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ABSTRACT

The use of telecommunications was studied as a means of making higher education more accessible to urban disadvantaged adults by using a statewide, closed-circuit, instructional telecommunications network. A comprehensive review was made of telecommunications in higher education, the learning needs and styles of urban disadvantaged adults, and the alternative modes of telecommunications and their applications. It was recommended that the Commonwealth of Massachusetts should not establish a state-wide closed-circuit instructional television system, but should consider the use of broadcast facilities to broaden access; videotape or instructional television, fixed service (ITS) systems, and neighborhood learning centers would help make education accessible to disadvantaged adults. Appendixes include the research reports, consultant reports, a design for a neighborhood learning center, brochures, and a bibliography of over 100 items. Figures include maps of the areas and statistical data. (Author/DS)

OPENING HIGHER EDUCATION WITH TELECOMMUNICATIONS

Project 73-025-011

A REPORT

Submitted to

The Board of Higher Education

Commonwealth of Massachusetts

November 30, 1974

University of Massachusetts

At Amherst

Principal Investigator

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Project Director

Robert S. Donnelly

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Telecommunications Report

Introduction

At the outset it must be noted that the ideas in the body of this report are in large measure those of the Community Advisory Council which aided the project staff in the study. The details of the composition and operation of that Council are given later in this report; suffice it to say that this is their report, The learning system proposed is as they conceived it. It is the hope of the staff that the Council's ideas are adequately expressed.

Summary - This report was funded in 1973 by a grant from the Massachusetts Board of Higher Education. The initial intention was to study and report on the feasibility of a statewide, closed-circuit, instructional television network. The study was performed by surveying the state-of-the-art of telecommunications as it is applied to higher education and evaluating the potential for applying that technology in Massachusetts. A target population was chosen and basic system parameters evolved based on their location, educational needs and potential media applications. The critical factors about the target population which influenced the design of the instructional system and the application of telecommunications were determined. The critical factors for other populations were considered as well, and the suitable communications systems reviewed. Those considerations led to the following recommendations --

1. No general state-wide, closed-circuit, instructional television should be established. (Other alternatives seem to offer more flexible, more economic ways to meet current needs.)

2. If broad access to higher education is sought, the existing broadcast television system should be used.

3. If access to technical educational programs is sought, a system of videotape distribution should be established or one or more ITFS (Instructional Television, Fixed Service) systems should be established in areas where industry is heavily concentrated. Such systems should be established only where sufficient industrial support exists to provide financial viability.

4. To aid less advantaged adults in improving their life situations through education, a system of technologically-based, indigenously staffed, Neighborhood Learning Centers (similar to current Adult Basic Education centers) should be established, including vocational training on a community basis, supported by the closest public institution of post-secondary education.

Background - This report was funded under Title I of the Higher Education Act of 1965 by the Board of Higher Education of the Commonwealth of Massachusetts. The grant was made under the 1973 amendment of Program IMPACT, the State Plan for Community Service and Continuing Education. That Plan enables the state to consider strategies for dealing with many community programs which defy short-range solutions. The Plan states (pg. 3) that its community service focus in education requires that the education of people be oriented toward the neighborhood as the primary beneficiary. It further states (pg. 4) that during the years 1973-76, "Massachusetts will direct its efforts toward making an IMPACT on community problems related to access." The Plan points out (pg. 5) that "...the complexity of modern technology...becomes a crucial obstacle standing in the way of public participation in the solution of community problems." And finally, the Plan states (also pg. 5) that its highest priority will be directed toward "the neglected" including those

"...disadvantaged by race, language or cultural barriers, the poor and the disenfranchised..."

It is within the context of that State Plan for Community Service and Continuing Education that this study was initiated and carried out. As will be apparent the purpose of this report has been to determine how the technology of telecommunications could best be harnessed to provide greater access to higher education for the urban disadvantaged.

In accordance with the procedures of Program IMPACT, a proposal for support in FY 1973 was submitted by the University of Massachusetts to the Board of Higher Education in February, 1973. The proposal (pg. 1) recognized a need in the Commonwealth for "low cost public education which can respond to the varied needs of a student body which is becoming increasingly diverse in age, occupation, socio-economic background and racial and ethnic origins." It's stated objective (pg. 1) was to "...perform a feasibility study for a state-wide closed-circuit, instructional television network which would interface with public cable television and link the campuses of the University of Massachusetts with those of the State and Community colleges." The intent of the study was presented (pg. 1) as an attempt "to determine the: a) management; b) hardware; c) programming; and d) financial requirements of a system which when linked with cable T.V. can reach the optimum number of citizens in the Commonwealth and service the broadest range of educational needs."

