experiences. Via two-way cable television, teachers can conduct in-service science and mathematics education sessions. Pupils of various backgrounds can exchange and share common experiences with each other. Parents not only receive, via cable TV, information about the SIC science/mathematics program, they can interact with other parents via the two-way cable television system.

The Science/Math Center occupies the ground floor of an original wing of Walker Elementary School. The rest of the building, including a new wing, is devoted to Walker School, a typical elementary education facility. Two rooms in the Center are specially equipped for elementary science education and two for mathematics education. The SIC has a small museum and a learning center with books and other

⁵⁷"Experimental Applications of Two-way Cable Communications In Urban Administration and Social Service Delivery" (prepared under grant No. SSH7420863 A01, National Science Foundation, Washington, D. C., January, 1975).

educational materials. SIC participants share the Walker School gymnasium and playground facilities.

Special features of the Center include a small pond on the school ground where pupils can study ecology and gather biological specimens; a programmable calculator, enough scientific apparatus (e.g., simple microscopes, thermometers, scales, compasses) so that each individual in a class of about twenty-five can use the equipment; and collections of rocks, bones, plants, chemicals, and invertebrate animals for student handling and observation. This Center has highly specialized and expensive learning materials, not available to the individual schools in the community.

The Center uses a "hands-on," activity-centered philosophy of teaching. Participating pupils are expected to learn by manipulating materials to an extent not possible in other schools. Specifically, the staff attempts to teach such skills as systematic observation, measurement and recording of data, use of graphs to show relationships between variables and to make inferences, design and execution of controlled experiments, and some fundamental scientific concepts.

For example, one instructional unit deals with variations on the question:

"What makes ice melt faster or slower?"

The children time how long it takes for ice to melt in air and differing amounts of water. They compare melting rates on different surfaces such as wood and metal, and melting rates of different shapes of ice. The children also try to determine why ice floats. This exercise teaches children to measure and record data using appropriate instruments (thermometers and timers, in this case), to generate hypotheses about relationships, to conduct simple experiments to test those hypotheses, and to learn about the laws of conservation of matter and energy.

The curriculum is diverse and allows for topic selection by participating pupils and their teachers. Currently one mathematics unit, metric measurement, is required of all participants. Teleconferencing would necessitate the addition of one or two required science units from among those now available so that common measures of achievement could be used across experimental groups.

Instructional units have been selected primarily from Science: A Process Approach, which was developed and tested by the American Association for the Advancement of Science; Elementary Science Study, which was developed and tested by the Education Development Center, Inc., of Newton, Massachusetts; and Science Curriculum Improvement Study, developed by the University of California at Berkeley. Both curricula were prepared under funding from the National

Science Foundation and are endorsed by NSF. Some materials were taken from Conceptually Oriented Programs in Elementary Science (COPES), developed by the Center for Field Research and School Services, New York University, for the U. S. Office of Education. Additional materials have been developed by SIX staff personnel.

The instructional units are taken from curriculum packages designed for use in grades K-6. Thus, only a small fraction of the available materials are used by any one group of classes during their one-week stay at the center.

Pupil interest in science and mathematics should be stimulated by their experiences at the SIC. Further, their classroom teachers gain expertise in experience-based mathematics and science teaching. While at the center, the visiting teachers observe, participate in, and help plan daily learning activities under the guidance of the SIC teachers. Thus, pupils should be well-motivated to continue learning through projects begun at the center, and classroom teachers should be prepared to facilitate such learning.

Fourth-grade pupils attend the SIC for only one week. They come from not more than four different classes. Upon arrival at the SIC the pupils are grouped racially and academically into activity units. After the one week, pupils return to their respective schools and regular classrooms.

The two-way cable television communication channel can extend the SIC experiences for the pupils and classroom teachers. Parents can also become familiar with the SIC program. Not only can pupils interact with SIC teachers from their own classroom, they can stay in touch with pupils from other schools and continue academic unit activities commenced at the SIC. Teachers can use the channel for SIC in-service education sessions. Parents can visit their child's respective school and interact with other parents geographically separated. Also, one-way televised programs about pupils involved in SIC science and math activities might motivate parents and pupils to watch TV together and interact with each other.

The complete instructional system which involves the interaction of pupils, parents, and educators via two-way cable television will be explained in Chapter IV.

Summary

Current endeavors to achieve equal educational opportunity between majority and visible minority pupils are extensions of efforts commenced in the 1930's. The initial goal was to counteract the disparity of physical facilities under the doctrine of separate but equal as it had been applied to education. School segregation played a major role in preventing the legislative branch of the federal

government from agreeing on methods of appropriating general aid funds to public education.

Court decisions and legislative enactments of the mid-50's and 60's significantly checked de jure segregation in public education and clarified the concept of equal educational opportunity. The new concept focused upon educational outcome and stimulated greater parental input into the pupil's educational process. Increasing parental involvement fostered a triangular relationship among parents, pupils, and educators in an effort to extend equal educational opportunity to all pupils.

Cooperative communication among parents and educators is important for increasing pupil achievement. In situations where parents, pupils, and educators are geographically separated, it is possible to share and exchange educational information by teleconferencing via two-way cable television. Teleconferencing is already being used in higher education and private industry.

Rockford's science/mathematics Special Interest Center (SIC), which was designed to provide both teachers and pupils with special academic experiences, is a nucleus around which teleconferencing can be conducted via two-way cable television. The goal of both SIC and video conferencing is to increase academic achievement.

CHAPTER III

THE INSTRUCTIONAL DEVELOPMENT PROCESS

In 1974 the National Science Foundation (NSF) took major steps to evaluate the delivery of social services to city residents via two-way cable television systems. Research teams throughout the United States applied to NSF for project grants to evaluate the practical operation of two-way cable television.

One research team from Michigan State University worked with the city of Rockford, Illinois, and the cable franchise, Rockford Cablevision, to design, develop, and implement strategies aimed at evaluating various public service functions of the two-way cable television systems. The Michigan State University team, led by Thomas F. Baldwin, Bradley S. Greenberg, and Thomas A. Muth, secured funds from NSF to design several applications for Rockford's two-way cable television system. Martin Block of MSU was appointed field director of the project. He worked in Rockford and served as the liaison between the MSU research team and various social agencies in Rockford whose services appeared applicable to two-way cable television.

Several social service and government agencies were consulted in an effort to design and develop the applications for social services via cable television for Rockford residents. One application of the total two-way television project of Rockford, Illinois, focused on the city's educational needs. A major concern for Rockford Public Schools was the development of a plan for extending equal educational opportunity to all pupils. To this end, effective use of two-way cable television was considered.

The design and development team for the educational application consisted of an instructional developer, Larry Redd; two communication researchers, Thomas Baldwin and Bradley Greenberg; and a content specialist, Don Swanson of Rockford Public Schools. MSU project team members of all other applications made suggestions and input to the total project at periodic central staff meetings.

The instructional developer joined the Michigan State University NSF cable television project after other applications and design efforts were significantly under way. The overall approach to applications of cable television to Rockford agencies had been established.

An instructional development (ID) process was used by the instructional developer to design, develop, and implement systematically the use of two-way cable television in Rockford Public Schools. Concomitantly an instructional

development model was used by the instructional developer in the CATV design and development process. The model was a valuable tool used to interface the instructional developer's educational background with the background of the communication researchers. The model also served as an internal checklist and guide for the instructional development process.

The model was a modified version of the one used by the National Special Media Institute (NSMI). The modification is in the evaluation stage of the model. The NSMI model suggests a prototype be tested, the results analyzed and recycled if necessary. In the modified version of the NSMI model, no prototype was tested. Rogers and Shoemakers innovation characteristics were used to analyze and predict whether the instructional system would be adopted by Rockford citizens and school officials.

The second function in the evaluation stage outlined experimental guidelines which could be used to assist in quantitatively measuring the instructional system's effectiveness (Appendices A and B).

Systems

Instructional development is needed in the application of CATV to education partly because of the nature of cable television. Cable television is itself a hardware system.

It is a product, a single dimension, of what Robert Heinich sees as three-dimensional technology. According to him, confusion and misunderstanding surrounds technology, as a result of:

. . . an inadequate understanding of and a failure to distinguish between three facets of technology: the science of technology (technological process), the resulting technological products, and the technological setting or facilitating structure that encourage technological solutions to problems.¹

Heinich points out that equipment cannot solve problems when separated from knowledge of how to use it (technological processes) and a supporting technological structure (society decision makers). Language laboratories were failures in secondary education during the 1960's because too much emphasis was placed on equipment alone. Educational and industrial decision makers failed to integrate adequately knowledge of how to use the laboratories. Subsequently, application of the language lab equipment to foreign language curricula resulted in chaos.

Webster defines chaos as "a state of utter confusion-- a confused mass of heterogeneous agglomeration." Kenneth Boulding sets forth the concept of negative entropy to describe the inverse of chaos: "Whatever is not chaos is system."² Building upon Boulding's premise, utilization of

¹Robert Heinich, "Technology and Teacher Productivity," Audiovisual Instruction, January 1971, p. 79.

²Kenneth E. Boulding, "Political Implications of General Systems Research," General Systems, VI (1961), p. 1.

equipment in education, to avoid chaos, should be done systematically:

The concept of system, then, implies a goal or purpose, and it implies interaction and communication between components or parts. For the individual human organism, the components are cells and the subsystems are the organs of the body. In the case of complex man-machine systems, the components are individual humans and the machines they control and by which they are controlled.³

Therefore, to use technology systematically means that clear interrelationships should be established and maintained among equipment, knowledge of how to use it, and members of the particular social structure.

Antionette T. Ryan has classified systems into four categories:

- (1) Natural systems: Natural systems include solar systems, mechanical and thermodynamical universes of nature and the human organism.
- (2) Man-made systems: Man-made systems refer to organizations or structures of related components devised by man, rather than found in the natural state.
- (3) Closed system: A system is closed if there is no import or export of energies in any of its forms, such as information, heat, physical materials, and no change of components.
- (4) Open system: An open system is one in which there is an exchange of materials, energies of information between the system and its environment.⁴

³John L. Kennedy, "Psychology and System Development," Psychological Principles In System Development, ed. Robert Gagné (New York: Holt, Rinehart and Winston, 1962), p. 15.

⁴Antionette T. Ryan, "Systems Techniques for Programs of Counseling and Counselor Education," Introduction to the Systems Approach (Englewood Cliffs, N. J.: Educational Technology Publications, 1973), p. 48.

Using Ryan's terms, this study is concerned with man-made open systems. When created, the specific system's purpose and content must be identified, and that purpose will dictate the various kinds of system components. The specific types of components determine a man-made system's content. The nature of component interaction, two-way communication among components, will determine system processes and subsequent output.

James Finn used the airline system to describe a man-made open system constructed to achieve specified goals:

When an aircraft--bomber or commercial--is in the air, it consists of an intricate system of men and machines made up of smaller unit systems of men and machines. To make that aircraft accomplish its objective--whether to deliver a bomb or a sack of mail--it is necessary that the system as a whole be managed. What is important is not the physical and psychological condition of pilots, the electronic devices the code used with the tower, each taken separately, but the gestalt or field of all these items and many more, considered as they interact with each other.⁵

Another way of viewing the airline system is to perceive information as input. The manner in which the components treat that information is the process. The mail delivery service is then the product of the system.

The description by Finn emphasizes the presence of a communication system which is used by interrelated components to share and exchange information with regard to the

⁵James Finn, "AV Development and the Concept of Systems," Teaching Tools, Fall 1956, p. 163.

system's product. Two-way communication among components implies that information does not move linearly through a system and that the process of a system is cyclical.

James J. Thompson indicates that the information exchange process is a primary function of system maintenance:

The system must have information about its own behavior and the means of correcting inefficient and wayward performance. Without such knowledge or information the system will degenerate.⁶

F. H. Allport defines system as:

. . . something that is concerned with some kind of activity and preserves a kind of integration and unity, and a particular system can be recognized as distinct from other systems to which, however, it may be dynamically related. Systems may be complex; they may be made up of interdependent subsystems, each of which, though less autonomous than the entire aggregate, is nevertheless fairly distinguishable in operation.⁷

Systems Approach

Systems approach is a methodology which empowers man to design, develop, manage and evaluate complex organized entities. R. E. Corrigan and R. A. Kaufman view systems

⁶James J. Thompson, Instructional Communication (New York: The American Book Company, 1967), p. 34.

⁷F. H. Allport, Theories of Perception and the Concept of Structure (New York: John Wiley and Sons, 1955), p. 469.

approach as an identification of all elements related to goal attainment and specification of element functions.

A major consideration of this perspective is that planning precedes action. They define systems approach as:

. . . formal analytical planning methods for progressing from the specification of system mission objectives to the achievement of those objectives through the controlled and orderly specifications of parts making up the total system and the integration of parts according to functions to be performed into a total system that achieves stated mission objectives.⁸

Simon Ramo sees systems approach as first of all comprehending clearly and exactly the problem. Secondly, a goal must be established and some criteria formulated to determine when that goal (problem solution) has been reached. According to Ramo, development of criteria lead to the investigation of many avenues to the solution. He states:

As the end result, the approach seeks to work out a detailed description of a specified combination of men and machine--with such concomitant assignment of function, designated use of material, and pattern of information flow that the whole system represents a compatible, optimum, interconnected ensemble for achieving the performance desired.⁹

Instructional Development

When a systems approach is applied to the educational setting it is called instructional development.

⁸R. E. Corrigan and R. A. Kaufman, Why Systems Engineering? (Palo Alto, Calif.: Jearon Publishers, 1965), p.71.

⁹Simon Ramo, Cure for Chaos (New York: David McKay Company, 1969), p. 11.

The technique is properly a "systems approach to instructional systems development,"¹⁰ and Thomas Foster maintains that the former phrase "has been shortened to instructional development."¹¹ Those who practice instructional development are called instructional developers.

Instructional development and systems approach are inextricably bound together by their non-linear and cyclical characteristics. In a paper presented at the 1971 Association of Educational Communications and Technology (AECT) convention, Kent Gustafson stated that some models which attempt to illustrate the elements in instructional development often give the impression that the ID process is linear. However, states Gustafson:

Taking the concept of the "systems approach" a bit further, ID is indeed a system. It has all the attributes of a system and is quite comparable to a biological system. . . . Anyone who attempts ID rapidly finds that individual elements cannot be singled out for undivided attention since their explanation depends on information, decisions and consequences occurring within other elements. For example one cannot define an instructional problem (often erroneously labeled the "first step") without organizing his management and resources and collecting data (often considered a "later step"). The point is that

¹⁰D. G. Hamreus, "The Systems Approach to Instructional Development," The Contribution of Behavioral Science to Instructional Technology (Monmouth, Oregon: Teaching Research, 1968), pp. 1-6.

¹¹Thomas U. Foster, "An Evaluation of a Mediated Introduction to Television Production" (unpublished Ph.D. dissertation, Michigan State University, 1972), p. 17.

neither element can occur separately from the other. Further evidence of the interdependence of ID elements becomes apparent as one makes decisions regarding one element which has consequent effects on others.¹²

D. G. Hamreus defines "instructional development" simply as "a systematic process of bringing relevant instructional goals into effective learning activity."¹³

Instructional System

Gustafson points out that instructional development efforts are congruent with the systems concept in yet another manner. The results of instructional development is a product. The product of a system is dependent upon its designated purpose. The product of instructional development is an instructional system.¹⁴

Gustafson's position appears to be based somewhat upon the conclusions reached by Elwood G. Miller in the mid-1960's. Miller researched extensively the works of general systems theorists. He then developed instructional system characteristics by combining system concepts to the process

¹²Kent L. Gustafson, "Toward a Definition of Instructional Development" (a paper presented to the Instructional Development Division Association for Educational Communications and Technology, Philadelphia, March 1971), p. 20.

¹³D. G. Hamreus, Toward a Definition of Instructional Development (Monmouth, Oregon: Oregon State System of Higher Education, 1971), p. 1.

¹⁴Gustafson, op. cit., p. 23.

of instruction. Instruction is defined by Stephen M. Corey as the:

. . . process whereby the environment of an individual is deliberately manipulated to enable him to learn to emit or engage in specific behaviors under specified conditions or responses to specified situations.¹⁵

Miller described the characteristics of an instructional system as follows:

1. An instructional system is open-ended. No instructional system can be designed that does not include in its set of principles or ground rules a built-in opportunity for changing itself upon presentation of demonstrated need. An obvious framework within which the educator could trap himself might result from a description so definitive that innovation is not a possible alternative. To innovate oneself into an unchangeable system should not be possible.
2. An instructional system must include a collection of components, including the human instructors and students, any machines used in the process, all materials of any nature introduced into the system, the learning environment provided to the system to contain the instructional pattern, and a stated time interval over which the instructional pattern is to be spread.
3. An instructional system may provide for groupings of students or potential learners, arranged in any prescribed fashion (large group, small group, individual, or any combination of these).
4. An instructional system must be composed in such a manner that interaction within the system can be observed and accounted for. This includes interaction between individual students, the interaction between instructors and students, and the interaction between any human elements in the system and any machines or materials introduced into the system.

¹⁵Stephen M. Corey, "The Nature of Instructional Design," Instructional Design: Readings, ed. M. David Merrill (Englewood Cliffs, N.J.: Prentice-Hall Inc., 1971), p. 15.

5. An instructional system must be designed in such a manner that evaluation, according to the best research and practice, can be an integral part of the operation of the system. Such evaluation must be in conjunction with stated objectives of the instructional system.¹⁶

Miller's instructional system characteristics include identification of components and necessity for communication among the components in order for the system to change its goals and perpetuate its existence. Thompson has defined instructional system as consisting--

. . . of three components: people, complex ideas, and hardware components such as media which interact with people and ideas. All tend to lose something of their individual identity as they become part of a dynamic, fluid whole in pursuit of instructional goals.¹⁷

Models

Instructional developers have attempted to utilize the systems approach to instructional systems development for problems in education, through the development and use of instructional models. Models, like systems, vary according to the specific purpose.

Gerald Gerlach and Donald Ely cited the purpose for which they perceive the use of models in the planning of

¹⁶Elwood G. Miller, "A Descriptive Study, Evaluation and Analysis of Instructional Systems Development, Activities In Selected Departments at Michigan State University During the Period 1960-1963" (unpublished Ph.D. dissertation, Michigan State University, East Lansing, Michigan, 1965), pp. 57-59.