The proposal was accepted by the Board of Higher Education and funded in the amount of $48,000 in federal funds with $24,000 in matching funds provided by the University. The period of performance of the grant was from August 1, 1973 to November 30, 1974.

In 1972, '73 and '74, a bill (House bill #2903 in 1974) was presented in the Massachusetts legislature by Speaker Bartley, to authorize the development of a multi-channeled, closed-circuit instructional television network for Massachusetts. That bill has not been enacted by the legislature to date. One of the factors felt to be delaying passage of that authorizing legislation was the absence of an in-depth study which could clarify the issues related to the development of such a network. The study proposed by the University and funded under this grant was intended to "be helpful in developing the information necessary for the legislature to take the appropriate action on this bill" (Proposal, pg. 9) Recommendation 1, above, is that the bill not be enacted.)

<u>The Problem</u> - This report will set forth the results of the investigation undertaken in the context of that background. The approach used in that investigation was to step back from the engineering study initially envisaged and evaluate the question--How can the use of telecommunications be developed best to aid the institutions of public higher education of the Commonwealth of Massachusetts in serving non-traditional students? In a sense, the assumption in the proposal that a closed-circuit television network was appropriate was questioned and it was decided to focus instead on the <u>best</u> use of telecommunications in serving non-traditional students.

In seeking to answer the major question, it was necessary to seek answers to a group of subsidiary questions, such as:

What are the current needs of non-traditional students for higher education?

What uses are currently being made of telecommunications and/or the media forms susceptible to transmission by telecommunications?

What trends exist in development which might have impact on a future telecommunications system? (Such trends must be considered as those in:

students, (3) media forms, (4) telecommunications technology, (5) programming for telecommunications, and (6) composite packages of learning materials.)

What can be done through telecommunications to enhance the ability of public institutions of higher education to serve non-traditional students, now and in the future?

An attempt to assess the potential of telecommunications in aiding public higher education could have been attacked in a number of ways. A survey could have been made of the institutions of public higher education in the Commonwealth to determine how to connect them together (the original approach). An ideal communications system could have been designed and ways to use it generated which might have justified its installation. The educational needs of people prepared for post-secondary education in the state could have been considered and ways of meeting those needs through telecommunications found. The decision was made, however, to focus on a population having some coherence and evaluate its needs and the potential services through which to meet those needs. From a communications standpoint this approach was most desirable. It meant, essentially, that it would be necessary to determine to whom information would flow, what the information would be which flowed, and the source or sources from which it would originate--what information, from whom, to whom.

While the source of the funds for this grant (Program IMPACT) predisposed the investigators toward involving the "neglected",(the disadvantaged), it was important to decide whether the group was functional as a target population, from a communications viewpoint. For purposes of communication, the simplest arrangement would be to have two single locations between which communications could take place. There are disadvantaged people and undereducated people in every area of the state. People in rural areas are as economically disadvantaged as those in the cities, but they are more dispersed. Trying to reach all the disadvantaged in the state, since they are found throughout the state, requires immediately, a broadcast communications system. While broadcast is a possibility, it might not be the best alternative. The choice was made to locate the disadvantaged by using census data and see if concentrations existed which might lend themselves to some other communications system design.

To forestall the possibility of designing an overly specific system, a decision was made to review the needs of other populations, once one group's needs were met, to briefly assess the applicability of the suggested design. The needs of the rural poor, "second chance" students, the institutionalized, business-based students and traditional students were all also to be reviewed.

In addition to defining and locating the target population, it was necessary to determine what information in what form was to be supplied to them. The assumption could have been to provide the kind of information normal to institutions of higher education in the usual form--lectures of college courses. It seemed more reasonable, however, not to impose arbitrary limitations which might result in designing a system to provide a product for which there was no market. The decision was made to ascertain what informational needs the target population had and then try to find ways to supply what was needed.

The same sort of analytical process was used in considering the form of presentation. There are a number of ways of presenting information, educational or otherwise. The idea of the "talking head" (the transmission of a picture of a lecturer) which is used for most educational programs (with the obvious exception of Sesame Street and The Electric Company) was rejected as inappropriate for our clientele. It was decided to investigate what forms of presentation would be suitable, and then to try to design a communications system which could carry the format needed.

Finally, while the staff had an institutional base (public higher education) with which it was obviously concerned, no prejudgment could be made as to whether all or any of the institutions involved in public higher education could provide what is needed. Until the learning needs and required format were defined, it was necessary to reserve judgment on which institutions should be "on" the system.

In essence then, the tasks as the staff defined them were to establish the location of the target population and, using their educational needs and learning styles, to determine the most suitable instructional system, specifically including the communications media to be used. Finally, to assess which existing institutions if any, could establish the necessary system, and to use all that information as the design parameters of a telecommunications system.

Definitions - Before proceeding with the discussion of how the problem studied, it seems desirable to ensure common understanding of the most significant terms used. The intent here, and throughout the report, is to ensure its serviceability for the informed lay reader. If that intent is expressed in ways which appear patronizing, that most assuredly was not our desire. Throughout the report the technology of telecommunications, the needs and learning styles of the disadvantaged and the potential for applications of education media will be discussed. The meaning attached to each of those terms -- telecommunications, disadvantaged and media -- are as follows:

Telecommunications is the technology of electronic transmission of information from one place or person to some other or others on an instantaneous basis. It includes such systems as television (both broadcast and closed-circuit), Community Antenna Television, coaxial cable, telephone, teletype, facsimile, satellites, etc. Its essential features are that it is electronic and instantaneous. A detailed description and definition, along with some specific illustrations, are provided in Appendix C4 to this report.

Disadvantaged refers to people having a family income of less than two times the federal poverty level and having less than four years of college. While those criteria may at first seem extremely liberal, this report relates to higher education, so considering people having only an 8th grade education would be restrictive well below the actual group of concern to the Board of Higher Education. At the same time, considering those people having graduated from high school but not from college would narrow the range of concern to the extent that "disadvantaged" would become very limited indeed. The economic criteria--two times federal poverty level - also prevents excessively narrow limits which might exclude many people with high school diplomas who have a valid claim on the services of higher education. Education and economi status tend to correlate well with one another in current society and the combination chosen was felt to be most suitable to the nature of the study. If an error were made, it was preferable that it be on the side of being inclusive rather than exclusive. More thorough explanations of this term and the people to whom it applies can be found in Appendix C-1.

Media is the means by which educational material (information) is presented to a learner. It includes instructors, motion pictures, television, books, etc. Educators frequently limit the term to mean television, films, filmstrips and other audio-visual materials, but the broader meaning will be used in this report. The term "media" is also used in communications, where it has the same meaning it has in education. Appendix C-3 to this report deals with educational media and their applications.

Other, less pervasive terms occasionally will need definition. They will be defined as they occur.

The balance of this report will reflect, then, the way in which the study was carried out and what was found. The findings commence with a description of the situation in higher education in 1974, generally, and in Massachusetts, and provide brief summaries of the research done by the project staff. The instructional system which evolved from the research is then described in some detail including the citation of existing models of the suggested components, problems foreseen, and the potential participation of existing institutions. The potential for the application of telecommunications to the suggested system is assessed. Finally, the pertinent system and population characteristics are noted, the "other" populations are analysed and conclusions are drawn about potentially suitable systems for them.

The report concludes with suggestions as to the next steps which might be taken to move toward the establishment of the suggested system.

Method of Investigation

Community Advisory Council - As early as possible in the project, a Community Advisory Council was formed. That Council included the following people --

Permanent members:

Ayala, Julio	Springfield
Ayala, Maria Luisa	Springfield
Brewster, Ana	Worcester
Dearman, William	Springfield
Donawa, Edward	Springfield
Donawa, Gloria	Springfield
Egan, Iris	Worcester
Rivera, Elena Ayala	Springfield
Silva, Agapito	Springfield
Silva, Maria	Springfield
White, Naomi	Springfield

Other members (those attending only one or two meetings):

Bithorn, Maria	Springfield
Cameron, Daniel	Springfield
Hawley, Eleanor	Worcester
Lavoie, Lois	Holyoke
Moore, James	Amherst
Olivera, Hector	Springfield
Planadeball, Eladia	Springfield
Planadeball, Ernestine	Springfield
Rivera, Julio	Springfield
Rodriguez, Cristobal	Springfield
Vazquez, Gladys	Springfield

In general, the Council was multi-ethnic including white and black members and members of Spanish speaking heritage. The project staff sought as broad a geographical spread as possible; however, the travel required limited the potential geographic representation. No one from the Boston area contacted by the staff was able to participate. The members were people who were, or had been disadvantaged themselves or, in a few cases, were in direct, continuing contact with disadvantaged people through their employment. Most of the Council members were students in the University Without Walls of the University of Massachusetts, although some were students at other schools, including Springfield Technical Community College and American International College. All of the members served without compensation because they were concerned about education and were willing to do what they could to aid the Commonwealth.