¹⁷Thompson, op. cit., p. 34.

instruction:

It is a guideline--a road map--and should be used as a checklist in planning for teaching. It shows the major components of the total teaching learning system, even though it does not portray the fine details of each component. It does show the relationship of one element to another, and it does offer a sequential pattern which can be followed in developing a plan for teaching.¹⁸

Models as seen by Gerlach and Ely can be designed to show component relationships among a school district as well as in the teaching learning process when both settings are systematically approached. The model becomes, as A. Chapanis says, a symbol which represents the "thing"--be it the teaching learning process or components of a school district.¹⁹

When the "thing" is too large for an individual to control, models can be used in a team situation to create a common reference for persons viewing the system from different professional backgrounds. Thus Lawrence Alexander and Steven Yelon used models in a 1969 study to increase group communication reliability. They developed the Common Experiential Referent model:

When people work together designing systems they invariably encounter communications difficulties. This is usually because, coming from different backgrounds

¹⁸Gerald Gerlach and Donald Ely, Teaching a Systematic Approach (Englewood Cliffs, N.J.: Prentice-Hall, 1971), p. 12.

¹⁹A. Chapanis, "Men, Machines and Models," American Psychology, 1961, pp. 113-131.

and having different ways of approaching a task, they tend to view problems differently. Often each employs a different vocabulary, or technical language, derived from his particular area of training or competence, which also impedes communication of ideas.²⁰

In their 1971 work Gerlach and Ely define models simply as a description or an analogy used to visualize, in simplified fashion, something which is not observed.²¹

The model used in this study served as a checklist to ensure a systems view of information input, interaction, and goal achievement among pupils, parents, educators, and technology. The model was a road map used to define the problem and develop strategies to extend equal educational opportunity in Rockford Public Schools.

The ID Model

The activities of instructional development, represented by the model, can be visualized in three general stages: (1) define, (2) develop, and (3) evaluate. Each stage has several functions which will be discussed as they relate to the design of an instructional system. During the actual instructional development process, the functions were often conducted simultaneously.

²⁰Lawrence Alexander and Steven Yelon, "The Common Experiential Referent Model," Systems Approach (Englewood Cliffs, N.J.: Educational Technology Publications, 1973), p. 44.

²¹Gerlach and Ely, op. cit., p. 23.

For purposes of clarity the functions will be treated separately.

Define Stage

The define stage consists of a series of functions which assist in stating the problem. This is accomplished by defining the problem, analyzing the setting where the problem is located, and organizing a management team. Particular attention is paid to the target audience, the resources available, and the conditions under which the problem must be solved. The management team must be organized to manage the task of dealing with the identified problem.

Function 1: State the Problem

A problem exists when an activity needs to be performed but no clear method of performing the activity exists or is known. In some instances symptoms appear to be problems. Problem definition is interrelated to collecting information about the audience and its environment. There are three steps in defining the problem:

1. Assess the needs of the audience.
2. Establish a prioritized list of needs.
3. State the problem.

The steps suggest comparing a status quo situation to the situation which is desired by members of a social system.

What existed in Rockford was unsystematic interaction among parents, educators, and pupils of Rockford Public Schools. In response to a coalition of citizen groups which had initiated a desegregation class action suit against Rockford Public Schools, the school district had created Special Interest Centers for elementary school pupils as an effective and equitable approach to academic achievement. Rockford school officials were confident that Special Interest Centers were a proper and just method of extending equal educational opportunity to all elementary school pupils. Meantime the citizen coalition was monitoring closely the Special Interest Centers.

On a rotating basis pupils from two to three designated fourth-grade classes were bused per week from their regular schools to the science/mathematics Special Interest Center. Upon arrival, the classes were purposefully and racially integrated into academic study groups. They spent one week participating in science and mathematic activities and projects. The process was scheduled to be repeated each week until all fourth-grade classes had spent one week at the science/mathematics Special Interest Center.

To determine what were the most important of several problems which existed, a prioritized list of problems was created, based upon the instructional developer's verbal interaction with various community organization representatives and citizens of Rockford. The coalition of community

groups perceived several problems inherent with Special Interest Center approach to equal educational opportunity:

1. Fifteen days of Special Interest Center schooling was not integration.
2. Five days a year at the science/math Special Interest Center was not sufficient to stimulate academic improvement or positive social attitude change.
3. Most of the time, at regular schools, children were still segregated in their classroom.
4. Disparity of physical facilities and instructional material between high- and low-achieving schools persisted.

Meetings with Rockford Public Schools' officials by the Michigan State University project team revealed that the officials perceived their problems in a more general sense than did the community groups:

1. There was no effective method of communicating and interacting with the community.
2. There was no way to absolutely prevent additional desegregation legal action.
3. There was no existent plan for extending the time pupils spent at the Special Interest Centers which, though not enough, was a positive step.

What was desired by Rockford Public Schools and the coalition of community groups was a more extensive method of

exposing all pupils to learning opportunities which would reduce the academic achievement gap among pupils in high- and low-achieving schools. The most effective approach, projected by Rockford Public Schools, would contain:

1. Extension of Special Interest Center experience for pupils and teachers.
2. Well-planned and orderly communication among educators and parents; schools need parental support.
3. Involvement of parents in the pupils educational process, based on the assumption that schools cannot do everything.

Thus, what existed was a Rockford Public Schools desegregation plan, accepted by the courts, but with which the coalition of community organizations was not satisfied. What was desired by both the citizen groups and Rockford Public Schools officials was equal educational opportunity for all elementary school pupils. How could academic and social achievement be attained when advantaged and disadvantaged pupils interacted with each other and in a special environment for only one-twelfth of the school year?

Function 2: Analyze the Setting

There were two general audiences of concern within Rockford. One existed within the immediate public school administrative structure. The second audience, which included parents, tax-paying citizens, city government

officials, and local business people, was directly related to the first.

The two audiences were related in such a way that a change among one could create a change among the other audience. Citizens, for example, can vote down a millage request by the school board and thereby create significant changes within the educational structure.

It was determined by the instructional developer, in view of the court action initiated by local organizations and citizens in favor of integration, that the target audience should include educators, pupils, and the community, specifically, parents. Educators involved in central administration were of primary concern. They directed and controlled school policy including any and all research requests regarding Rockford Public Schools.

The target audience also included Special Interest Center teachers and regular classroom teachers of fourth graders. Any extension of SIC experiences would necessarily involve these two groups of educators. They worked closely together in the center's programs which were designed to extend equal educational opportunity to all pupils.

Pupils identified included all fourth graders enrolled in Rockford Public Schools. Only fourth graders were involved in the Special Interest Center program. Specification of pupils determined the identification of parents.

Community citizens ostensibly concerned with equal educational opportunity were identified through their association with civic groups.

Internal and external political, social, and economic conditions of any organization can have an impact upon the desired goals of that organization. In a school district the conditions and constraints under which a problem is to be solved should be identified, as much as possible, among both audiences, internal and external.

The social, political, and economic conditions under which the problem of extending Special Interest Center experiences had to be solved revolved around the Rockford desegregation plan. The plan was not something over which the MSU project developers could exercise any degree of control. The school officials believed in it and had in fact designed it. While not all citizens accepted it, the court had ruled in the plan's favor. The developers fully comprehended the importance of a good school-community relationship. It was one of the primary reasons why the project developers continually held meetings with citizens and school officials.

Also important to the setting is the identification and location of resources which can be used to assist in the problem's solution. Both human and non-human resources should be sought. People design man-made systems, and

people will determine whether a solution ensuing from the system succeeds or fails. Non-human resources (materials, media, and other equipment) within the setting or available to it can be organized by humans to help solve a problem.

An analysis of the Rockford setting showed that people were the most valuable resource. Some school officials made available court documents and others placed the project developers in touch with responsible community citizens and leaders. Both the school officials and the citizens assisted the developers in identifying additional human and non-human resources and comprehending the conditions under which the project would have to be developed.

Rockford was one of the few cities with a cable television system capable of two-way audiovisual communication. Rockford Cablevision's management and engineering staff were enthusiastic about developing the system as a model of national renown.

The principal of the elementary school in which the science/mathematics Special Interest Center was housed had an outstanding background in science. Central administration officials frequently referred to him as "Mr. Science." The center had been placed at his school because of his extensive development of science and math curricula at the school. He also understood the relationship between educational technology and science education.

Thus the science/mathematics Special Interest Center was selected by the developers as the focal point of extending experiences for four reasons:

1. The principal had a strong background and interest in both science and media including cable television.
2. The center was located at a school which was in the interactive cable television quadrant and was equipped with a cable drop line.
3. The science/mathematics curriculum offered a subject matter where visual communication is an essential element.
4. The principal was held in high esteem by central administration.

Function 3: Organize Management

Instructional development is usually conducted by a team. Each team member contributes expertise in a particular area. Based on information collected about the problem and setting, tasks are delineated and assigned to personnel and time lines for task completion are established. The instructional development team was staffed with one school administrator, two communication researchers, an instructional developer, and a science/mathematics content specialist.

Both scheduled meetings and informal rap sessions were held between Rockford Public Schools officials and Michigan State University project developers. A total of four trips were made to Rockford by the instructional developer and communication researchers. Numerous negotiation and planning sessions were conducted with the Rockford Public Schools director of integration, the superintendent of schools, teachers, and representatives of the citizens' coalition. The sessions resulted in the identification of three fundamental tasks:

1. Permission to develop a plan for use of two-way cable television in Rockford Public Schools had to be secured from both the Education Committee and Board of Education.
2. A two-way cable television description, applicable to Rockford Public Schools, had to be written.
3. A presentation on two-way cable television for Rockford had to be presented to the Education Committee, which served as an interface and gatekeeper to the board of education.

Additionally, more specific tasks were then identified for the adaptation of two-way CATV for use in Rockford Public Schools. The instructional developer was assigned the task of developing a teleconference model for Rockford. Technical requirements were identified and described by the

engineering staff of Rockford Cablevision. Preparation of budget specifications was assigned jointly to the instructional developer and communication researchers.

A report to the Education Committee was made by three MSU Rockford Cable Project team members. Written proposals were mailed to each committee member prior to the oral report and discussion. The details on the use of two-way cable were explained. A commitment to work completely in cooperation with Rockford school officials and educators was made.

The Education Committee had two major concerns. They wanted to be assured that the cost of the proposed two-way CATV would not be an additional cost to Rockford Public Schools. This assurance was given, and in addition they were assured by the developers that after project completion the equipment would be left to the district. Secondly, one member expressed concern that two-way cable TV appeared to be a substitute for physical integration. That issue was not possible for the researchers to solve, since the success of the program as a desegregation measure would be mainly dependent on the good faith of the community and the action of the federal court.

The committee, however, was impressed and granted MSU permission to develop a teleconferencing concept for Rockford Public Schools, to be evaluated at a subsequent

date. Two months later the MSU team appeared before the committee with an extensive outline for a teleconferencing plan. The committee accepted the recommendations and indicated that the outline would be forwarded to the Rockford Public Schools board of education for approval. Shortly thereafter the board of education granted MSU/NSF permission to develop a teleconference project for Rockford elementary schools.

Attaining the permission--and the approval--for the project involved accomplishing several tasks previously mentioned. The first task involved comprehending the needs and problems of Rockford Public Schools. This was done by the developers visiting Rockford and interacting with members of the Rockford community; reading Rockford newspapers, school reports, and court records related to Rockford Public Schools; and relying on information forwarded from the project field director, permanently stationed in the city.

New tasks were continually identified and completed during the instructional development process. Each function within the three stages required tasks to be identified, assigned to team personnel, completed, and occasionally recycled for perfection.

Development Stage

The development stage is the appropriate place to emphasize and concentrate attention upon goals of the instructional development effort. Once the goals are stated and clarified, resources can be selected and strategies developed to solve the problem. A prototype is constructed to represent a solution which can be evaluated against data.

Function 4: Determine Goals

Goal definition and determination of goal relevance are important activities in instructional development. Clearly stated goals can serve as the basis for evaluation of ID efforts. Without a defined goal it is difficult if not impossible to know if you have achieved the goal attempted. Well-stated goals must also be relevant. To be relevant, goals must be appropriate to their setting; they are subject to the conditions and constraints of the educational environment for which they were created. An organization may reject goals which radically offend it.

The goals of the instructional development effort of this study include the goals of the science/mathematics Special Interest Center. The decision to include SIC goals was reached jointly by the instructional developer and NSF project director. The goals of SIC, stated in Chapter II, are generally to improve racial attitudes and increase

academic skills among fourth-grade elementary school pupils.

After collection of information to assess needs, and after analysis of the environmental setting, it appeared appropriate to the instructional developer to include parents in the goal statements. Two basic goals were oriented toward parents:

1. To facilitate positive attitudes toward science and math among parents of fourth-grade pupils who attend different elementary schools.
2. To enhance the role of parents as science and mathematics teachers.

Function 5: Specify Methods

Materials, facilities, and other resources can be organized to maximize goal attainment. Methods are explored which appear appropriate to achieve stated goals efficiently and effectively.

Theoretically, hardware technology is selected after goals have been stated. "After all, the machinist does not select a tool until he knows what operation he intends to perform."²² In this study, which began with an investigation of two-way cable television, the tool was the initial

²²Robert F. Mager, Preparing Instructional Objectives (Palo Alto, Calif.: Fearon Publishers, 1962), p. 3.

focal point. More specifically, teleconferencing was the strategy--the tool--of primary interest. The curriculum materials of the science/math Special Interest Center appeared appropriate for teleconferencing after needs assessment was conducted and information on the setting was collected and evaluated.

Teleconferencing goals and strategies were formulated on the basis of the following questions:

1. Can the two-way communication channels of cable television be used to facilitate positive effective outcomes from interactions conducted among pupils of racially different elementary schools, socio-economic, and cultural backgrounds?
2. Can the two-way communication channels of cable television be used to facilitate positive effective outcomes from the interactions conducted among parents of racially different elementary schools, socio-economic, and cultural backgrounds?
3. Can the two-way communication channels of cable television be used to further enhance the role of parents as teachers from the interactions conducted among parents and teachers?
4. Can the two-way communication channels of cable television be used to increase science and mathematics teaching proficiency among elementary school classroom teachers?
5. Can the two-way communication channels of cable television be used to increase science/mathematics academic achievement among elementary school pupils?

Pupils, parents and educators were included in the design of teleconferencing strategy in three phases:

1. Orientation to the instructional system.

2. Teleconference among the Special Interest Center and elementary school classrooms.
3. Teleconference among geographically separated elementary school classrooms.

Objectives for teleconference sessions among elementary school classes depended upon the specific science/mathematics unit and experiments being studied. Classroom teacher in-service/mathematics sessions via two-way cable cover a number of various science/math units. Each science or math unit set of experiments would dictate the objectives. The same would hold true for parent interaction via cable. Goals and objectives of teleconference orientation sessions for pupils, teachers, and parents have been specified since they are not a part of the existing Rockford curriculum.

Goals

Interest

To increase interest of the student toward the Center.

To increase the interest of parents in their child's experience at the Center.

To increase the interest of the fourth-grade classroom teacher toward science and math.

To increase via teleconferencing the interest of students in other students whom they have met at the Center.

Communication

To conduct communication among students anticipated to meet each other at the Center.

To conduct communication among parents whose children will meet at the Center.

To increase via teleconferencing the frequency of communication between classroom and the Science Interest Center teachers.

Information

To inform students what will take place at the Science Interest Center.

To inform students how the Science Interest Center program operates and functions.

To inform students of their roles at the Science Interest Center.

To inform parents of the child's role at the Science Interest Center.

To inform parents what will take place at the Science Interest Center.

To inform parents of other parents' academic expectations of their children.

To inform parents of other parents' roles in their child's academic achievement.

To inform parents of other parents' expectations of child behavior in school.

To inform parents of the role of the classroom teacher at the Science Interest Center.

To inform parents of the Science Interest Center teacher's role at the Science Interest Center.

To inform parents of their role in the Science Interest Center.

Orientation Sessions Objectives

Teachers

Upon completion of the orientation programs teachers will be able to:

1. Describe the concept of teleconferencing.

2. Identify by name 90 percent of the pupils from the interacting elementary school class.
3. Name four major pieces of television equipment used in teleconferencing.
4. Describe the function of the four major pieces of equipment used in teleconferencing.
5. Conduct a teleconference session.

Pupils

Upon completion of the orientation programs pupils will be able to:

1. Name each member of their Special Interest Center activity team.
2. Describe the initial science/mathematics activity in which he/she will be involved.
3. Name the classroom teacher from the interacting elementary school class.
4. Name one Special Interest Center teacher.
5. Name two pieces of special equipment used at the Special Interest Center.
6. Name the four major pieces of television equipment used in teleconferencing.

Parents

Upon completion of the orientation program parents will be able to:

1. Identify by name two parents from the interacting school.
2. State the four goals of Special Interest Centers.
3. Identify by name both classroom teachers at the Special Interest Center.
4. Identify by name one Special Interest Center teacher.

5. Describe three possible group activities in which Special Interest Center pupils will participate.
6. Identify by name five parents from the interacting elementary school.
7. Describe five pieces of equipment used at the Special Interest Center.
8. Describe the concept of teleconferencing.
9. Name the four major pieces of television equipment used in teleconferencing.
10. Describe two science/mathematics activities which pupils will participate in at the Center.

The project team decided that teleconferencing would involve groups instead of individuals, in light of the financial consideration that teleconferencing among individuals would not be cost-efficient. Teleconferencing sessions would interconnect groups of pupils, educators, and parents in various number combinations.

Function 6: Prototype Construction

Goals, resources, and strategies can be synthesized and developed into a testable product by constructing a prototype of the instructional system. However, since the instructional system was only to be designed and not actually developed, television scripts depicting teleconference sessions via cable television were written by the instructional developer. The script will be presented in the next chapter.

Evaluation Stage

Evaluation, also conducted during each function within the model, is an essential stage of instructional development. Its purpose is to determine whether the new instructional system, represented by the prototype, will function to a degree capable of achieving the goals.

Where possible, the prototype should be functionally tested. In some instances, however, construction of a functional prototype is impractical. The decentralization of a school district, for example, may be outlined on paper, but a functional test of decentralization is not possible for a given school district. The decentralization of a similar school district may be used as an example, or a test may be conducted using only a portion of the school district, but a true test of decentralization must in fact be decentralization.

Evaluation represented by the model in this study was conducted by using Rogers and Shoemaker's characteristics of innovations. The design of the instructional system was evaluated by the instructional developer by predicting, as well as possible, the degree to which the citizens and city officials, business and educational, would adopt the system, given its telecommunication instructional system characteristics. In practice, evaluation preceded efforts to obtain permission to teleconference from Rockford Public Schools.