The members of the Community Advisory Council were primarily located through the cooperation and suggestions of Mr. Edward Harris, Director of the University Without Walls at University of Massachusetts, Amherst. The Council met in the evening at the University in Amherst and in Springfield. A total of four meetings were held, one each in April, May, June and October, 1974.

Over the course of the meetings, the Council reviewed and assessed the original research design for the project, providing guidance as to approaches to use and suggesting alternative, more suitable organizational patterns. The learning center design was essentially theirs, as were the ideas behind the learning materials and the promotional brochure. They provided a "real world" context for the project which, hopefully, has given the design a validity not otherwise attainable. In addition to providing direction and ideas, the Council members involved others whom they felt could make a valuable contribution to the project. (Those members not involved throughout the project are recorded as "Casual Members" in the list above.) The Council also provided suggestions as to still others who should be contacted. Finally, the Council reviewed a draft of this report and made numerous comments and suggestions for its improvement which have been incorporated.

Project Staff - The research staff on the project included five persons in addition to the Project Director, an Administrative Assistant, Margaret Levin, who is an editor and research assistant, and four graduate students at the University of Massachusetts. The graduate students each had backgrounds directly pertinent to an area of concern to the project. One, William Gibson, was a media specialist and worked heavily with the Community Advisory Council and Local Resource Group. Another, William Tripp, was a demographer-sociologist. The others were a communications engineer and an urban education specialist--Lawrence Durfee and Jeannette Feely, respectively. The Project Director had a background in communications, education and research management.

Literature Review - A literature review was made of such diverse areas as learning, telecommunications, informational needs of the disadvantaged, Aptitude-Treatment Interaction Research, adult learning, educational media, and learning styles. The University of Massachusetts, Amherst, library was of great value as were the other libraries in the Five College area. A number of university faculty opened their private libraries to the staff. Two searches of ERIC (Educational Resources Information Center) were performed and a number of valuable documents obtained as a result. The ERIC microfiche file of University of Massachusetts, Amherst was completely surveyed for applicable studies and printed copies were made. Data was also obtained at the conventions attended detailed below--and through contacts made there. While no claim to have exhausted the available literature can be made (the areas of interest were simply too many and too broad), a thorough and critical review was done. A bibliography of the materials reviewed is provided as an appendix to this report.

Personal Contacts - The project director attended two conferences in connection with the project--the National Conference on Opening Higher Education at the University of Nebraska in Lincoln in January, 1974 and the annual Association of Educational and Communications Technology Conference in Atlantic City, New Jersey in May, 1974. The project staff member most concerned with media, William Gibson, also attended the AECT Conference. Gibson attended the New England Regional Conference of Adult Education Directors in Springfield, Massachusetts, in June, 1974 as well. All the conferences were of great value since they afforded staff members the opportunity to hear and meet many of the persons in the forefront of educational communications and adult education.

In addition to the conferences, contacts were made by mail, telephone and personal visit. Letters seeking information pertinent to the project were sent to Adult Education Directors throughout the country, many of whom provided extensive information about their activities.

Personal visits were made to a variety of sites in Massachusetts, Connecticut, New York City, Chicago, Washington, D.C. and New Jersey. Some of the places visited were the Chicago T. V. College, the United Aircraft Training Center, the A J Nielson Research office, the United States Office of Education and the OWL Center in Springfield. Again, the experience of people directly involved in the field was tapped.