Quantitative evaluation measures were also planned. Bradley Greenberg, one of the communication researchers, designed the model by which the effect of teleconferencing could be measured among pupils.

Function 7: Instructional System Characteristics

In this study predictive evaluation of the instructional system was carried out. Since a prototype of the instructional system could not be produced and tested, the characteristics of innovations which relate to adoption of a new idea were used to evaluate the implementation of the instruction development product, an instructional system.

Teleconferencing is a relatively new concept among professional telecommunicators, and was for the most part unheard of among the general population of Rockford. According to Everett Rogers and F. Floyd Shoemaker, "An innovation is an idea, practice, or object perceived as new by an individual."²³ Rogers and Shoemaker set forth in universal terms five characteristics that affect the rate at which innovations are adopted by members of a social system: (1) relative advantage, (2) compatability, (3) complexity, (4) trailability, and (5) observability. The instructional developer endeavored to evaluate the

²³ Everett M. Rogers and F. Floyd Shoemaker, Communication of Innovations (New York: The Free Press, 1971), p. 19.

instructional system from the perspective of the potential adopters. Each of these five attributes is discussed as it relates to the instructional system as perceived by school officials and citizens of Rockford, Illinois. Citizens and school officials hold the power to adopt or reject an innovation for use by pupils and themselves.

Relative Advantage

"Relative advantage is the degree to which an innovation is perceived as being better than the idea it supersedes."²⁴ Members of a social system may perceive an innovation as reward or punishment when it is viewed in comparison to the practice which it supersedes.

Extending SIC experiences among pupils, though not a crisis, was certainly a need overtly expressed by some citizens and school officials. In-service teacher education sessions and workshops were often cumbersome. Teachers had to leave school immediately after school and travel across town. Sometimes workshops were held in the evenings and took teachers away from their families. Teleconferencing appeared to meet the needs of both pupils and teachers. Pupils could interact and exchange science studies and experiences with each other and SIC teachers. Teachers could participate in science and mathematics in-service

²⁴Ibid., p. 138.

workshops from their own school via two-way cable television with SIC teachers before or after school, saving time and travel expenses.

Several rewards from the instructional system appeared attainable to Rockford citizens. The school system would receive, without cost, the equipment used in the teleconferencing project; the National Science Foundation would not remove the equipment from Rockford Public Schools. The disadvantage was that future maintenance service would have to be assumed by the school district after the NSF project was completed.

Another advantage was that development of educational teleconferencing would contribute to projecting Rockford Public Schools and Rockford Cablevision as a national CATV model. The city councilmen had worked hard in the past to locate human resources to effect that outcome. Moreover, Rockford Public Schools perceived teleconferencing as a method of unifying the educational efforts of pupils, parents, and educators to increase academic achievement among all pupils (Appendix C).

Compatibility

"Compatibility is the degree to which an innovation is perceived as consistent with the existing values, past

experiences and needs of the receivers."²⁵ Teleconferencing did not appear to be wholly congruent with the values of the local chapter of the NAACP. However, no official response to teleconferencing was received after one meeting with a top NAACP official. Another member of a local citizens coalition group expressed concern that teleconferencing would not equalize learning resources, deficient in black elementary schools, with those of white elementary schools. Among both groups a preference for physical integration was articulated.

Business and school leaders expressed support for educational teleconferencing. However, their negative attitude toward busing students for the purpose of integration could not be ruled out as an underlying motive for their support of teleconferencing. The election of three persons to the board of education on the basis of antibusing platforms appeared to indicate that teleconferencing, which required no cross-boundary busing, was compatible with some members of the board of education, and a majority of the voting public. In selecting the Rockford Public Schools' plan over two other busing plans, the court also had indicated a preference for non-busing desegregation strategies.

²⁵Ibid., p. 145.

Primarily Rockford Public Schools and parents of elementary pupils, particularly many black parents, wanted pupil math and reading achievement equality. The major goals of the innovation, educational teleconferencing, coincided with the goals of SIC and also involved the parents directly in the educational process.

Educational teleconferencing's relationship to existing ideas and values among Rockford citizens appeared slightly controversial. Some board of education and central administration personnel favored no cross-boundary busing of children. Teleconferencing was seemingly compatible with those values. In contrast, however, other persons preferred cross-busing and the physical integration of pupils.

Teleconferencing was not dependent upon segregation, however. Parents and teachers needed to communicate with each other. That value was present at least among educators. In-service science and math education sessions via two-way cable remained, therefore, compatible with educator values. There would remain a need for pupils to increase their academic experience by utilization of the Special Interest Center whether they were in integrated or segregated regular classrooms.

Another innovation compatible with existent values was the use of the educational cable channel on Rockford Cablevision. The educational channel, already in limited use,

had been generating positive parental interest and feedback. A school events calendar was placed on a TV drum and rolled continuously from 7:00 p.m. to 2:00 a.m., Monday through Friday. In addition, Rockford city council meetings had been aired on cable television and had received impressively favorable viewer ratings and feedback to city hall. The instructional developer felt that teleconferencing would be perceived as compatible with the existing values of Rockford's citizens.

Complexity

"Complexity is the degree to which an innovation is perceived as relatively difficult to understand and use."²⁶ Our technological society often conditions its members for advances such as teleconferencing. However, the team anticipated that the complexities of the system would present difficulties for two reasons. Although teleconferencing is quite simple to explain conceptually, explaining the entire program, complete with theory and rationale which involved conducting communication via two-way cable among parents, pupils, and teachers, was quite another consideration. Secondly, a host of questions were anticipated which involved organizational responsibility during and after the NSF project, and financial projections as to whether the

²⁶Ibid., p. 154.

school district could afford the system's long-range maintenance requirements.

A third complexity was whether or not teleconferences would eventually be used by Rockford and other school districts as a substitute for integration. The question on integration substitution did not remain complex. Legally, teleconferencing cannot be used as a substitute for integration.

The "system," as discussed previously in this study, was explained to Rockford citizens over a period of time. Written and oral reports were presented to school officials. These measures were taken to counteract the complexity of the project which the project developers anticipated would be perceived by the audience.

Trialability

Trialability is the degree to which an innovation may be experimented with on a limited basis."²⁷ Two-way video and audio had been experimented with by Rockford cablevision on at least one occasion prior to MSU's approaching Rockford Schools. The technical capacity to demonstrate the two-way communication process clearly existed. Operating the entire instructional system on a trial basis was impossible. The purpose of the proposed project was in fact a trial.

²⁷Ibid., p. 155.

Rockford school officials completely understood this position. However, on one occasion a teleconference was conducted between the adults who designed the instructional system and a Special Interest Center science class. The trialability script will be presented in the next chapter. Teleconferencing was trialable.

Observability

"Observability is the degree to which the results of an innovation are visible to others."²⁸ That characteristic was the weakest among the five. Results of the proposed instructional system did not exist because the resources and strategies had not been converted into a product to be tested for results. However, results of the instructional system's communication channel, cable television, was highly visible. Some city council meetings which had been held on the cable system's government channel received impressive local ratings. The educational channel used by Rockford Public Schools to publicize school events had stimulated many phone calls to the board of education and increased public attendance at some school activities. Members of the Rockford social and political power structure were made cognizant of the NSF project and its specific application of teleconferencing to the school system. The best effort

²⁸Ibid., p. 155.

made toward making teleconferencing more visible was to present research which supported the NSF/MSU team. That research was represented in the preceding chapter. Observability of educational teleconferencing was minimal and results of teleconferencing would be delayed. Observability, then, was not considered an asset in the acceptance of the innovation.

In general, however, the instructional developer felt that the innovation would be accepted by Rockford Public Schools and citizens. The MSU research team agreed.

Function 8: Quantitative Measurement

The quantitative measurement of the instructional system was, for the most part, designed by communication researcher Bradley S. Greenberg and his assistant Mark Miller, with additional input from other project team members. The following description of the instructional system's evaluation component represents a general direction and fundamental overview of a suggested experimental design.

Rockford Public School officials were explicit in stating guidelines for research to be conducted in the school district. All research efforts would have to be cooperatively developed and approved by central administration. Their main directive was that standardized tests not be employed to test knowledge and attitudes about science and math outcomes at the Special Interest Center.

Critical Outcome Variables

Assessment of outcome variables were specified in two general areas. One is related to the enhancement of science and mathematics training. The other deals with the interpersonal relationships among the children being brought from different environments.

Using non-standardized tests appropriate to the science/mathematics areas, the purpose of the tests would be to measure:

- 1) The relative knowledge gains in the substantive content areas by a pre-post test of participating students;
- 2) The relative long-term impact of teleconferencing, through a re-test of content skills later in the school year.

Using instruments developed to assess the effective aspects of the learning situation, examine:

- 1) The attitudes of the students toward the subject matter areas;
- 2) The student's self-confidence in this skills area;
- 3) The student's interest in continuing work in this subject matter;
- 4) The attitudes of the students, teachers, and parents toward the learning format, i.e., the Center concept and the instructional mode;
- 5) Parental knowledge about the Centers and their purposes.

The following are examples of the assessment tests:

(Math/Science testing)

1. Familiarity with metric measurement:

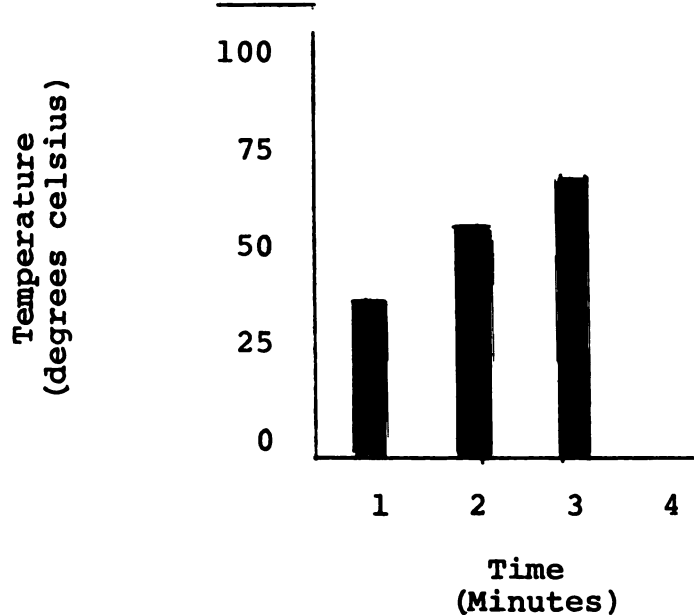
Which of these is the same as 42 centimeters?

- a. 4200 millimeters
- b. 2 decimeters, and 40 centimeters
- c. 4 decimeters and 20 millimeters
- d. none of these

2. Extrapolating a graph:

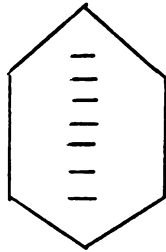
A scientist heats a beaker of water with a flame and records its temperature every minute. Below is a graph of the temperatures he recorded. What do you think the temperature of the water will be after four minutes?

Answer here _____



3. Systematic Observation:

Draw the picture below, making it three times bigger.
(graded by checking the accuracy of the enlargement
and counting to see that the pupil has reproduced
the correct number of lines.)



4. Consumer Math

If an 8-ounce of top costs 15 cents and a ten-ounce bottle costs 20 cents, which bottle costs less for each ounce?

5. Factual Learning

Which one of these parts of the body makes red blood cells?

- a. the pancreas
- b. the liver
- c. bone marrow
- d. the kidneys

After each one of the items in the next three instruments, these response categories would be repeated.

- _____ strongly agree
- _____ agree
- _____ I'm not sure
- _____ disagree
- _____ strongly disagree

(Children's Attitudes Toward Math/Science Learning)

- 1. Learning about science can be fun.
- 2. Knowing about math can help me do things I want to do.

3. I'd like to be a scientist when I grow up.
4. Science helps me understand things going on around me.
5. I've been interested in science for a long time, but didn't know it.

(Teacher Attitudes Toward the Center)

1. Students like to learn by doing.
2. Disadvantaged students are often helped by mixing with more advantaged students, but it hurts the advantaged students.
3. It's more difficult to teach integrated classes than it is to teach non-integrated classes.
4. Students learn better by manipulating materials than they do by lecture methods.

(Parental Attitudes Toward the Center)

1. The Science/Math SIC made my child more interested in math and science.
2. My child seemed to learn a good deal at the Science/Math SIC.
3. My child had bad learning experiences with other children at the SIC.
4. My child has good learning experiences with other children at the SIC.

(Parental Knowledge About the Center)

1. What are the purposes of the Science/Math SIC?
2. What do children do while at the Science/Math SIC/
3. What do visiting teachers do at the Science/Math SIC?
4. How long do students spend at the Rockford Science/Math SIC?

These are illustrative of the types of materials used to evaluate the outcome variable areas which deal primarily with the subject matter of the Center.

Interpersonal Relationships

Here, existing instruments and custom instruments would examine:

1. Interpersonal preferences among the children, e.g., who in this class would you like to have work with you?
2. Interpersonal behaviors, e.g., who in this class is your friend?
3. Interaction analysis. Here we propose to analyze for content the videotapes of in-class interactions to examine changes in verbal and non-verbal behaviors over time. For example, over the course of the week and over the teleconferencing sessions, what is the nature of black-white interactions, both in terms of frequency and content? How do the children group themselves?
4. Inventorying racial attitudes, primarily in terms of examining stereotypes. Prior to the Center experience, children will be assessed in terms of their perceived characteristics of the other major race with whom they will come in contact (or not, in the control groups). After the Center experience, and the follow-up teleconferencing experience, these will be reassessed.
5. Correspondence between the expectations of parents of participating students with their attitudes after the Center experience will be assessed. Just what do the parents think will be the result of mixing their children, and what do they think was the result?

Some sample instruments to tap these outcome variables will be presented here.

(Interpersonal Preferences)

A. Sociometric Nominations

1. Preference Items

- a. Who in this class would you want to have work with you on a class project?
- b. Who in this class would you want to sit next to you?
- c. Who in this class would you want to come to your house and visit you?
- d. Who in this class would you want as a close friend?

2. Behavioral Items

- a. Who in this class do you work with on class projects?
- b. Who in this class sits next to you?
- c. Who in this class comes to your house to visit you?
- d. Who in this class are your friends?

B. Likert-Type Evaluations of Individuals

1. How much would you like to have (student's name) work with you on a class project?

___very much ___pretty much ___not so much

2. How much would you like to have (student's name) sit next to you?

___very much ___pretty much ___not so much

It should be stressed that the two procedures labeled "Sociometric Analysis" above have substantial advantages over the usual attitude questions: 1) They require the child to make simple and natural judgments; 2) they make no explicit reference to race; and 3) they relate very directly to the question of how different children perceive each other. Further, the data can be examined along dimensions other than race, e.g., sex-group patterns, socio-economic groupings.

(Interaction Analysis)

It will be relatively easy to videotape the class sessions for subsequent analysis of the students' verbal and non-verbal behaviors. This would provide a record of some actual choice behavior among the children. Because such an analysis has not been attempted for purposes like that of this project, exact coding schemes will be developed from viewing the tapes. The codes probably would include such things as counts of black-black, black-white, and white-white interactions and descriptions of the qualities of these interactions (e.g., related or not related to course content; question or answer; praise or criticism.) In addition, such non-verbal behaviors as the children's choices in seating arrangements could also be examined. While interaction analysis is arduous, it makes no demands on student time or ability and it relates directly to behavioral manifestations of how students are "getting along."

(Inter-Racial Attitudes)

The racial attitude instruments reviewed suffered from one or more of the following disadvantages: 1) They apparently were written at a time when overt racism was more socially acceptable than it is today. (Recent evidence suggests that among college students and adults, many persons are refusing to respond to questionnaires containing items like, "I think all Negroes should be shipped back to Africa.")

2) Most items were written for older respondents asking about behaviors of little salience to children, e.g., marriage, dating, integrated neighborhoods, and 3) In most cases they ask only for whites' assessments of blacks, but few are racially neutral. However, these problems can be circumvented by developing our own instrument. Some suggested items are these:

1. I don't like to be around people of other races because I might say something that would make them mad.
2. Most people of other races think they're better than me.
3. I think someone of another race could become a good friend of mine.
4. It wouldn't make any difference to me if my teacher were my race or a different race.
5. No matter what anyone says, I think my race is the best.
6. I would like sitting next to a member of another race in class.

Response categories for each item would be: strongly agree, not sure, disagree, strongly disagree.

At this point, it is uncertain what meanings the word "race" has for young people. It may be that alternate forms of this instrument would be given to different race students with statements made parallel to this fashion:

(For blacks: "Most white kids think they're better than me.")

(For whites: "Most black kids think they're better than me.")

(Racial Stereotypes)

Racial and ethnic stereotypes are quite difficult to assess because they are in flux, because they often have an element of truth in them, and because it is difficult to determine accurately people's perceptions of such a complex phenomenon. The most common technique is an adjective check list. The disadvantage of the check list is that it forces evaluative criteria, increasing the salience of the adjectives included and excluding other possible descriptors. However, no other technique has been used with a high degree of success. We have modified commonly used adjective check lists to adapt them to a fourth-grader's vocabulary, as in the following example:

Which of the following words do you think describe members of the Black (White) race?

Smart
Friendly
Lazy
Musical
Athletic
Happy-Go-Lucky
Talkative
Dirty
Polite
Funny
Proud

Respondents would evaluate their own race, as well; this would allow for comparative data and give an indication of self-esteem.

(Parental Attitudes About School Integration)

1. I worry that my child might get hurt if he/she goes to an integrated school.
2. The quality of education suffers in integrated schools.
3. Teachers have to watch for racial tension instead of teaching.
4. Most children benefit from experiences with other races.
5. Children don't really notice racial differences unless their parents teach them to.

These examples require much more extensive treatment, pre-testing, and validation prior to a final implementation.

Hypotheses

The predicted outcomes of our treatment conditions are largely self-apparent from the rationale presented and accompanying textual discussion. Nevertheless, it is important to formalize the key hypotheses for the orientation segments of the teleconferencing process and for the follow-up teleconferencing classroom sessions.

H1. The teleconference orientation programs will:

- a. Reduce student anxiety about work at the Special Interest Center.
- b. Facilitate the task-orientation of the students; less start-up time will be required during the center week.
- c. Facilitate the interpersonal interaction process: earlier and more intensive interactions will be observable.
- d. Reduce parent anxiety about their children's activities at the center.

e. Increase parent interest in the center.

H2. The follow-up teleconferencing work sessions will:

a. Increase the amount of scientific information mastered by the students.

b. Reinforce the positive affect developed among the heterogeneous students.

c. Continue to reduce racial stereotypes.

d. Facilitate the positive nature of the children's attitudes toward science and the center concept.

H3. The program material cabled to parents will:

a. Increase their knowledge about the center activities.

b. Increase their support for the center concept.

c. Increase their acceptance of their child's interaction with a mixed group of students.

H4. The program material viewed by home school teachers will:

a. Increase their acceptance of the center concept.

b. Increase their acceptance of the teaching model of the science center.

Experimental Design

The diagram on the next page describes the particular treatments in the proposed telecommunication experiment. It makes possible the testing of the stated hypotheses.

Basically, the Center week, as now conducted, will be preceded by a week-long orientation period, involving three to five hours of orientation programs. The follow-up teleconferences will extend in once-weekly hour-long sessions for approximately twelve weeks.

EXPERIMENTAL DESIGN FOR SCHOOL CENTERS' APPLICATION

January/February

TREATMENTS						
	Integrated Classes		Not Integrated Classes (White)		Not Integrated Classes (Black)	
	<u>Exp.</u>	<u>Control</u>	<u>Exp.</u>	<u>Control</u>	<u>Exp.</u>	<u>Control</u>
Week 1	Orientation	-0-	Orientation	-0-	Orientation	-0-
Week 2	Center	Center	Center	Center	Center	Center
Week 3-9	Follow-up	-0-	Follow-up	-0-	Follow-up	-0-

April/May

Week 1	Orientation	-0-	Orientation	-0-	Orientation	-0-
Week 2	Center	Center	Center	Center	Center	Center
Week 3-9	Follow-up	-0-	Follow-up	-0-	Follow-up	-0-

The design permits the testing of all that has been discussed to this point, plus one additional thrust. Experimental and control groups of racially homogeneous students have also been included. This includes the opportunity for a direct assessment of the question of whether integrated classes perform any differently from non-integrated ones.

Integrated classes, on the basis of available Rockford public schools information, would have 25 percent to 30 percent minority students within the experimental treatments. Non-integrated white classes would have approximately 5 percent to 7 percent minority students. Non-integrated, non-white classes would have approximately 70 percent minority students.

CHAPTER IV

THE INSTRUCTIONAL SYSTEM

The purpose of this chapter is to describe the instructional system by illustrating the interrelated functions of the system's components and the system as a whole. First, the interaction functions among the system's human components will be described. Second, a method will be presented to show how the SIC science and mathematics instructional process can be conducted via two-way cable television. The chapter is concluded with a delineation of the personnel required to operate and maintain the system as well as proposed construction and operation budget estimates.

To illustrate how the instructional system works, the educational functions of pupils, educators, and parents will be presented in a set of teleconference scripts. The scripts illustrate succinctly some types of instructional sessions expected to occur during the operation of the system. To further demonstrate the instructional system functions, there is a transcription taken from an actual demonstration of a science education session conducted over the instructional system's communication channel on two-way cable television.

Interaction Among System Components

Interaction activities for groups of educators, pupils, and parents were designed to be conducted in three phases: (1) orientation, (2) Special Interest Center, and (3) follow-up. During orientation participants who will later meet at the SIC become acquainted with each other via cable television. Parents meet other parents and pupils meet other pupils. Parents and pupils are also informed about some of the resources they will use at the SIC. Educators, pupils, and parents are familiarized with the cable television equipment to be used in teleconference sessions. The Special Interest Center phase focuses on the established science and mathematics curriculum. Pupils, parents, and educators all participate in activities at the SIC. The follow-up phase continues science and mathematic experiences for pupils, educators, and parents after they have completed their visits to the SIC.

Fourth-grade classes were targeted in eight elementary schools. Each class contained approximately thirty pupils. Sixty pupils could interact via two-way cable television each day. Two-hundred forty pupils could use the two-way cable television system during the week. Classes rotate use of the cable system daily and continued daily rotation for twelve weeks or more.

The teleconferencing schedule indicates that on Monday, Barbour and Dennis, two predominately African American populated schools, will teleconference. Tuesday is designated as the teleconference day between Bell and Vandercook, predominately white. Henrietta, predominately black, and Sky View, predominately white, will teleconference on Wednesday. Two fourth-grade classes from legally integrated schools, Kiswaukee and Spring Creek, will teleconference on Thursday. Friday is reserved for teleconferencing among educators, classroom teachers, and Special Interest Center teachers.

The teleconferencing equipment to be used by the participating elementary classes was mobile. It was scheduled to be used by two different schools each day and to be moved for use by another set of schools the following day. Before the teleconferencing equipment is moved, parents of pupils attending the respective schools could use the communication channel to interact with each other in the evening (Appendix D).

One-way communication via cable television is also an important part of the instructional system. Strategically repeated one-way televised programs from Science and Mathematics SIC to the homes of attending children were designed into the instructional system to explain the function and operation of the center. Short videotapes of class activities would be used and include all center children.

Children would take notes home from school to inform their parents when they would be on television. That would attract parental attention to the purposes of the Special Interest Center and would serve to reassure them of the value of the educational program and the integration experience. The videotapes would also increase the motivation for parents to watch the program and interact with their child about science and mathematics. The tapes would be played on the cable system at times convenient to parents.

The Instructional Process: Orientation

Teachers

Two teacher orientation sessions were designed to introduce and explain the concept of teleconferencing and how inservice education via two-way cable television would be conducted. The sessions would include hands-on experiences with television cameras and other equipment essential to teleconferencing from the classroom. Using two-way cable television, classroom teachers introduce themselves from the two geographically separated teleconferencing sites. Special Interest Center teachers, located at the SIC, would then lead the classroom teachers through a science and mathematics lesson-planning session via two-way cable television.

Students

Pupils would be involved in three orientation sessions.

Session 1: To introduce and explain equipment in their home rooms essential to the telecast; such as, television cameras and television sets. Students would touch and operate the equipment.

Session 2: Using the two-way cable capabilities, students would be introduced to center teachers and various types of equipment and materials they would be using. Students would be able to ask questions about all aspects of the presentation.

Session 3: Introduce the classes from the different schools to each other with specific emphasis on introducing members of the prospective project teams to each other. Each pupil would be allowed to discuss his/her hobby or favorite interest or activity.

The following script illustrates the kind of interaction which might occur between pupils from a predominately black fourth-grade class and pupils from a predominately white fourth-grade class in a different elementary school. These pupils have never met, but will be working with each other in about one week.

Upon arrival at the Special Interest Center the two classes will be mixed and divided into activity groups. The script illustrates how the two classroom teachers

handle pupil introductions to each other and assignments to activity groups.

Imagine that the teacher has a list of activity groups and the names of pupils assigned to each group. The teachers standing before their respective cameras in their classrooms introduce themselves and then proceed to introduce each student according to science/math activity groups. Each student is called before the camera just as football introductions are made on NCAA games of the week. In this teleconference case, however, pupils have the opportunity to talk about themselves and ask questions of pupils located in classrooms across town.

(STUDENT-STUDENT INTERACTION IN ORIENTATION PROGRAMS)

This content immediately follows a one-way general orientation to the Center where day-to-day routine is described by Center teachers and the Aide. Optional topics have already been selected by a vote of the two schools after seeing an earlier videotape. NOTE: In this case we have video on separate monitors from the two sources available in both places. Camera 1 is in Haskell School; Camera 2 in Highland School.

VIDEO	AUDIO SOURCE	AUDIO
CAM 1 CU Mr. Anderson	Haskell School	Hello, my name is Mr. Anderson. I teach fourth grade at Haskell Elementary School. Your teacher, Mrs. Smith and I are good friends and I hope you and my students will also get to know each other. Right now I would like to introduce a member of my class who will be a part of the Bones of the Body team at the Science and Math Center. His name is John
CAM 2 LS Highland School Students		
- - -		
CAM 1 MS John		Hi. My name is John Jones. I live at 316 Barlett. I have two older brothers and one sister younger than me. We all play basketball in our backyard almost everyday after school and I am pretty good. I am good in math and I am on test 43. That's all I have to say.
CAM 2 LS Highland School Students		
- - -		
CAM 1 MCU Mr. Anderson		Thank you John. The next member of the Gases and Airs team project is Billy.
CAM 2 LS Highland School		
- - -		
CAM 1 MS Billy		Hi. My name is Billy Curtis and I like science. Last week we learned about the insides of our

(STUDENT-STUDENT INTERACTION IN ORIENTATION PROGRAMS) --continued

VIDEO	AUDIO SOURCE	AUDIO
CAM 2 LS Highland School Students		mouths by looking at a chart. I have good penmanship and like to play kickball. I live at 4519 Glenn and want to meet you next week.
-- --		
CAM 1 MCU Mrs. Smith		Thank you Billy. Mrs. Smith does anyone from your school have a question they would like to ask John or Billy?
CAM 2 LS Highland School Students		
-- --		
CAM 2 CU Mrs. Smith	Highland School	Mr. Anderson, I do have one question from Mike Tucker . . . Mike.
CAM 1 LS Haskell School Students		
-- --		
CAM 1 MCU Mike		I would like to ask John Jones if he thinks Bob Lanier is as good as Jabbar?
CAM 1 LS Haskell School Students		
CAM 1 CU John	Haskell School	I think they are both good but I think the Bucks are better than the Pistons. Do you like to play basketball at recess?
CAM 2 MCU Mike		
CAM 2 MCU Mike	Highland School	Yes. Would you like to play next week at the Center?
CAM 1 CU John		

(STUDENT-STUDENT INTERACTION IN ORIENTATION PROGRAMS) ---continued

VIDEO	AUDIO SOURCE	AUDIO
CAM 1 MCU John CAM 2 MCU Mike - - -	Haskett School	Yeah.
CAM 1 MCU Mr. Anderson CAM 2 LS Highland School Students		Okay, Mrs. Smith, would you like to introduce the members from your school who will be a part of the Bones of the Body team?

This pattern would proceed until all members of the Bones of the Body project group are introduced.

Parents

In the evening, parents meet at their respective child's school classroom. They will see a brief television presentation about the Special Interest Center, the center's science equipment, and how children use it. Secondly, parents at school A will interact via cable television with parents at school B. They will introduce themselves and with the assistance of their child's teacher, maybe discuss their hopes for their children and what behavior ought to be exhibited in the classroom. Pre-arranged stimulus material will be used to facilitate the parents' interaction with each other. For example, the parents may be given both a science problem and a disciplinary problem and asked how they would go about solving each.

The following script illustrates the possible nature and direction of interaction among two groups of parents, located in two different elementary schools, and a center teacher located at the science and mathematics center. The meeting is a regular PTA meeting, during which a one-way television program concerning the nature and curriculum of the science/math center is shown simultaneously to both schools.

Afterwards, the teachers at each school mediate interaction between the parents and the center via cable television.

(PARENTS-CENTER INTERACTION IN ORIENTATION PROGRAMS)

This is a part of a question and answer teleconferencing session which immediately follows a one-way television parent orientation which describes the Center program. Camera 1 is in Haskell School; Camera 2 is in Highland School and Camera 3 in the Science/Math Center.

VIDEO	AUDIO SOURCE	AUDIO
CAM 1 CU Parent CAM 2 CU Mr. Swanson	Haskell School	Mr. Swanson, I have another question concerning the Center.
CAM 3 CU Mr. Swanson CAM 1 CU Parent CAM 2 LS Highland parents	Center	Of course. Go right ahead.
CAM 1 MCU Parent CAM 3 MS Mr. Swanson CAM 2 LS Highland parents	Haskell School	Can you tell me what steps have been taken to assist the children in case of an accident at the Center? Before I could walk to school, but now I feel just a bit uneasy with them being away from their home school.
CAM 3 MCU Mr. Swanson CAM 1 CU Parent CAM 2 LS Highland parents	Center	Walker School has a full-time nurse to aid in case of illness or injury. To assist her in preparing for any emergency, all student health cards for students coming to the Center are brought to the center with each attending class.

(PARENTS-CENTER INTERACTION IN ORIENTATION PROGRAMS) ---continued

VIDEO	AUDIO SOURCE	AUDIO
CAM 2 MCU Mrs. Smith CAM 3 MCU Mr. Swanson CAM 1 LS Haskell parents - - - CAM 2 CU Parent CAM 3 MCU Mr. Swanson CAM 1 LS Haskell parents	Highland School	Mr. Swanson, we have a question over here. You mentioned that the children from the two schools will work together. Can you explain how this will be done?
CAM 3 MCU Mr. Swanson CAM 2 MCU Parent CAM 1 LS Haskell parents	Center	I will be glad to. If you will turn to page six of the handout material given you this evening, you'll see a sample of what we call teaching blocks. Students are placed in these equal sized groups or blocks; each troupe has a racial balance.
CAM 2 CU Parent CAM 3 MCU Mr. Swanson CAM 1 LS Haskell parents	Highland School	I see a great many positive aspects about the Science/Math Center including the elaborate equipment and materials already shown and explained which the children will use. However, it seems to me that mixing the students randomly as you've done is going to hinder the bright students from moving at their normal rate.

(PARENTS-CENTER INTERACTION IN ORIENTATION PROGRAMS) --continued

VIDEO	AUDIO SOURCE	AUDIO
CAM 3 CU Center teacher CAM 1 LS Highland parents CAM 2 LS Haskell parents	Center	First, a Center teacher and home school teacher will work together in a team to instruct each of our many different learning units involving the student groups or blocks. Secondly, the best information available on grouping students by ability comes from the well-known Coleman Report. Which I might add, I support based on my personal experience. Coleman found that high achievers did not suffer academically when placed with low achievers and that the low achievers increased their academic performance. So we are very confident that all students will benefit.
CAM 1 MS Mr. Anderson CAM 3 CU Mr. Swanson CAM 2 LS Highland parents	Haskell School	We have another question over here, Mr. Swanson.
CAM 3 MS Mr. Swanson CAM 1 MS Parent CAM 2 LS Highland parents	Center	Yes, go ahead.
CAM 1 MS Parent CAM 3 CU Mr. Swanson CAM 2 LS Highland parent	Haskell School	Can you give us an example of the kinds of things students will be required to do at the Center?

(PARENTS-CENTER INTERACTION IN ORIENTATION PROGRAMS)--continued

VIDEO	AUDIO Source	AUDIO
CAM 3 Varied Shots Mr. Swanson CAM 1 Haskell parents CAM 2 Highland parents	Center	Okay. At the bottom of page 10 you'll see a sample of four block activities: Small Things; Colored Solutions; Field Math; and Metric Measurement. Let's take Ice Cubes under small things. This unit deals with variations of the questions "What makes an ice cube melt faster or slower?" Children time how long it takes an ice cube to melt in the air and in different amounts of water. They hold contests to see who can keep the ice cube the longest. They compare the melting rates of different ice shapes which helps them develop a feeling for surface-volume relationships. They compare the melting rate of ice in contact with metal, wood, and other materials, and they try to determine why ice floats in water. Some of the skills they will acquire as a result of the ice cube activity are: 1. Using time as a measure of rate. 2. Using line and bar graphs to picture relationship between variables. 3. Ability to use a thermometer to measure heat relationships. 4. Ability to collect and organize data-based observations. 5. Concepts about the nature of heat and energy. 6. Concepts about the effect that cooling has on substances. 7. Designing and executing a controlled experiment. 8. Use of the metric system in measuring volume and time relationships.

Instructional Process: Special Interest CenterStudents

The science and mathematics curriculum of the Special Interest Center is already established. Videotapes were scheduled to be made of pupil activities and projects, allowing pupils to show and tell for delayed telecast to parents at home. Also visual records would be used to construct a sociogram among pupils.

Teachers

Via two-way cable, regular classroom teachers will interact with center teachers to obtain data on upcoming and ongoing science and math projects. Objectives, materials, procedures, and evaluations will be shared by telecommunication.

Parents

Parents will be involved in cooperatively coping with a specific task at the SIC. One such task (already developed and used in other contexts) might be the developing of a roll of film. In this example, the parents would be shown a video tape of the process and then work in small groups (matching their own child's work group in the Science Interest Center) to develop that roll of film. To motivate the parents, the roll of film could contain pictures of the children from both schools, plus photos of the two schools

paired during the SIC week. Another task which might be programed for the parents would be the assembling of the bones of the body.

Instructional Process: Follow-Up

Parents

If parents decide to continue interaction they should do so through the PTA groups at their respective schools, using the public access channel. Via one-way transmission, parents would continue to receive video tapes of their children involved in science/math experiments.

Teachers

Teachers will receive information and additional science and math project activity via cable after or before school.

The in-service education sessions between classroom teachers located in their own buildings and Special Interest Center teachers at the center were designed to be conducted in a group interaction manner. However, one SIC teacher might communicate with a group of classroom teachers. Center teachers were designated to demonstrate and explain science/mathematics experiments via cable television. Those teachers without two-way television were scheduled to use telephone lines to complete the two-way communication process in order to ask the center teachers clarification questions.

The following script illustrates in-service science/math education between classroom teachers and Special Interest Center teachers. The classroom teachers are located in elementary schools which are geographically separated.

Upon completion of one week of science/math instruction at the center, classes return to their respective elementary schools. Science activities continue, however. To maintain a high level of science/math instruction, classroom teachers and center teachers communicate via cable television. Demonstrations are conducted and explained. Classroom teachers may be able to conduct science/math lessons better after receiving some science/math instruction from specialists at the SIC.

(TEACHER-TEACHER INTERACTION IN FOLLOW-UP TELECONFERENCE SESSION)

This is the introduction to a new unit that the teams working in the Center have selected as one of the units to work on together by teleconferencing after the Center experience. Camera 1 is the Haskell School teacher; Camera 2 is the Highland School teacher, and Camera 3, the Science/Math Center teacher.

VIDEO	AUDIO SOURCE	AUDIO
CAM 3 MS Center teacher	Center	Good morning. Today we will begin our preview of the unit on Gases and Airs. As you can see on the table here, we have two sets of apparatus.
CAM 1 LS Haskell teacher		
CAM 2 LS Highland teacher		
CAM 3 Zoom to CU		One set is a bottle inverted over a burning candle standing in a tray of water.
CAM 3 Pan to CU of jar		The second set shows the same set-up, but indicates the results of the experiment. As you can see the candle has gone out and a considerable amount of water has found its way into the jar.
CAM 3 MS Center teacher and jar		The traditional explanation of this water rise has been that the candle uses up all the oxygen in the jar and the water rises to take its place.
CAM 3 MCU jar		The answer of water replacement ignores the role of heat, which is causing the air to expand in the jar, thus to escape unnoticed, is the major factor in the water rise. Actually, the candle has used up only a portion of the oxygen available before going out.