Among the practitioners in the various fields who were interviewed were --

Mr. G. J. Adams - President, Adams-Russell Co., Waltham, Mass. (Cable T.V. owning company)

Dr. R. A. Smith - Assistant to the President, Purdue Univ. (an operator of the Indiana Higher Educational Television System)

Mr. Zeke Feurerman - United Aircraft Training Center, Hartford, Conn. (Disadvantaged adult vocational training center)

Mr. Herbert H. Taylor - Director of Media Development, Worcester State College and member of Title I Advisory Council (During site visit at Amherst)

Dr. Adrienne Reeves, Travelers Corp., Hartford, Conn. (Director, disadvantaged adult industrial training program)

Dr. George Nolfi, President, University Consultants, Cambridge, Mass. (Consultant to Open Univ. Task Force)

Dr. Joseph Marcus, Univ. of Mass., Amherst (Associate Dean, School of Engineering)

Dr. William Dwyer, President, Massachusetts Board of Regional Community Colleges.

Dr. Kenneth Picha, Univ. of Mass., Amherst (Dean, School of Engineering)

Local Resource Group - Finally, in June, 1974 the staff met with a group who were generally located in Amherst or at the University of Massachusetts, Amherst. This Local Resource Group consisted of persons concerned with and working in media or instructional systems design. They reviewed the efforts and tentative conclusions of the project staff to that point and provided guidance and suggestions. The persons attending that meeting were:

Godwin Oyewole	Jeff Rabidoux
Charles Keenan	Leslie Squires
Juan Caban	Douglas Ruhe
Raymond Wyman	Fran Koster
Marjorie Harrison	Sydney Hedderich
Arnold Feingold	Robert Henderson
Frank Llamas	

In summary, then this study was carried out in the following manner: A project staff having appropriate backgrounds and interests was selected. A Community Advisory Council was organized and participated heavily in the conceptualization and development of the approach recommended for the urban disadvantaged. An extensive literature review was done including ERIC searches. Indirect contacts were made throughout the country with people and projects of seeming pertinence. A broad range of personal contacts were made and interviews held. A Local Resource Group provided advice and suggestions midway through the work effort. In essence, all the prople who could be identified as having a possible interest in the project, and who were willing to participate were involved and all of the information which could be located and obtained was brought to bear by a project staff of diverse backgrounds and skills.

What the Research Showed

Higher Education - 1974 - There was, as noted above, a direct context for this project in the proposal which had been funded and the program through which those funds flowed. That context was "near-field" in a sense. There was and is a larger more distant - "far-field" - context for the report as well; one reflected in the series of questions posed when the project was redefined-- the current situation in higher education and its impace on institutions of higher education especially in Massachusetts. There is a great deal of information on this subject, but a brief review here will set the stage for the balance of the report.

In 1973, the Carnegie Commission on Higher Education published the final report on their study which had been underway for 6 years. The study provided a series of reports, the major recommendations of which are summarized in the final report. It states that[1] -

> The extension of formal education into more and more of the lives of more and more of the people has been one of the great social developments in the United States, and the world, in recent centuries. The "Educational" Revolution stands along with the "Industrial" and "Democratic" revolutions (Parsons, 1971) as a major force in transforming the life of modern man in all Western societies, and in most others as well....

The report goes on to note that while the U.S. has led in this revolution and now spends about one-eighth of its national productive effort on formal education, education in the United States is in trouble. It points out that higher education faces crises because of the engagement by students and faculty in sometimes disruptive political activities, the growing reluctance of government to continue the expansion of financial support, and the newly developed movement toward universal attendance in college rather than universal access to college. Since there is a correlation between college attendance and subsequent income, universal attendance which does not include the disadvantaged, would serve to increase the disparity between them and the rest of our society. The very success of higher education suggests an obligation to be concerned with societal imbalances that success might cause.

While the Carnegie Commission focused on institutions of higher education and the view from that perspective, others have sought to view education and particularly higher education from a different frame of reference - how well the educational needs and aspirations of students, both traditional and non-traditional are being met.

The State University of Nebraska is being set up to meet what are perceived as new needs for higher education. It will be based on television broadcasts and learning centers rather than a campus. The logic behind its development was stated[2] as being based on the fact that changes are occurring in higher education because education is becoming a "lifetime" activity and higher education is now becoming oriented to meeting the needs of adults. The designers of the system add that education is now seen as a human right not a privilege. In the material summarizing the research done during the design of their new television-learning center system, S-U-N reports[3] that -

> The Carnegie Commission Report on Higher Education and the Newman Report, both released late in 1970, made clear that the higher education institutions of today are not reaching a certain segment of the population. These are people who desire higher education but because of a number of personal factors are not able to avail themselves of present higher education opportunities.