(TEACHER-TEACHER INTERACTION IN FOLLOW-UP TELECONFERENCE SESSION) ---continued

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VIDEO	AUDIO SOURCE	AUDIO
CAM 3 LS		The question throughout Gases and Airs is: "What happens to air in a jar placed down over a burning candle?" The pursuit of "what happens to the air" lends purpose and interest to the various gas and air activities. And just as a scientist so often finds that one question leads to others which may require new thinking, so does the initial question posed here. The unit will lead the student to consider many pertinent questions in the study of gases. Are there any questions at this point?
CAM 1 MS Haskell teacher	Haskell School	You mentioned that the initial candle burning experiment is to be followed by various other experiments. Can you be more specific?
CAM 3 MS Center teacher	Center	Yes. There are 30 experiments or activities which comprise the unit on Gases and Airs. And each experiment will lead to questions to be used to explore the next experiment.
CAM 1 MS Haskell teacher	Haskell School	Jan, are you saying that the experimental work proceeds in small steps and that the class work should flow, say, from experiment or activity to discussion to experiment to discussion?

(TEACHER-TEACHER INTERACTION IN FOLLOW-UP TELECONFERENCE SESSION) ---continued

VIDEO	AUDIO SOURCE	AUDIO
CAM 3 MCU Center teacher	Center	That's correct. Each activity is designed to lead naturally to the next experiment.
CAM 2 CU Highland teacher	Highland School	Will we depend upon the discussion of the children to suggest or determine our next steps?
CAM 3 MS Center teacher	Center	Very often this will happen, but if the children don't suggest new directions, you can take over and suggest pertinent points or merely tell them where you are going next.
CAM 2 MCU Highland teacher	Highland School	In going over some 30 experiments, this will take a great deal of instructional materials. Can we order these materials from AV or what?
CAM 3 CU Center teacher	Center	It would facilitate things if you would involve both parents and students in collecting common items such as steel wool, candles, and small trays. The Center will provide the more complex materials. Are there any more questions before we present an experiment and get into a discussion?

Students

Pupil follow-up is broken into two parts: academic and social. The emphasis in the academic portion of the interaction between students of school B and school A involves the reporting and asking of questions about the science projects by students who were originally gathered at the Science/Math Center in project teams. The interaction is really an extension of the Science/Math Center training. Based on sociogram data gathered from the Center;s association experience via taped video segments and the teacher's own observations, the teacher at the home schools can encourage informal exchange among students from different schools using two-way cable.

The following script illustrates the kind of interaction between the center and pupils of two elementary school classes. Both classes have been at the center during the same week. They were mixed in groups and conducted experiments jointly. Upon return to their respective schools they have continued to study science and math.

In this interaction session a group from each class explains what the other has been doing. Each group has a chairperson. The teacher or aide mediates the interaction when necessary.

(PUPIL-PUPIL INTERACTION IN FOLLOW-UP TELECONFERENCE SESSION)

This script sample illustrates teleconferencing between the center, and two schools. In this particular script, the Center teacher plays a minor role. In other teleconference sessions, the Center teacher will be more prominent, e.g., making assignments, instructional modules. This script emphasizes the content and interaction of the two student groups. Camera 1 is at School A, Camera 2 is at School B, and Camera 3 is at the Science/Math Center.

VIDEO	AUDIO Source	AUDIO
CAM 1 CU Mrs. Smith	School A	Good morning, Mrs. Jones. My group on Air is ready to begin.
CAM 2 CU Mrs. Jones	School B	Thank you, Mrs. Smith. We are all set to go here.
CAM 1 CU Mrs. Smith	School A	The group leader this morning is Ron Jordan. He will be the chairman.
CAM 2 CU Mrs. Jones	School B	The group leader for my group this morning is Helen Morrow and she will serve as chairperson.
CAM 1 CU Mrs. Smith	School A	Ron, please start.
Pan and zoom out to MCU of Ron	Ron	I would like to begin by saying that our group members all want to save as many trees and green plants as possible. Since our last meeting, we have studied air and how plants are important. When plants breathe they give us air and when we breathe we give them air.
		One of our members has a story to report. Here is Kelley Boyd.

(PUPIL-PUPIL INTERACTION IN FOLLOW-UP TELECONFERENCE SESSION)---continued

VIDEO	AUDIO SOURCE	AUDIO
CAM 1 LS of Kelley	School B	Hi, Kelley. Good to see you again.
CAM 1 MCU	Kelley	My report is on the plants in our house. My mother has a lot of plants which I don't like because I have to water them all the time. But now I have begun to like our plants because of our science lesson. My friend Terriann and me drew a picture of how plants help us and how we help plants.
CAM 1 MCU of Damon and the illustration	Terriann of School A	We found out that human beings need oxygen to breathe and live and that green plants exhale oxygen. We have called our plant Baby Huey and this picture shows Baby Huey spraying oxygen all over everything. Over here is Yogi The Bear and he is inhaling the oxygen being given off by Baby Huey. The white stuff coming out of Yogi Bear's nose is carbon dioxide and that is the kind of air Baby Huey needs to live on. That's our report.
CAM 3 Pan to MCU	Center Teacher	Now we will show you a movie on plants. It's called "Plants and Air." This movie shows what School A has just been reporting about
Cut to movie 5 min. The Movie: <u>Plants and Air</u>	From AV Center	

(PUPIL-PUPIL INTERACTION IN FOLLOW-UP TELECONFERENCE SESSION)---continued

VIDEO	AUDIO SOURCE	AUDIO
CAM 1 Cut to MCU	Ron of School A	That's our presentation for today. We hope that you have enjoyed us and learned from our information. Do you have any questions to any members of our team?
CAM 2 CU	Debra of School B	I would like to know from Terriann what she meant by the word exhale--that plants exhaled oxygen.
CAM 1 CU	Terriann of School A	Exhale means when you breathe out like this . . . Inhale means when you breathe in like this . . . Plants breathe in and out just like we do but they breathe out oxygen. (questions may continue until chairperson is instructed by teacher or aide to end interaction)
CAM 1 LS of School A group	Ron of School A	That concludes our presentation for today. We are now ready to hear your report.
CAM 2 MCU	Oswell of School B	We also did an experiment with air. We tried to find out some of the characteristics of air. Elias Lumpkins will tell about our experiment.

(PUPIL-PUPIL INTERACTION IN FOLLOW-UP TELECONFERENCE SESSION) ---continued

VIDEO	AUDIO SOURCE	AUDIO
CAM 2 MCU. Pan and zoom in on experiment being described	Elias	What we did was take a candle and light it. We then took the candle and set it in a tray which had some water in the bottom. Next we put this cylinder over the candle. Bernie Barnes will tell about the next part.
Pan to second experiment		Now we are going to show you what will happen to the candle burning experiment after 24 hours pass.
CAM 1 Cut to MCU	Ron of School A	Does anybody see anything different 24 hours later? Yes, the candle is out.
CAM 1 Pan to Damon - CU	Terriann	There is water in the tube which covers the candle.
CAM 2 CU	Oswell of School B	Those things are right. But our real question is what happened to the oxygen in the cylinder over 24 hours?
CAM 1 CU	Kelly of School A	The water in the cylinder forced the air out of the tube.
CAM 3 MCU	Center Teacher	Leads discussion of similarities and differences between the two experiments.

A Science Lesson Teleconference Demonstration

The use of teleconference in Rockford Public Schools remained purely theoretical until a science education session was conducted between pupils at the science and mathematics SIC and adults located across town at Rockford Cablevision.

The teleconference session was arranged to demonstrate the application of an instructional process via two-way cable television. It was considered the best way to convince decision makers at the National Science Foundation that extending academic and social experiences of the SIC through teleconferencing was a valuable application of two-way cable television.

The actual teleconference session was arranged and demonstrated on March 21, 1975, for NSF. Dorothy Derringer of the National Science Foundation suggested the session be videotaped. The pupils in a science class at the Special Interest Center explained their science experiments to an adult group located several miles across town in Rockford Cablevision's conference room. One science teacher handled approximately 60 fourth graders from predominately white elementary schools who took little time in warming to the TV teleconference.

The adults were seated in panel form facing one camera and two television sets. One television set was a

monitor which showed what was being telecast from Rockford Cablevision location. The panel could view themselves as they talked. A second television set showed the participants located across town at the SIC.

Pupils at the center had the same one camera and two television sets arrangement as the adults. They could see themselves and view and hear the adults on the respective sets. The pupils were seated on the floor in a number of activity groups. There were five to six pupils in each group. Each group had already conducted a set of science experiments prior to the teleconference session.

The following script was transcribed from the sound track of the videotape. In addition to the SIC participants, the adults included persons who had worked together in designing a teleconference model for Rockford Public Schools. They were:

James Thomas--Rockford Cablevision
Thomas Baldwin--Michigan State University
Larry Redd--Michigan State University
Special Interest Center pupils and teacher
Dorothy Derringer--National Science Foundation
Bradley Greenberg--Michigan State University
Martin Block--Michigan State University
James Wright--Rockford Cablevision
Don Swanson--Rockford Public Schools

(see Appendix E for additional information).

Instructional System Management

Hopefully it is clear by now what the instructional system is and how the components can interact with each other via two-way cable television.

The following personnel appeared crucial to operate the instructional system satisfactorily. All personnel specifications were designed so that the management staff would collaborate with each other fully in operating and directing the system.

Project Coordinator

This staff person will have key management and administrative responsibilities. In particular, this person will be responsible for scheduling of videotape sessions, production arrangement, and data collection. Information dissemination among staff personnel will be administered by this person. This is a 100 percent time activity.

Science Education Field Director

This person will be responsible for producing science/math learning modules to be used in supporting classroom teacher use of television, for the videotapes which will be cablecast to parents' homes, training both pupils and teachers in the use of the cable equipment, and explaining educational teleconferencing. This is a 50 percent activity.

Master Science Teacher

One current teacher from SIC will be released to the project for the full year or twelve weeks. This person will collaborate in the development of the SIC science/mathematics curriculum, and will be the primary trainer within the teleconferencing sessions. Further, this teacher will serve as the major consultant to schools during follow-up periods. This is a 100 percent activity.

Teacher Aides

These two persons will be present in each of the two teleconferencing classrooms. They will handle the class while the teacher is teleconferencing with a small group, and supervise some social teleconference sessions. These positions are each 50 percent activities. However, the aides will move to different schools each day to follow the teleconferencing classes.

Management Plan

Project Staff Components

1. Education sub-staff (Teachers)
2. Research sub-staff (Social Scientists)
3. Production sub-staff (TV personnel)

<u>Time Period</u>	<u>Tasks</u>	<u>Staff Responsibility</u>
(Pre-Implementation Phase)		
July-August	Fill staff needs	Principal Investigator
August-September	Develop research instrument	Research staff
	Develop curriculum supplement for follow-up	Education staff
	Obtain site test equipment	Production staff
September-October	Plan and produce orientation programs, materials	Education, production staff
	Pre-test research instruments	Research staff
	Train SIC staff	Education, production staff
November	Gather baseline data	Research staff
	Train first group of visiting teachers	Education, production staff
(1st Implementation Phase)		
January-February	Produce programs for evening showing on SIC activities	Production
	Gather videotape data for interaction analysis	Production
	Gather post-test data on SIC impact	Research
	Begin data coding, analysis	Research
	Monitor SIC program, teacher training	Education
	Plan changes in orientation program	Education
(1st Follow-up Phase)		
February-March	Produce follow-up teleconference sessions	Production, education
	Produce modified orientation programs	Production, education
	Post-test on effects of follow-up sessions	Research
	Data analysis	Research

continued

<u>Time Period</u>	<u>Tasks</u>	<u>Staff Responsibility</u>
	Intern Report Plan changes in follow-up procedure	Research, education Education
(2nd Implementation Phase)		
April	(Recycle activities of 1st implementation phase)	All
	(Recycle activities of 1st follow-up phase)	All
(Report and Dissemination Phase)		
June-August	Complete data analysis Report due for 1st year Report due for 2nd year	Research All All

Second Year Possibility

The basic activities would be recycled through a second year. Specific changes would be planned after analysis of the first year's data. The principal objective of the second year would be to provide this training on a cost-effective basis. This would involve an increased number of replications of the teleconference conditions, using more classes per sequencing, and more frequent sequencings to determine how efficiently this could be done on a massed basis. Some of the replications would include a single-channel teleconferencing procedure where a television director or the teacher at the Science/Math Center switches between the two schools and the Center. The two schools would have a single monitor for the live program. The Center

teacher would have three camera monitors and a live monitor. In this procedure it is not necessary to lease extra channels and a cost saving is realized. Additionally, the small ear plugs are not needed. Modified testing would be done to determine reliability of first year results. It is assumed that the non-integrated teleconferencing conditions could be dropped. Classes would either undergo the teleconference or not. Variations in the teleconference experience would be experimentally planned, conducted and tested, to maximize gains among the participants.

Teleconferencing Budget

The teleconferencing budget is presented in three parts: (1) telecommunication equipment, (2) personnel budget and (3) system operation. The system's operation costs are divided into two plans. One plan calls for system operation for twelve weeks. The second system operation plan covers a budget for nine months or a full academic year. Figure 1 shows the weekly schedule of teleconferencing schedule. Figure 2 shows the overall system operation telecommunication design.

The cost of operating the system for a full academic year is \$87,427.00. For 12 weeks, the cost of operating the instructional system is \$47,676.00.

<u>Weekly Schedule</u>		
Monday	Barbour 83.6% Black	Dennis 92% Black
Tuesday	Bell 59% White	Vander Cook 52% White
Wednesday	Henrietta 79% Black	Sky View 71% White
Thursday	Kishwaukee 18.6% Black	Spring Creek 14.5% Black
Friday	Friday was designated as teleconference day among classroom and Special Interest Center teachers. Two classroom teachers will be able to interact with the SIC teacher audiovisually, Kishwaukee and Spring Creek. The other teachers will use return audio from their classrooms to SIC via telephones. All fourth grade teachers will receive television signals in their classrooms.	

Figure 1. Teleconferencing weekly schedule.

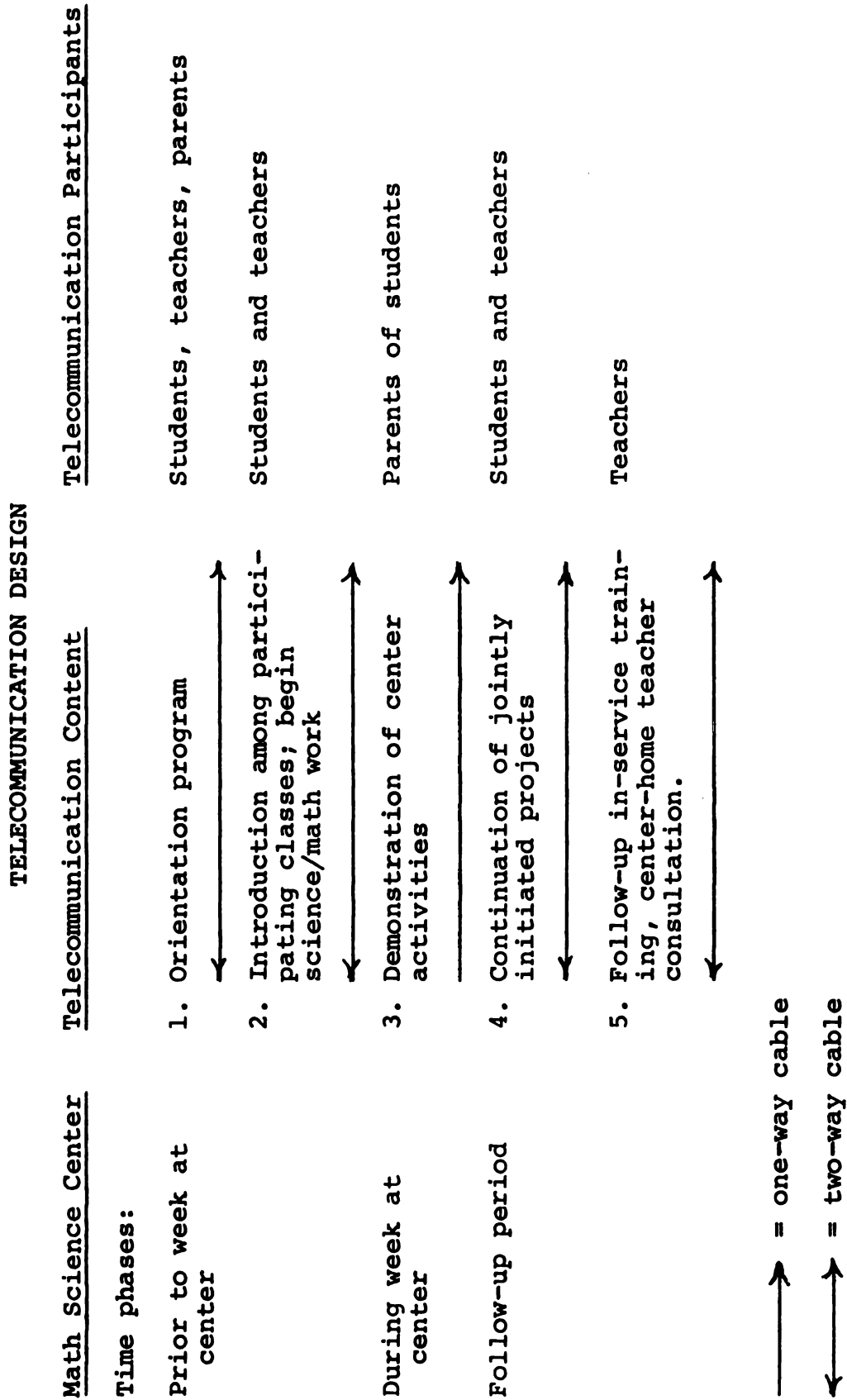


Figure 2. Overall system operation telecommunication design.

Telecommunication Equipment

1. Transportation Channels

a. Downstream audio and video channels

Telemet 4400 D-1 transmitter	\$1,200
Telemet transmitter plug-in-unit	350
Band pass filter	155
Subtotal forward video channel	<u>1,705</u>
Subtotal three forward channels	x \$5,115

b. Upstream audio and video channels

Telemet 4400 D-1 transmitter	\$1,200
Telemet transmitter plug-in-unit	350
Telemet 4400 D-1 receiver	1,225
Telemet receiver plug-in-unit	425
2 Band pass filters	310
Catel FMRX 2200 receiver	225
Catel PS 2000 power supply	125
Catel CA 2000 chassis	110
Catel AM 2000 transmitter	345
Subtotal return video channels	<u>4,315</u>
Subtotal three return channels	x \$12,945

c. Headend control unit

Switcher	\$1,800
Catel FMX 2000 transmitter	365
3 Catel FMRS 2000 receivers	675
2 Catel PS 2000 power supplies	250
2 Catel CA 2000 chassis	220
Roh audio mixer	350
Subtotal headend control	x \$3,660

2. Remote Units and accessories

a. Television production units

Build remote production units	\$900
Emcore Rack	500
Telemation RPD-90 power distribution panel	30
Tektronix 528 waveform monitor	1,000
Unimedix color 9" video monitor	1,055
TUM-2000 Sony 83 channel demodulator	325
Shure M-67C microphone mixer	297
Shibaden FP-1500 color camera	4,495

Zoom lens/automatic iris	\$918
Sampson tripod	473
Color bar generators	219
2 Head sets	109
Total three units	<u>\$10,321</u>

b. Classroom headset equipment

75 headsets	\$375
3 Panels	300
Wiring	300
	<u>\$975</u>

Equipment total..... \$33,016

3. Maintenance Costs

a. Rate of one percent of the equipment cost per month =	\$330.16
b. Nine months =	2,971.44
c. Three months =	990.48

4. Operation--one upstream channel

- a. \$30.00 per 1 1/2 hours
- b. Five day weekly = \$150.00
- c. Thirty-nine weeks = \$5,850.00
- d. Twelve weeks = \$1,800.00

Personnel Budget

<u>Position</u>	<u>Full Academic Year</u>	<u>Twelve Weeks</u>
Project coordinator	\$14,000 (fulltime)	\$3,500
Center Science teacher	\$15,600 (fulltime)	\$3,900
Science Education field director	\$7,800 (halftime)	\$1,950
Teacher aides	\$4,005 x 2 (fulltime)	\$1,260 x 2
Total	\$45,590.00	\$11,870.00

System Operation CostsFull Academic Year Operation

Equipment Cost:	\$33,016.00
Nine months--maintenance cost:	2,971.00
Nine months--operation cost:	5,850.00
Nine months--personnel cost:	<u>45,590.00</u>
Total cost.....	\$87,427.00

Twelve Weeks Operation

Equipment Cost:	\$33,016.00
Twelve weeks--maintenance cost	990.48
Twelve weeks--operation cost	1,800.00
Twelve weeks--personnel cost	<u>11,870.00</u>
Total cost.....	\$47,676.48

$$\text{Per person expenditure} = \frac{\text{total cost}}{\text{total people}} = \frac{\$87,427.00}{490} = \$178.42$$

Per person use: Nine months (39 weeks)

240 pupils =	9,350
240 parents	240
8 teachers	312
<u>2 SIC teachers</u>	<u>77</u>
Total	490
	9,979

$$\begin{array}{l} \text{Total} \\ \text{per person} \\ \text{use rate} \end{array} = \frac{\text{nine month cost}}{\text{total person use}} = \frac{\$87,427.00}{9,979} = \$8.76$$

Per person use: Three months (12 weeks)

240 pupils =	2,880
240 parents	240
8 classroom	
teachers =	96
<u>2 SIC teachers</u>	<u>24</u>
	3,240

$$\begin{array}{l} \text{Total per person} \\ \text{use rate} \end{array} = \frac{\text{three month cost}}{\text{total person use}} = \frac{\$47,676.48}{3,240} = \$14.71$$

When equipment cost, \$33,016.00, is amortized over seven years, its annual expenditure is \$4,716.57. The cost per person during the academic year when the equipment cost is amortized is \$120.67.

CHAPTER V

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

Summary

Efforts to achieve equal educational opportunity are historically extensive and complex. In spite of Brown; regardless of Swann; and ESEA and the Civil Rights Act of 1964, notwithstanding; equal educational opportunity for many pupils has not been achieved.

The roots to resistance against educational equality are in the policy and practice of "separate but equal." Congressional actions reported in the Federal Role In Education indicates that race was a crucial factor when the U. S. legislature failed to pass general aid to education bills in the 1940's and 1950's.

Despite massive funding in the 1960's to place resources in public schools and passage of laws which make discrimination illegal in any program receiving federal funds, equal educational opportunity has not been achieved. After more than 20 years since Brown, large numbers of African American pupils remain segregated in public schools, and many pupils underachieve in mathematics and reading.

The struggle for educational equality has resulted in an agreement among educators that the role of parents is important to pupil achievement. Beyond the legal question of whether schools are desegregated, parents are now concerned about academic and social achievement.

In Rockford, Illinois, a coalition of citizens and community organizations filed a court suit against Rockford Public Schools in an effort to achieve pupil equal educational opportunity. The district court judge, directing desegregation efforts in Rockford, deemphasized the use of busing. Consequently school officials created Special Interest Centers to:

1. To provide additional opportunities for elementary school pupils (fourth graders).
2. To improve student attitudes toward academic pursuits.
3. To provide in-service teacher training through observation of new teaching techniques and participation in instruction.
4. To provide diversified interpersonal experiences to elementary pupils and thus enhance mutual understanding across races, socio-economic classes, and geographic section of the city.

The problem with the SIC's is that some citizens and school officials felt that the time spent at the Center, five days at each of the three Centers per academic year, was not enough to affect academic and social achievement among pupils.

The purpose of this study was to design and describe an instructional system to extend SIC experiences. The study described the process of organizing educators, pupils, parents, and the science and mathematics Special Interest Center into an instructional system which used two-way cable television as the prime communication channel among the system's components. Secondly, the study described inter-related functions which the instructional system's components would have to perform in order to produce academic and social achievement among fourth-grade pupils.

The instructional system was designed by using the process of instructional development. A major tool of instructional development, an instructional development model, was used as a guide to identify the correct problem and organize all materials, facilities, and human resources into an instructional system design. The model's three stages (define, develop, and evaluate) were subdivided into a total of eight smaller functions.

THE INSTRUCTIONAL MODEL

STAGE 1: DEFINE

Function 1: STATE THE PROBLEM

The process of isolating the correct problem consisted of three steps. First the needs of Rockford Public Schools were assessed. Two, priority lists of needs, as determined by school officials and

citizens, were compiled. Third, the mutually most important problem from both lists were identified and stated.

Function 2: ANALYZE THE SETTING

The audiences for whom the problem existed and those that would be affected by the problem resolution were identified. The social, political, and economic conditions under which the problem had to be solved was identified and analyzed. Finally, facilities, human resources, and materials needed to assist in the problem solution were located.

Function 3: ORGANIZE MANAGEMENT

Tasks which needed to be completed were identified and assigned to various instructional development team members.

STAGE 2: DEVELOPMENT

Function 4: DETERMINE GOALS

Goals were stated to provide development direction. Careful efforts were made to determine goal relevancy under the conditions and constraints within the setting. A special endeavor was made to include the existing goals of the SIC which centered around educational equality.

Function 5: SPECIFY METHODS

Materials, facilities, human resources, and strategies were synthesized into a method, teleconferencing, deemed appropriate by the ID team to achieve specifically stated objectives.

Function 5: PROTOTYPE CONSTRUCTION

Based on goals and objectives, resources, and strategies were designed into a representative product of the instructional system.

STAGE 3: EVALUATION**Function 7: CHARACTERISTICS**

The characteristics of innovations developed by Rogers and Shoemaker, which relate to adoption by members of the audience, were used to predict new instructional system.

Function 8: QUANTITATIVE MEASUREMENT

A quantitative measurement model was designed to evaluate statistically whether the instructional system, when activated, would support hypotheses.

Conclusions

As the instructional developer on the MSU/Rockford Cable Project, this researcher used instructional development to determine optimum use of two-way cable television in Rockford Public Schools. While this study was descriptive and did not include quantitative analysis, some conclusions can be drawn from the observation methodology employed in the study. Several conclusions can be drawn from observations made about Rockford, its public schools, the two-way cable system, and the instructional development process which was used to integrate CATV into the educational system.

1. Instructional development is an instructional system producing process. The unit designed by using the ID process meets all of the requirements identified by Miller as necessary for an instructional system.

2. The ID model is an efficient and effective instructional development tool. The model bridged the professional language gap between the education and communication team members. In addition, the model served as an effective checklist to identify each stage and verify completion of each ID function.

3. What some instructional developers have written about the non-linear process of instructional development proved to be true in Rockford. Many of the functions and tasks in the various ID stages overlapped and were carried out simultaneously. Tasks were also continuously recycled in order to perfect portions of the instructional system. The process was entered with the method already specified, however, the instructional developer was able to investigate the appropriateness of the method in a systematic way by using a systematic ID model.

4. Rogers and Shoemaker's Diffusion of Innovation Characteristics were used successfully in Rockford to predict acceptance or rejection of a new instructional system.

5. Rockford Public Schools is an appropriate school district in which to develop educational teleconferencing via two-way cable television. The officials of Rockford Public Schools have agreed to allow teleconferencing experimentation. Local city officials are also supportive of educational teleconference development. In addition, some key and responsible African American community leaders do

not oppose the use of two-way cable television to conduct instructional communication among fourth-grade pupils, their parents, and educators. The science and mathematics program at the Special Interest Center provides an opportunity to evaluate achievement among various socio-economic classroom populations, educators, and parents. Comparative evaluations can be made between groups that interact face-to-face at the SIC . . . teleconference, and control groups that only attend the SIC.

6. Two-way cable television is a communication channel through which it is possible to conduct science education experiments among the SIC and fourth-grade classrooms. Pupils at the science and mathematics SIC explained and shared science education experiments with adults who were in the Rockford Cablevision conference room located across town. Technically there is no factor which would prevent conducting similar sessions between designated elementary classrooms and the SIC or between two classrooms. The pupils were responsive to questions and eager to explain their science projects to the adults. The adults, however, appeared to have some difficulty adjusting to the teleconference session. There is no reason to believe that two groups of teleconferencing pupils would generate less effective communication among themselves.

7. Two-way cable television, specifically teleconferencing, is not a legally accepted substitute for racial

desegregation of Rockford Public Schools. The schools, which do not meet Illinois guidelines for desegregation, are in violation of the state's statutes. It remains the responsibility of Rockford Public Schools to desegregate with or without the use of teleconferencing via two-way cable television. And it remains the right of parents and citizens to prod desegregation action. The 5th Circuit Court of Appeals of Texas ruled that two-way television is not a tool which can be used to eliminate the presence of a dual school system. The Dallas Independent School District and Rockford Public Schools teleconferencing plans differ in a number of important ways. The DISD plan was clearly a substitute for school desegregation. Rockford's plan was designed specifically to improve achievement. The DISD plan was narrowly aimed at pupils only. The Rockford plan specified that teleconferencing take place among pupils, parents, and educators. The DISD plan proposed to enter teleconferencing permanently and without empirical research to support the plan. The Rockford plan called for a specified test period for the purpose of collecting and evaluating empirical data to determine academic and social achievement. The DISD plan was massive in scope. It covered all grade levels and was estimated to cost nearly ten million dollars. Rockford's effort was limited to one grade level and cost under one hundred thousand dollars.

8. The proposed use of cable television in Rockford Public Schools (teleconferencing and some one-way transmission) as described in this study is a relatively cost effective method of involving parents in the educational process and delivering in-service and special instruction to educators and pupils. The cost of the instructional system is estimated to be \$178.42 per person. That figure includes, however, the initial purchase of equipment which is \$33,016.00. When the equipment is amortized over seven years, the annual equipment cost would be reduced from \$33,016.00 to \$4,716.57 and the annual cost per person would be \$120.67.

9. From a history of educational developments described in Chapters I and II, it can be observed that educators, pupils, and parents each play interrelated and important roles in academic and social achievement of pupils. Some Rockford parents, and other citizens, endeavored to legally require the board of education to comply with the state in desegregating schools. Other parents, and citizens of the voting public, elected persons to the board of education who opposed busing as a method to desegregate schools. Everyone involved in the Rockford educational process, including pupils, affects educational and social achievement.

Discussion

An objective appraisal of equal educational opportunity efforts leads the open mind to conclude that segregation in public schools permits a situation to exist which often results in a negative imbalance of educational resources and facilities in racially identifiable schools. The literature is replete with reports to support that fact. In Rockford, a school district which is not atypical, the League of Voters' survey revealed that inadequate resources and facilities existed in racially identifiable schools.

Desegregation, then, is not just a legal position to uphold. It is very difficult to abandon desegregation efforts in the face of historical and current evidence of educational resource discrimination.

To suggest that teleconferencing can have a positive impact on improving pupil academic and social achievement is a new frontier and direction taken toward educational equality. The mere suggestion may at first appear to be counter to the position of many influential citizens and organizations that have invested many years fighting for physical integration of black and white pupils. But, teleconferencing, as described in this study, is aimed at improving pupil achievement. It is independent of segregation, de jure or de facto, which is unconstitutional.

The Rockford school district does not have to be segregated to use teleconferencing to improve pupil achievement. Pupil achievement is not as given in desegregated schools. The quest for pupil achievement is an ongoing process. Those most directly involved with and responsible for the pupil achievement process are educators, parents, and pupils themselves. Each of the major human components must carry out their responsibility or the school system's product, pupils that manifest "acceptable" academic and social skills, will be flawed.

The conclusions reached in this study encourage those directly responsible for pupil achievement to work together cooperatively. It does little good if teachers make homework assignments which go undone because parents are conceptually unaware of a learning environment which they should provide at home, or simply fail to provide a learning environment. The position does not shift responsibility from professional educators. It places an onus on educators and parents to work together to create continuity between school and home environments.

The conclusions also support the position that teleconferencing in Rockford is a method worthy of being experimented with to conduct positive communication and systematic instruction among educators, pupils, and parents. The most important consideration is the cooperation among the human components.

Teleconferencing is not a panacea for all problems in educational equality efforts. This study, by employing instructional development, avoided approaching the consideration of cable television from the position which says, "Here is CATV what can we do with it?" It is true that the study commenced with an interest in CATV and teleconferencing. However, by employing ID, a particular problem was systematically identified, and teleconferencing was verified and selected as a tool, based upon its usefulness in supporting systematic cooperation among educators, pupils, and parents to achieve equal educational opportunity in Rockford Public Schools.

The danger of some school districts using CATV as a substitute for desegregation is no greater than misuse of other educational innovations such as misuse of the pupil's educational file. In face of uncertainty regarding pupil achievement, it seems reasonable and logical for some agency or group of agencies to allocate a total of nearly \$100,000 to test the effects of teleconferencing in Rockford Public Schools.

Recommendations

1. The instructional system should be tested to quantitatively evaluate the correlation between pupil achievement and systematic communication among educators, pupils, and

parents via two-way cable television.

2. The research should test the correspondence between (1) pupil achievement and their participation in science and mathematics teleconferencing; (2) pupil achievement and classroom teacher participation in in-service science and mathematics education by teleconferencing and; (3) pupil achievement and parental communication with SIC teachers and other parents by teleconferencing.

3. A study should be made to determine the best conditions for sustaining teleconference sessions among parents from different schools and neighborhoods.

4. The system designed in this study should be developed, used and tested among urban and suburban districts where achievement is a problem.

LIST OF REFERENCES

LIST OF REFERENCES

- Alexander, Lawrence and Steven Yelon. "The Common Experiential Referent Model," Systems Approach. Englewood Cliffs, N. J.: Educational Technology Publications. 1973.
- Allport, F. H. Theories of Perception and the Concept of Structure. New York: John Wiley and Sons. 1955.
- Barker, Horace. The Federal Retreat In School Desegregation. Atlanta: Southern Regional Council Inc. 1969.
- Blumenberg, Eleanor. "The Yellow Peril," Journal of Intergroup Relations." Summer 1973.
- Boulding, Kenneth E. "Political Implications of General Systems Research," General Systems, VI. 1961.
- Bowles, Samuel. "Towards Equality of Educational Opportunity," Harvard Educational Review. Winter 1968.
- Brown et al. v. Board of Education. 347 U. S. 1954.
- Buck, Mildred and Harvey R. Austin. "Factors Related to School Achievement in an Economically Disadvantaged Group," Child Development. December 1971.
- Bullock, Henry. A History of Negro Education In the South Cambridge: Harvard University Press. 1967.
- Cablines. October 1974.
- Campbell, Robert. "Accountability and Stone Soup," Phi Delta Kappan. November 1971.
- Carter, Robert L. "Equal Educational Opportunities for Negroes," With All Deliberate Speed. Ed. by John McCord, University of Illinois Press. 1969.
- Chapanis, A. "Men, Machines and Models," American Psychology. 1961.

- Chisholm, Leslie. Guiding Youth In the Secondary School. New York: American Book Company. 1945.
- Chung, Dr. Ki-Suck. Michigan Department of Education, telephone interview. August 5, 1976.
- Cohen, David K. "Policy for the Public Schools: Compensation and Integration," Harvard Educational Review. Winter 1968.
- Coleman, James S. et al. Equality of Educational Opportunity. Washington, D.C.: Department of Health, Education, and Welfare. 1966.
- Coleman, James S. "Responsibility of Schools in the Provision of Equal Education Opportunity." National Association of Secondary-School Principals. May 1968.
- Corey, Stephen M. "The Nature of Instructional Design," Instructional Design: Readings. M. David Merrill, ed. Englewood Cliffs, N.J.: Prentice-Hall Inc. 1971.
- Corrigan, R. E. and R. A. Kaufman. Why Systems Engineering? Palo Alto, Calif.: Fearon Publishers. 1965.
- "Experimental Applications of Two-Way Cable Communications In Urban Administration and Social Service Delivery." Prepared under Grant No. SSH74-20863-A01, National Science Foundation, Washington, D. C. January 1975.
- Fantini, Mario. Community Control and the Urban School. New York: Praeger Publishers. 1970.
- Federal Role In Education. Washington, D. C.: Congressional Quarterly Service. 2nd Ed. 1967.
- Finn, James. "AV Development and the Concept of Systems," Teaching Tools. Fall 1956.
- Foster, Thomas U. "An Evaluation of a Mediated Introduction to Television Production." Ph.D. dissertation, Michigan State University, East Lansing. 1972.
- Gerlach, Gerald and Donald Ely. Teaching a Systematic Approach. Englewood Cliffs, N.J.: Prentice-Hall Inc. 1971.
- Goldman, Richard. "Cross-cultural Adaptation of a Program to Involve Parents in Their Childrens Learning," Child Welfare. October 1973.