In one of the more detailed listings found, S-U-N shows that the groups identified as making up the "new" students include[4] -

1. Middle ages males desiring a career change
2. Middle aged females seeking enrichment and a degree
3. Young marrieds desiring to recoup missed educational opportunities
4. Older adults seeking enrichment
5. Physically handicapped persons
6. Senior citizens
7. Early retireds thinking of new horizons
8. Students in training programs (nurses, technicians)
9. High school seniors wanting a head start of college
10. Minority and low income persons
11. College dropouts
12. Job-bound persons
13. Rural and physically isolated persons
14. Persons seeking personal enrichment, but not interested in credit.

So broad an array of "new" students, non-traditional students, alone presents frightful difficulties for course development and organization. K. Patricia Cross (who has contributed a great deal to the literature and knowledge of non-traditional students) points out[5] that not only is there a new student for higher education, representing a much broader spectrum of the population than ever before, but that there is also a need for greater specialization of undergraduate curricula and a reorientation toward practical ends in terms of the available jobs on the current market. In terms of the marketability of present college educations it was recently noted[6] that there is a 15% unemployment rate for humanities and social sciences graduates as compared to 5% for business graduates, and that 25% of all BA's and 30% of social sciences and humanities graduates use little or none of their training in their actual work situation.

To try to serve the needs seen by those concerned with non-traditional education, it is necessary for higher education to remove the limits of place, and time and relevancy of course content training.[7] To date most programs for non-traditional students have been oriented toward part-time, evening attendance. Evening programs have met the major demands of the past by enabling employed persons to obtain the additional education they sought.

Samuel Gould (The Chairman of the Commission on Non-Traditional Study) suggests that there are four patterns becoming apparent in non-traditional study, 1) it enables more nearly full educational opportunity, 2) it provides more flexibility in the system, 3) it includes competitive educational enterprises (proprietaries, TV, business, etc.), and 4) it provides individualized opportunity and responsibility. He further points out[9] that there are three realities which must be faced by higher education so far as non-traditional study is concerned -- 1) it will continue to grow because people want it, 2) much is said about it, but little is really known (based on research) and 3) full opportunity for education is desirable. He points out[10] that non-traditional study attempts to overcome a number of the barriers to traditional educational opportunity, including geographical problems of access, the necessity of credits, the expectation of education's being the student's major activity, and the fact that learning is often equated with classroom hours or credits, difficulties of scheduling, and the need for financial assistance.

Gould and Cross[11] suggest there are five basic types of non-traditional programs -

1. Administrative-Facilitative - normal degree programs which simply vary the method of study to fit better the availability of the student - Evening Courses, television courses, and correspondence courses, for instance.

2. Modes of learning - programs leading to special degrees through varied patterns of learning within or without the institution - Bachelor of Liberal Studies degrees, University Without Walls, the British Open University or Bachelor of Independent Studies degrees are all examples.

3. Examination - granting a degree by virtue of the ability of the learner to pass one or more prescribed examinations. The University of London has used this model for some time and the New York State Regent's program, which is intended to operate this way, has just started.

4. Validation - granting a degree by evaluation of the overall knowledge of a learner ascertained by whatever method is felt most suitable - not necessarily examination. In some ways the Advanced Placement Program or College Level Examination Program fit this model because, while they both use examinations the examinations make up only a part of the total requirement.

5. Credits - granting of credits or degrees by an institution which does not offer instruction, but requires the learner to meet criteria which are based on tests given elsewhere. There are no current examples in the United States although the Commission on Accreditation of Service Experiences makes recommendations for award of credit. England's Council for National Academic Awards does grant credit in this manner.

In practice, of course, the five categories are not so distinct and programs often will have characteristics of two or three at once. The categories can serve, however, to aid in understanding the variations from program to program in generic terms.

One of the early attempts to meet the needs of non-traditional students was the Chicago TV College which was established in 1956 and in 1973 was on the air an average of 26 hours a week and as many as 20 courses have been telecast within a school year. Another well established program is the University Without Walls program of the Union for Experimenting Colleges and Universities which was initiated in 1971 and is being implemented by some twenty participating institutions. Nebraska's S-U-N project which was mentioned above is shortly to be activated. In England, a massive effort they call the British Open University, received 42,000 applications in 1970, its first year of operations.[12] And there are many others, including the Open University proposed for Massachusetts and the Empire State University of New York.