- Green, V. et al. County School Board. 391 U. S. 430. 1967.
- Gustafson, Kent L. "Toward a Definition of Instructional Development." A paper presented to the Instructional Development Division Association for Educational Communications and Technology. Philadelphia. March 1971.
- Hamreus, D. G. "The Systems Approach to Instructional Development," The Contribution of Behavioral Science to Instructional Technology. Monmouth, Oregon: Teaching Research. 1968.
- Hamreus, D. G. Toward A Definition of Instructional Development. Monmouth, Oregon: Oregon State System of Higher Education. 1971.
- Harvard Educational Review, eds. Winter 1968.
- Head, Sydney. Broadcasting In America. Boston: Houghton-Mifflin Company. 1976.
- Heinich, Robert. "Technology and Teacher Productivity," Audiovisual Instruction. January 1971.
- Humphrey, Herbert H. Integration v. Segregation. New York: Cowen Co. 1964.
- Johnson, Arthur. Superintendent of Rockford Public Schools, telephone interview. August 6, 1976.
- Johnson, Claudia and Roger Katz. "Using Parents as Change Agents for Their Children: A Review," Journal of Child Psychology and Psychiatry and Allied Disciplines. June 1973.
- Jull, G. W. and C. A. Billowes. "Human and Technical Factors in Teleconferencing Services." A paper presented at the International Symposium on Subscriber Loops and Services. Ottawa, Canada. May 20-23, 1974.
- Kennedy, John L. "Psychology and System Development," Psychological Principles In System Development, ed. Robert Gagné. New York: Holt, Rinehart and Winston. 1962.
- Koven, Jacqueline and Michael LeBow. "Teaching Parents to Remediate the Academic Problems of Their Children," Journal of Experimental Education. Summer 1973.

- Larimer, George and Ward Sinclair. "Some Effects of Two-Way Television on Social Interaction," AV Communication Review. Spring 1969.
- Larkin, Ralph. "Class, Race, Sex, and Preadolescent Attitudes," California Journal of Educational Research. November 1972.
- Levine, Daniel. "Unequal Opportunities in the Large Inner-City High School," National Association of Secondary School Principals. November 1968.
- Logan, Rayford. Betrayal of the Negro. London: Collier Books. 1967.
- Mager, Robert F. Preparing Instructional Objectives. Palo Alto, Calif.: Fearon Publishers. 1962.
- Miller, Elwood G. "A Descriptive Study, Evaluation and Analysis of Instructional Systems Development, Activities In Selected Departments at Michigan State University During the Period 1960-1963." Ph.D. dissertation, Michigan State University, East Lansing. 1965.
- Poussaint, Alvin. "Building a Strong Self Image In the Black Child," Ebony. August 1974.
- Ramo, Simon. Cure for Chaos. New York: David McKay Company. 1969.
- "Report of the Cable Task Force." Tulsa Public Schools.
- Riles, Wilson. "Equal Educational Opportunities in a Changing Society," California Education. June 1965.
- Rubin, Lilian. Busing and Backlash. Berkely: University of California Press. 1972.
- Rupert, J. and Edward Peeples. "Prince Edward County, Virginia," Phi Delta Kappan. May 1964.
- Ryan, Antoinette T. "Systems Techniques for Programs of Counseling and Counselor Education," Introduction to the Systems Approach. Englewood Cliffs, N.J.: Educational Technology Publications. 1973.
- St. John, Nancy. School Desegregation Outcomes for Children. New York: John Wiley and Sons. 1975.

Schaefer, Earl. "Home Tutoring," Childhood Education.
October 1971.

Schrag, Peter. "End of the Impossible Dream," Saturday Review. September 19, 1970.

Status Report In Respect to Integration of Rockford Public Schools (Appendix 1), Rockford Public Schools. 1975.

Steiner, Robert. "Visions of Cablevision." A report to the Stephen H. Wilder Foundation. December 1972.

Swann et al. v. Charlotte-Mecklenburg Board of Education.
402 U. S. 15. 1970.

Tasby, Eddie Mitchell and Phillip Wayne Tasby by their parents and next friend Sam Tasby et al. v. Dr. Nolan Estes--General Superintendent of the Dallas Independent School District et al. Federal Supplement 342. 1971.

Tasby, Eddie Mitchell et al. v. Nolan Estes et al., Federal Reporter. Second Series. 1975.

Tate, Charles (ed.). Cable Television In the Cities.
Washington: Urban Institute. 1971.

"Teleconference--Canada." College of Environmental and Applied Sciences, Governors State University. 1975.

Thompson, Charles. "Education of the Negro in the United States," School and Society. November 9, 1935.

Thompson, James J. Instructional Communication.
New York: The American Book Company. 1967.

Toward Equal Educational Opportunity, edited by Francesco Cordasco. New York: AMS Press, Inc. 1974.

U. S. District Court, Northern District of Illinois Western Division, No. 70 C16.

U. S. District Court, Northern District of Illinois. No. 70 C16 (coded copy).

Van Uitert, Dean D. "Microwave Expands Campus Borders," Educational and Industrial Television. November 1974.

Welsing, Francis Cress. "Build A World Without Racism," Integrated Education. January-February 1975.

Wetmore, Warren C. "Boeing Network Cuts Apollo Work Costs,"
Aviation Week and Space Technology. February 10, 1969.

Williams, Laura. "Hello Detroit! Televised Teaching In
Action," Innovation. January 18, 1974.

APPENDICES

APPENDIX A

DEFINE Function 1 IDENTIFY PROBLEM ● Assess Needs ● Establish Priorities ● State Problem	Function 2 ANALYZE SETTING ● Audience ● Conditions ● Relevant Resources	Function 3 ORGANIZE MANAGEMENT ● Tasks ● Responsibilities ● Timelines
DEVELOP Function 4 IDENTIFY OBJECTIVES ● Terminal ● Enabling	Function 5 SPECIFY METHODS ● Learning ● Instruction ● Media	Function 6 CONSTRUCT PROTOTYPES ● Instructional Materials ● Evaluation Materials
EVALUATE Function 7 TEST PROTOTYPES ● Conduct Tryouts ● Collect Evaluation Data	Function 8 ANALYZE RESULTS ● Objectives ● Methods ● Evaluation Techniques	Function 9 IMPLEMENT/RECYCLE ● Review ● Decide ● Act

NSMI nine-step ID model.

APPENDIX B

DEFINE

Function 1
IDENTIFY PROBLEM

- Assess Needs
- Establish Priorities
- State Problem

Function 2
ANALYZE SETTING

- Audience
- Conditions
- Relevant Resources

Function 3
ORGANIZE MANAGEMENT

- Tasks
- Responsibilities
- Timelines

DEVELOP

Function 4
DETERMINE GOALS

- Define Goals
- Relevant Goals

Function 5
SPECIFY METHODS

- Media
- Communication Channel
- Strategy

Function 6
PROTOTYPE CONSTRUCTION

- Goals
- Resources
- Strategy

EVALUATE

Function 7
INSTRUCTIONAL SYSTEM
CHARACTERISTICS

- Rogers and Shoemaker

Function 8

- Quantitative Measurement

Modified NSMI model.

APPENDIX C

INTERVIEWS: ROCKFORD PUBLIC SCHOOLS OFFICIALS

- LR: I'm speaking with Superintendent Johnson of the Rockford Public Schools. Superintendent Johnson, on teleconferencing, how do you see this as being supportive to your academic program?
- J: Well, I believe that using teleconferencing we can expand the in-service training for our entire school system. Right now, we're having an opportunity by utilizing the Special Interest Center to in-service train staff members at the fourth grade level. The staff members go to the center, they work with master teachers, and when they go back to their own schools, they have an opportunity to carry on the programs that had been developed while they were at the center. With teleconferencing, we can of course make available to the entire staff the same particular procedures, the same type of demonstrations and of course the entire range of activities that we now do at the center. We also can use teleconferencing to promote I would say a better relationship between all of the pupils in Rockford. The parents will then also have an opportunity to view what we're doing and to become involved at their level.
- LR: You mentioned earlier what seemed to be one of the most interesting examples of the centers and what might even increase with teleconferencing with the fact that as you visited one of the homes you saw some other students besides the family pupil at the table.
- J: Yes, we found that students when they go to one of the two present fourth grade centers establish apparently lasting friendships. They call each other when they go back to their own schools, and they visit each other's homes. There has been a good deal of interest because they know, you see, that they will meet again at the other center, in this case, the language arts center. But I think this sort of relationship the students develop carry over to the parents as well. We're hopeful that through teleconferencing that we will be able to involve PTA group activities so that throughout the city parents will get the feeling that they can be involved in improving education. It's not limited, you know, just to teachers or to staff members.

LR: How do you think parents would receive teleconferencing?

J: Well, I think they'd be delighted. Many of the parents watch the board meetings now being televised and the other educational programs that are shown. It would seem to me that we can have a more open relationship between the staff members, our pupils, and the community in general through the teleconferencing method. Parents will be excited to learn what we're doing in our schools, and the broad ramifications for any program. Although we talk about a science interest type program, one must realize that in conducting such a program you have to touch on the areas of reading and language arts, and certainly the area of social studies is prominent.

LR: I noticed that throughout our visitations here you have made a consistent reference to teachers, parents and the school. Why is that?

J: Well, I don't think that any school system can make progress without a total involvement of those segments. Now I talk about parents and I talk about students and certainly the staff members. But the community that would normally not be involved in schools--those people who do not have children in school now--are becoming more interested in our activities as we publicize these activities. And of course, when we go to the public for financial support or any other form of support, I think by telling them what we're doing year-round they then are better able to judge our performance.

LR: Do you have any predictions on what the relationships might develop between parents as they get together via teleconferencing or this kind of thing?

J: Well, I think that they would find all over the city that they all have common interests. They want the best education for their children, they're concerned about the same problems, civic problems, that the city is dealing with. I believe that the parents will find that they can develop not only in the educational field, but the recreational field--the types of activities that will help us integrate our schools but promote a better understanding throughout the entire city. You know, this can have very positive effect on the total governmental life of our city. And many of the people of the civic agencies as well as the people who

represent our citizens at the government level have been very supportive of our efforts, and I think that you will find that this teleconferencing will be a method of informing all of these various segments and we bring these people together to develop what could be a very exciting pattern of growth and development for the future.

LR: Thank you very much, Superintendent Johnson. Anything else you might like to say to other superintendents that might find themselves in the present situation embarking upon teleconferencing?

J: Well, I think teleconferencing is a way of the future. It's the only method I know that we can reach such a large segment of the people by showing them exactly what we're doing, and also of course giving them an up-to-date report on our activities. It's so much better to go to these people in advance to tell them what our objectives are and then to report to them as we progress along the way. This is what I think is needed today, an honest, open relationship with the people we really serve.

LR: Thank you very much.

LR: I'm speaking with Mr. Parant who is on the Board of Education. Can you tell me why you think that teleconferencing is positive enough for you to give an affirmative vote for the limited experimentation?

P: Well, you know, generally speaking, I think it gives us an opportunity, without it we just don't have, and that would be the additional ability to bring students together, teachers together, parents together, you know, from throughout the school district. We do have a problem in communication as you always do. And I think this gives us a tremendous amount of ability to improve the communications area itself. The additional training that it can provide to the teaching staff itself I think, you know, will be enhanced by the teleconferencing approach. The actual ability of not so much maybe in this initial project, but eventually to better utilize the strengths of your specific teachers and being able to get their expertise throughout the

school district; whereas, now it might be confined to an individual school, or at least a very limited number of schools. I think this will increase accountability tremendously. I just think that it has so much potential in the communication, the curriculum area, the in-service area, the whole educational, you know, process in general, and I just feel that this type of a project will start to expose us to some of those benefits where now we think we see the benefit but we're really gonna realize it and then it'll open up some of the other potential.

LR: Now, because the experiment is new and today we sort of amended the original experiment, but going back to the original experiment, would you have made any predictions on how parents would accept teleconferencing, the concept of teleconferencing?

P: Well, I think like anything new, it'll probably start out slowly, but I think it would have been very good response. I think the fact that we've had cablevision now, you know, some period of time, and they've become familiar with seeing things on TV that they've never seen before--city council meetings, school board meetings themselves, and other activities that have been directly related to the schools. I think this is, and we've already had an area opened up, and I think that once they became aware of some of these additional things that would be available to them that they would just become very very turned on, so to speak, and become, you know, active participants.

LR: Now, for the purpose of those other board members around the country that might later be faced with the same kinds of decisions either to adopt teleconferencing in some form or not, what are some of the things that you yourself may have had to deal with in order to--you know--arrive at the point that you are now on teleconferencing?

P: Well, I probably should also--you know, clarify that my basic background keeps me pretty close to say the utilization of video, computers, and so forth, so that probably gave me a little insight that perhaps other board members might not have, but I think that as we look at--strictly from a board member's standpoint--the original presentation by the staff that presented it to the board, and of course to our administration, I thought they did an excellent job. I think if the portrayal of what it means to kids and just the fact

that we've been such a TV nation, you know, for awhile, that it's easy to relate to, really. I don't think there's any great difficulty relating to it. I think that you know, it's very easily described as to how it will function as it relates to the people themselves, and then the benefits I think are pretty you know, readily recognizable. So I don't see any big problems along that line.

LR: You also mentioned as did the superintendent and rather consistently teachers and students, and parents being involved in the teleconferencing. Why is that?

P: Well, I think, of course, the key to our educational system or any is the total involvement of all these factors. I think what makes education you know, good or bad, is dependent upon all three factors, and I think it's always been a problem to get all three factors as closely allied as you'd like to. And I think this gives you as it takes down some of the barriers of distance people might have to involved with or time and it can bring them together so much easier than in the past that it's gonna give you that ability to give them this more personal relationship and you know, a coordinated relationship that I think is really, really important.

LR: One final question. You must have really felt that the beginning--that's kind of a leading question, I suppose--that cable or teleconferencing does have some capabilities to extend equal educational opportunities to all students.

P: Yeah, I think so. Again, you know, it gives you the opportunity to bring people together, even though it might be through a technological medium like this, but it gives them the opportunity to see one another, to speak to one another, and even work with one another, through joint projects. And I think this is important, and I would think this would be important no matter what other situation you might be in, even if you had everybody evenly distributed throughout the community. The fact that no matter what the color the person might be, the fact that they're meeting other people and becoming familiar with other people, I think this is really important, and to me this is a real big benefit, real big key area.

LR: Mr. Parant, thank you very much.

P: Oh! Thank you.

APPENDIX D

TECHNICAL OVERVIEW

The technical capabilities for two-way television between schools in Rockford is made possible by the mobile Remote Audio/Video Unit. The Unit is located in each classroom which is participating in the communication system. The number of source classrooms in Rockford is never more than three. The Unit allows each group to produce its own voice and video and at the same time receive voice and pictures from the remaining two classrooms.

Briefly, each school is equipped with a mobile TV studio unit to both send and receive television signals. The Unit has a camera, one monitor for the camera person, and the essential number of TV sets to receive signals from the other communication points.

The television signals from each school travel "upstream" to the cable television's "headend." The headend is the hardware technological center which receives all incoming signals to the cable system and distributes them out to individual reception points.

Remote Audio/Video Production Unit for Use on
Rockford Cablevision Two-Way CATV System

General. The remote audio/video production unit was designed by Rockford CableVision to utilize its two-way

return system for production purposes. The unit currently in use was designed for single camera applications, however, with several modifications multiple cameras could be employed. The unit discussed has been in operation for several months now and has proven to be of high quality, reliable, and has eased the set-up and tear-down time required for normal productions (see Figure 3).

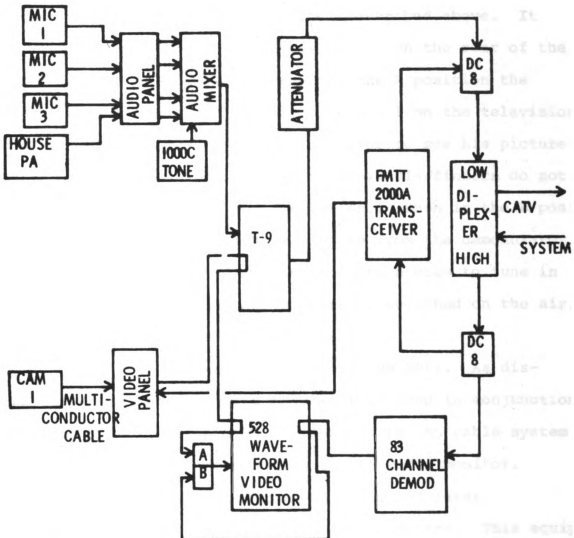
Equipment Specifications. The following is equipment normally included in the remote unit:

(1) Emcore I, 36" rack frame with doors, side panels and 4" casters. This is a basic unit which houses the remote package. The unit includes front and rear doors to protect equipment during transit. These doors pop off for access to equipment while in production. The 4" casters were added to enable the unit to roll easily and to support the weight of the equipment inside. The basic unit is 36" high, 22" wide, and 24" deep.

(2) RPD 90 Power Distribution Panel. Single, fused power panel to supply electricity to all equipment in the unit. This allows for only one power cord to leave the remote unit.

(3) Tektronix 528 Television Waveform Monitor. This is a 5½" vertical, one-half rack width waveform monitor, with a 5" CRT. The 528 is used to monitor the video from a television camera connected to the remote unit. This allows

REMOTE AUDIO/VIDEO PRODUCTION UNIT



D.A.D. -11/74

Figure 3. Remote audio/video production unit.

the camera operator, or audio mixer to keep a constant watch on the video output of the camera.

(4) Unimedia Color 9" Video Monitor. The video monitor mounts next to the waveform monitor described above. It serves two purposes in the remote unit. On the rear of the video monitor an A/B switch, when in the A position the video monitor shows the picture directly from the television camera. This allows the camera operator to see his picture as he is setting up the camera. (Camera viewfinders do not always give an accurate representation.) When in the B position the video monitor shows a picture from the demodulator (see below) allowing the remote production crew to tune in a channel and see when their picture is switched on the air, and the quality of the picture on-air.