It is worth noting that as Appendix D-1 reflects, while telecommunications are used in a number of systems of higher education, those programs directed at non-traditional students are not built around electronic communications. They represent organizational variations rather than variations in the delivery system.

Higher Education in Massachusetts - 1974 - The Commonwealth of Massachusetts has a number of programs directed toward meeting new, or newly recognized, educational needs of adults. Essentially all such programs are non-traditinal, in one respect or another. A report by University Consultants[13] in September, 1973 (The "Nolfi Report") for the Massachusetts Advisory Council on Education surveyed the various continuing and part-time post-secondary activities in the state. Noting that such activities were carried out through a wide range of institutions (public and private institutions of higher education, proprietary schools, local school districts, etc.), a summary of Nolfi's findings by public institutional type is essentially as follows:

The Community Colleges offer some opportunities for part-time students, but limit such study because of a full load of full-time students. They do have a special program of support and assistance for disadvantaged students.

The State Colleges have initiated "open colleges" at four locations. Worcester has an Extended Learning Program and, through the Worcester Consortium, has proposed an External Degree Program.

The University of Massachusetts has College III at its Boston campus, the University Without Walls, the University Year for Action, the Career Opportunities Program and others at its Amherst campus.

The regional vocational and technical schools offer only full-time day programs in post-secondary subjects with secondary academic programs at night.

Local school districts, in addition to Adult Basic Education and General Educational Development programs, have programs primarily in arts and crafts and personal interests with some vocational and academic areas.

The Open University proposed and currently under study is another attempt to meet the needs of non-traditional students in the Commonwealth.

Some appreciation for the number and range of programs available to adults in the Boston area can be gained from the information provided by the Educational Exchange of Greater Boston.[14] Its book has 177 pages of courses covering subjects from aeronautics to banjo to paperhanging.

They are offered by 234 organizations and institutions ranging from Harvard to Mudflat and from the Handel and Hadyn Society of Boston to the Joy of Movement Center. Nolfi[15] reports that 250-309 proprietary and independent institutions are in operation each year in Massachusetts.

The report further states[16] that "part-time students in Massachusetts degree-granting institutions are primarily in separate continuing or evening divisions (over 90,000) rather than part-time in regular day programs (over 19,000). Forty-three private junior colleges have programs; 13 community colleges, 11 State Colleges, the University of Massachusetts, Lowell Technological Institute and Southeastern Masacchusetts University..." have programs as well. "Public programs currently enroll 55% of total continuing and part-time students; privates 45%." Correspondence schools are reported[17] as enrolling over another 6,000. The Nolfi report reflects[18] that 150,000 adults are enrolled in all public school adult education programs, 30,000 in proprietary and correspondence schools and 150,000 in public agency programs.

While over 14.000 were in ABE programs[19] in 1971-72, that number represents less than 4% of the people in the state (roughly 416,000) over 19 years old who were reported in the 1970 Census[20] as having less than an 8th grade education. In the state at that time there were 962,000 more people who were over 19 years of age, but had not completed high school and another 1,764,000 who were over 19 and who had lsss than four years of college. The total number of persons reflected in the 1970 census as being over 19 years old and having less than four years of college, then, was 3,142,000. How many of those people feel the need for more education, especially if it were tailored to meet needs they recognize in their daily lives, no one really knows. Suffice it to say, there are people in the Commonwealth who may want another, better chance for education.

From the above it is apparent that a number of efforts are underway in Massachusetts to increase educational opportunity for adults, and many adults are involved to some degree. The bulk of the efforts at providing adult education seem to be outside the public institutions of higher education, however. The most numerous efforts at developing innovative programs within public higher education appear to be in the University of Massachusetts.

Such is the "far field" context for this study. That broader context, of course, became apparent as the study progressed. As it did, the literature review, interviews and other efforts were developing information in other areas as well. The efforts were directed toward accumulation the background data needed to detail the characteristics of the disadvantaged and the technologies of telecommunications and educational media.

Major Project Research - It was necessary to define the target population in such a way that it would be evident where they were located and in what numbers, what their characteristics were (beyond their disadvantagement), how they learned, and what educational needs they had. Once that information was available, it was possible to define, to some degree, an instructional system which would fit them and their needs. One aspect of the instructional system would be the media used to present the instructional material, so it was important to review educational media uses and applications. It was also important to understand telecommunications and its current use in higher education in order to assess its possible use in the instructional system. The intent was to use what was found in our research as a base for synthesis and extrapolation, not to be constrained by it.