(5) Sony 83 Channel Demodulator (TUM-200). As discussed above, the channel demodulator is used in conjunction with the video monitor. When connected to the cable system it will send any of the channels to the video monitor. Audio from the demodulator will be discussed later.

(6) Telemet T-9 Return Channel Transmitter. This equipment takes the video and audio signals fed to it from the production equipment and transmits them via the T-9 return channel to a receiver located in the home studio. Before reaching the return system the signal leaving the T-9 transmitter passes through a variable attenuator. The attenuator

allows the camera operator working in conjunction with an engineer at the studio to set the proper carrier output of the T-9 without having to adjust the transmitter itself. The T-9 has a front panel mounted meter in order to set proper video and audio deviation.

(7) Sony M-67-FC Microphone Mixer. A small, four input audio mixer accepts microphone or line audio. Inputs can be from microphones, audio tape systems or house PA systems. The camera operator can set levels for simple productions, or an audio mixer can be used for multiple sources. The M-67 comes with a 1000 cycle tone which can be switched onto the system in order to set proper levels back at the home studio.

(8) Catel FMTT-2000A FM Transceiver. This equipment, when used in conjunction with an additional transceiver at the home studio, allows the camera operator to have voice communication with the director at the home studio, using uncommitted FM channels on the forward and return system.

(9) Custom Audio/Video Monitoring and Connector Panels. The audio monitoring panel on the remote unit allows the camera operators, or microphone mixer to hear either line audio as it leaves the remote unit, or audio from any channel tuned in on the channel demodulator. The operator has a choice of listening on a speaker or through earphones, with volume controls for each.

The video patch panel has a connector for the camera and a connector for hook-up to the forward and return system.

(10) Shigaden FP-1500 Color Camera. Cameras should be reliable and rather simple to operate. The Shigaden is among a class of less costly color cameras that are being used extensively in cable television studio and remote settings. The small size and ease of operation supported choice of this camera. Each camera will be fitted with automatic iris zoom lenses and mounted on rolling tripods. Communication to cameramen and support personnel will be accomplished through common intercom headsets.

Production Notes. The integrated portable production package greatly simplifies remote production. Only four cables leave the remote unit for hook-up to camera, power, system feed and microphone. By reducing the number of cables and connections that have to be made, technical difficulties are greatly reduced.

Quantity of Remote Color Television Units. Three units will be required to provide teleconference capability for three locations. They will also be used for joint studio and remote applications.

APPENDIX E

COMMUNICATION CHANNEL TEST

Thomas:

Thank you and good afternoon. For those of you of our Cablevision subscribers who at this moment are tuning into Channel 6, our public access channel, bear with us as we allow you to look somewhat inside of what makes some of cablevision tick. If you will, stay with us as we're doing an experiment. Those of you who are watching my voice and picture on Channel 6, our public access channel, I'm Jim Thomas, Manager of Rockford Cablevision. For those of you who may also want to switch over to Channel 2, our government access channel, you are seeing a live picture from Walker School, being fed back on Rockford Cablevision's two-way return system. We are going to be conducting an experiment and so we will allow those of you of our some 18,000 subscribers to be privy to this rather internal experiment. For those of you who are watching on Channel 6 at the moment, I would like you to meet some of the people here in our Cablevision conference room at 303 North Main in the Gas and Electric Building. Starting on my extreme left, from (over one more, please Wes) Michigan State University, Dr. Thomas Baldwin (Michigan State University project team), visiting Rockford today. Seated next to him, Mr. Larry Redd, from

Michigan State University, one of the research analysts who is a part of the MSU project team. Skipping past me, to our guest of honor from Washington, D. C., Mrs. Dorothy Darringer, from the National Science Foundation, who is visiting here, and in fact visited with many of our school officials yesterday, last night, and again today, and looking into National Science Foundation experiments. On the right of Mrs. Darringer, is seated Dr. Brad Greenberg, from Michigan State University, who is a part of the project team and exploration of social science application of Rockford Cablevision. And on his right, Martin Block, who is the field project manager for Michigan State University and the consortium arrangement between and among Michigan State University, the City of Rockford, Rockford Cablevision, and on Martin Block's extreme right is (the camera will pan down), our electronics systems manager, Jim Wright. And I know that Wes Brown is shooting into some lights, so he's having to adjust the F-stop . . . James Wright, our electronics systems manager. All right, with the social amenities out of the way, and back now . . . Dean Deyo, our program manager in our control room, has allowed us to see, coming in on Channel 2, Walter School. May we now, Dean, switch to Walker School and establish communication with-- I'm hoping Don Swanson. (Swanson was not at Walker School, but enroute to Rockford Cablevision. He shortly joined the conference there.)

Mr. Swanson, if you're at Walker School, will you make your presence known to us (background noise). All right.

. . . I'm assuming that we are merely at this point looking in, if you will, at some activity occurring at Walker School and so until we make the decision to not disturb the group activity, perhaps we will just continue to look. Now I know that many of the students there are able to see on their monitors those of us here in the conference room. Wes, if you would zoom out just a little on your camera, perhaps . . . is that the extent of your zoom? Can you show a wider shot here? We will assume that . . . can you Walker students hear us? . . . down at Rockford Cablevision. If so, would you wave your hands, please? Oh, you do hear us! Look at that! How nice! Welcome! to all of you Walker School students. Do you have a nice picture that you can see us up here waving at you and if all of us would wave and pan the camera Wes. You can see us! How nice! It's good to see you. We're watching you from clear downtown in the Gas and Electric Building, down on North Main Street, and of course we're sitting here watching you doing some sort of very nice activity in your science center. Would one of you be able to come to the microphone and tell us here what project you're involved in and what you're making, please?

. . . Anyone that might come up to the microphone . . . and give us some idea of what you're doing.

SIC Teacher: Okay Raymond come over (background talking).

Thomas: All right. Hello there. Can you say hello to us? . . . What is your name?

Student: Raymond Brecklin.

Thomas: Would you tell me your name again?

Student: Raymond Brecklin.

Thomas: Brecklin. All right. How old are you?

Raymond: Nine.

Thomas: In what grade?

Raymond: Fourth.

Thomas: Who's your teacher?

Raymond: Mrs. Hall.

Thomas: Mrs. Hall. Is she in the room today with you?

Raymond: Not this room.

Thomas: All right.

Raymond: Over in I think 105-4.

Thomas: Uh-huh. What are you all doing up there now? What is it you're involved in? What are you doing?

Student: See how many seconds it takes for a bottle of water to leak out with a little thing that plugs it . . . hold it . . . usually takes sometimes . . . the first one takes about five-six seconds, the second one around nine seconds, and I don't know about the others, we haven't got into those yet.

Thomas: Are you going to write down on paper how long it takes after you do each of the tests?

Student: I don't know.
Mrs. Danridge would like to ask you . . . uh, Darringer . . . a question.

Darringer: Why do some of the bottles take longer than others for all the water to leak out?

Student: Sigh

Darringer: Have you figured that out yet?

Student: Well, some people count slower than others.
(laughter).

Darringer: That's a wonderful answer! Are you doing that experiment now? I don't see anyone with bottles of water there. You seem to have something on the floor. . . . Do you have bottles of water . . . oh yes, you do! Could you show us? Could we see what happens? Fill it up for us, and explain it as you do it. Could you do that? Why don't you . . . can you talk to us? Yes, can you talk to us and tell us what you're doing as you do it, is that possible?

SIC Teacher: John . . . how about you and your partner?
Yah, Mr. Mort will get someone to help you to do that.

John . . . let your partner . . . fill it.

John, you go over to the mike now.

Fine, we'll work down here, . . . could we have the rest of you be reasonably . . . hey, kids . . . could the rest of you be reasonably quiet, . . . these two boys work together, John's going to explain what we are doing. OK? Go ahead, John.

John: Well, as we fill it up we you fill it up and fill it up and ya hold the hole . . .

Darringer: Oh, so it doesn't leak out right away. uh-huh. (water running)
I see, now it's full of water, is that right? You've got the jar full of water.

John: Yeah, it's full of water now, and now someone watches the clock while it runs out so tell me when to go.

Darringer: OK

John: Go.

Darringer: Here it goes. I can see it.

John: Stop.

Student: 8.

John: It took 8 seconds for the second biggest hole to run out.

- Darringer: Oh, so it's the size of the hole that makes the difference in how fast the water runs out.
- John: Um-hum.
- Darringer: I see.
- SIC Teacher: Are there any . . . we were talking earlier about some reasons that we might have different answers between all the kids in the group? . . . What are some of the reasons we talked about for difference in answers?
- Student: Well, when you look at the clock slanted, you get a different picture and it takes like longer to see the seconds, when you look at it straight, you can see the seconds better than when you look at it slanted. I think.
- SIC Teacher: Or more accurate, maybe?
- Student: Yeah.
- SIC Teacher: More accurate. Some other reasons we talked about . . . What are some other reasons we talked about, Tim?
- Student: Well, some of them squeezed the bottle and so when . . . Oh, I see . . . so they just run down faster.
- Darringer: So you have to be careful how you hold the bottle when you're measuring, too.
- Tim: Um-hum. And they want us to hold it straight.

SIC Teacher: And were there some other reasons we talked about that might give us our differences in our answers? Yes, . . . Kelly?

Kelly: Some holes are big and some are small.

SIC Teacher: Yes, Don?

Darringer: We can't hear what Kelly said.

SIC Teacher: Oh, Kelly . . . you'll . . . you wanta step up here, please? Good!

Kelly: I said the hole some holes are big and some holes are small.

SIC Teacher: So this is going to give us a different time to empty the bottle, or time it takes to empty the bottle. All right. Different sized holes and . . . would you like to hear some more response or . . .

Darringer: Yes!

SIC Teacher: All right . . . Stephanie, you wanta step over here. . . .

Stephanie: Well, . . . one hole's bigger and then there's another one that's . . . they go like sort of like order, you know, like some holes are really tiny, then some are bigger, then there's bigger, and then there's one sort of like big hole, that's the first one we put into the bottle and now we're on to the second to the biggest.

Darringer: So we came in right in the middle of your experiment, is that what happened?

Stephanie: Um-hum.

SIC Teacher: All right, who else would like to respond?
. . . yes, . . .

Student: Well, we got the big holes like . . . we got
. . . a hole like this, and holes like that
. . . and real little ones, and a little bit bigger one, and there's one on under the bottle . . . and so like, we look at the clock, and there's certain thing in it and it gets a certain time when we look at the clock and we count as the thing empties.

SIC Teacher: . . . Now, I think most of us have tried . . .
I think we've all tried at least two of the stoppers that have different size openings. Some of you have tried three and maybe four. At this time, can we draw any conclusions? What have we found out so far? What are some of the things that you found out? Stephanie, what have you found out?

Stephanie: Well, um, that the water runs out at different speeds. Like, um, sometimes it takes . . . like me and Maria we both tried it and it ran out at 10 seconds and before it ran out in 5.

It goes down in different, you know, runs out, you know, sometimes it runs out slow, then it runs out fast.

SIC Teacher: I mean, are you saying that the bigger of the opening the slower it runs out or, you know, what?

Stephanie: Well, not really, you see. The bigger the opening sometimes it goes faster, and the smaller the opening sort of like slows down sometimes.

SIC Teacher: What do you mean by sometimes?

Stephanie: You know, like when me and Maria tried it, the second one, well, it sort of like slowed down.

SIC Teacher: All right, let's get some other responses. . .

Greenberg: I wonder if I could ask a couple of questions.

SIC Teacher: Yes, go ahead.

Greenberg: I wonder if the bucket that the water goes into makes any difference. If I used a bigger bucket to catch the water, would the water run out faster?

SIC Teacher: Don, would you like to respond to that? Here. You respond to his question?

Don: When . . . part . . . it isn't . . . you take the . . . the cup up to put the water in the

bottle and when you hold it at the bottom, it don't come out.

Greenberg: Could you show me that?

Don: . . . Kelly, she holds the bottom . . . and the person, she holds it down in the water and dumps the water in there . . .

SIC Teacher: Go ahead and bring that thru once more.

Don: When Kelly holds the bottle it don't come out and the other person they put the water in.

Greenberg: Why doesn't it come out?

Don: Because she's holding the bottom of it.

Greenberg: OK. What if I got all the water out and brought in some oil, and I filled those with oil instead of water . . . would that make any difference in how fast the liquid gets out of the bottle?

Robert, would you like to respond to this?

(Robert refused) . . . Did you hear the question? . . . talk to him, he can hear you.

Girl Student: Hi.

Greenberg: Hi.

Girl Student: When you put the . . . oil's a lot thicker than water then when you put the water in the oil will come out slower because it's a lot thicker and it'll go down slower than the water and the water will go faster . . .

Greenberg: I think that's a very good answer. Thank you for telling me that.

Girl Student: Um-kay.

Greenberg: I'd like to ask one more question.
If I took one of those bottles and it didn't have a hole in it, and somebody made a hole in the bottom with a needle, I wonder how fast or how slow it would take for the water to get out.

SIC Teacher: Do you understand the question?

Students: Yah.
I don't.

SIC Teacher: Let's see. There's someone else--someone who hasn't had a chance to respond . . . Have you had a chance to respond? Would you like to respond to his question? OK. Hold the mike.

Greenberg: Hi.

Student: It'd probably take an hour.

Greenberg: Probably take an hour.

Student: Yeah.

Greenberg: OK, thanks alot. Gee, I've learned alot.
Hang on, I think somebody else wants to talk to you.

Baldwin: Have any of you kinds ever been on television before?

Student: Yeah.

Baldwin: Where were you on television?

Student: At a different school.

Baldwin: One of the schools? Your own school?

Student: No.

Baldwin: But at one of the schools right here in Rockford?

Student: No, in Lovespark. (a competitive cable system)

Baldwin: Oh. At Lovespark Cable System. What did you do on television there?

Student: Well, they just seen how good we was doin' at work.

Baldwin: Would you say that a little louder?

Student: They was watching us work.

Baldwin: Oh, the camera was watching you work?

Student: Yeah.

Baldwin: What kind of work were you doing then?

Student: Reading.

Baldwin: How do you like the science center here?

Student: Good.

Baldwin: It's not your school, Walker School, is it?

Student: No.

Baldwin: Where do you come from?

Student: Misswaukee.

Baldwin: Misswaukee, in Rockford. How did you get to Walker School?

Student: By bus.

Baldwin: Did your whole class come on the bus?

Student: Yeah.

Baldwin: Is your teacher with you?

Student: Yeah.

Baldwin: Is she in the room there now?

Student: No.

Baldwin: Oh, she's in another room . . . Ok, thank you.

Student: Bye.

Redd: Hi, my name is Larry. Could I get a volunteer to speak with me? . . . How 'bout the young lady there with her hand up right in front of the teacher?

SIC Teacher: Stephanie or Maria?

Redd: The one with her hand up. Hi, Steph.

Stephanie: Hi.

Redd: My name is Larry. I'm not very good in science . . . can you tell me why that experiment is interesting to you?

Stephanie: Well, uh, this is the first time I've tried and I think it's sort of like fun because you can watch the different ways the water runs out on the different size of holes.

Redd: Is that something that you would like to do when you go home and show it to some of your brothers and sisters?

Stephanie: Yeah, I'd like to show it to my sister because she isn't in school, she's only four years old and down at Cochoran they have to be five years old in order to start kindergarten.

Redd: Hey, that sounds great. Have you met any friends there?

Stephanie: Yeah, I've met Maria, Barbara, I've met all the people in my classroom and a few people in the different rooms.

Redd: OK. Hey, it's nice talking with you, Steph.

Stephanie: OK, bye.

Swanson: Boys and girls, I'm glad to see you again at a different viewpoint now. And I think you've all done a very, very nice job. Just keep up the good work and I hope I'll see you again in another couple of days. I know you're gonna have a nice weekend but I do want you to have a real good time in doing some of the other things that you've got. So, I'm just gonna let you get back to some of these other people to talk to them, but you just keep going and we just really appreciate your helping us this afternoon, OK? Very good.

Students: OK. Bye.

Darringer: I'd just like to say one thing. I'm a visitor from Washington, and I asked before the session if we could make a videotape of the session so that I could take it back with me and show my colleagues in Washington and as I was sitting here I thought that perhaps your parents would like to see the session, perhaps your brothers and sisters would like to see it, and I asked, and Mr. Thomas says that this, our whole session right here, is going to be re-broadcast tonight on Channel 10 at 6 o'clock. This is the first time I've been on television, I'm not as experienced as you are, but if I'm in Rockford at 6 o'clock I'm going to watch Channel 10 and get to see me and the rest of you in our little conversation. So, write it down on a piece of paper or make a note to yourself and be sure to go home and watch yourself tonight at 6. You'll get to see our whole conversation again. Are there questions, is that what the hands are for?

SIC Teacher: Don, do you have a question?

Don: Yeah. . . . show us on TV?

SIC Teacher: Howcum they are going to see themselves on TV is Don's question.

Darringer: Well, we have, it's a way to record what we're actually broadcasting at the same time. It's a videotape machine, and just as you can make a record of what you say if you use a tape recorder and speak into it, we can make a record of what you're seeing and hearing. We have a special little machine that will do that and then re-broadcast it, just as they do the news as CBS or NBC or ABC does the news and re-broadcasts various kinds of movies and special interest presentations that you see on television. Oh, why is it worth it? We have someone else . . . Mr. Redd would like to make a response to that . . .

SIC Teacher: . . . We're gonna have to get ready for the buses soon. We're late for the bus.

Redd: I think the reason that this is important, uh, as you study science, how many of you out there recall the experiment with Benjamin Franklin and the flying of the kite? . . . Benjamin Franklin discovering electricity. How many of you remember that? Well, what you're taking part in here this afternoon is sort of like Benjamin Franklin with the flying of the kite, and as a result of discovering of

electricity, what you have is electric lights and all those other wonderful things, right? So this experiment that you're taking part in this afternoon might result in something very, very big in the future, and in the future perhaps you will be able to talk with other students in other schools so it's gonna grow and become much bigger than what it is this afternoon, but you should always remember this as being something very important that you participated in, right from the very beginning, so you'll want to see this tonight on TV also, and tell your parents about it. (background noise)

Thomas: So for those of you our cablevision subscribers who have been watching a part of what we think might be an historical event, we want to thank you for bearing with us on Channel 6 and those of you on Channel 2 to all you students in Walker School, thank you very, very much for allowing us to look over your shoulders. Thank you.

(applause) we're clapping for you too. Bye-bye. (byes)

Thank you to Rockford Cablevision subscribers. Sit tight.

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