The findings of the project staff in the three areas of special concern -- the disadvantaged, media and telecommunications -- are set forth in Appendices C-1, C-2, C-3 and C-4. C-1 covers the disadvantaged, generally including their learning needs and styles. C-2 provides locational data including a set of census tract maps. C-3 discusses media and C-4 delves into the technology of telecommunications and some possible alternatives for Massachusetts. A consultant's report by Genesys Systems, Inc., on current uses of telecommunications in higher education is given in Appendix D-1. The findings reported in those appendices are summarized in this section of the report. (The other consultants' reports, Appendices D-2, D-3 and D-4, will be discussed below as the topics on which they bear are taken up.)

The Disadvantaged (Appendix C-1) for present purposes were defined as being those adults (persons over 25) in the Commonwealth who had family incomes less than two times the federal poverty level and who had attended less than four years of college. Thad definition was specifically suited to the interests of the Board of Higher Education and was broad enough to ensure unwarrented exclusion.

The target population was located throughout the state by census district within each Standard Metropolitan Statistical Area. The distribution was relatively constant as a percentage of overall population with greatest concentrations in urban areas.

The Disadvantaged were found not to be a homogeneous group. They range from people who are fully functional in society with no obvious deficiencies other than their economic limitations, to those immobilized in front of their television sets in hopeless, apathetic resignation to their fate. Any instructional system must consider that breadth of behavior and be structured to accomodate it in so far as possible.

Because of the wide variation in characteristic behavior, the needs of the Disadvantaged for education also vary over a wide spectrum. At the lower end of the spectrum, the needs existent are generally urgent. They may not even be recognized as "educational" in the usual sense but are more nearly informational--how to find housing, how to get police protection, etc. At the same time, others of our target population are fully able to capitalize on opportunities for college-level academic work. The largest group are somewhere in between, needing training to enable them to get a job (or a better job), or to obtain a Basic Education (8th Grade) or General Educational Development (high school) certificate. A serviceable educational system must be able to handle the full range of needs.

The characteristics of the client group which are of most concern are two--they are adults and they are disadvantaged adults. A terse summary of the variations between traditional students and more mature adults or disadvantaged adults is provided in Table C1-1.

Characteristics of Adult Learners

Adult	Disadvantaged Adult
Experienced, realistic	Strong cultural variations
Settled in thinking	Significant knowledge gaps
Voluntary participant	Feels helpless, passive fatalism
Slower learning, perseveres	Highly sensitive to non-verbal behavior
Impatient	Needs frequent reassurances, reinforcement
Demands relevance	Physically, aurally oriented
Needs more light	Slow, careful, persevering
Less keen hearing	Low self-confidence, poor self-concept
Conflicting responsibilities	Prefers non-print materials
Wants to participate	Has <u>urgent</u> learning/information needs
More heterogenous	May have severe linguistic deficiency
Seeks concrete application	Reasons inductively, not deductively
Highly motivated	Spacially, not temporally oriented
Fears failure	Harsh past experiences
High standards of performance	Group oriented, extrovert
More fatigue	Has had unpleasant school experiences
May see school as "going back"	

Table C1-1

Other pertinent considerations are the fact that the more disadvantaged do not have the same information system available to them as is available to the larger society and adjustments must be made to get in contact with them. While the learning activities used must be strongly relevant, they should not be so narrow as to preclude developing independence of the education system through generally applicable development and knowledge.

Lastly, while the cost of serving the most disadvantaged group may be high, the marginal cost of the less disadvantaged using the system will be low. The ultimate cost of no service may be hidden, but is far greater in sum than that of a suitable education system.

Media (Appendix C-3) is used in the body of this report in the usual imprecise fashion--as meaning the means of presentation of educational material--a more careful definition was derived to enhance the analysis of the technology. The definition distinguished between the medium (word, picture, model, etc.) and the display device (book, television set, film, etc.).

The centrality of the medium in the instructional (communications) system was noted and illustrated by Figure C3-1 which also reflects the distinction made between medium and display.

The anlysis led to the conclusions that the sense or senses to be stimulated are the primary means of differentiating media from the learner's viewpoint, but the relative efficiency of alternative channels is not yet known. The critical characteristic of a medium is the degree and kind of coding (symbollism) used. If a learner cannot readily decode the information

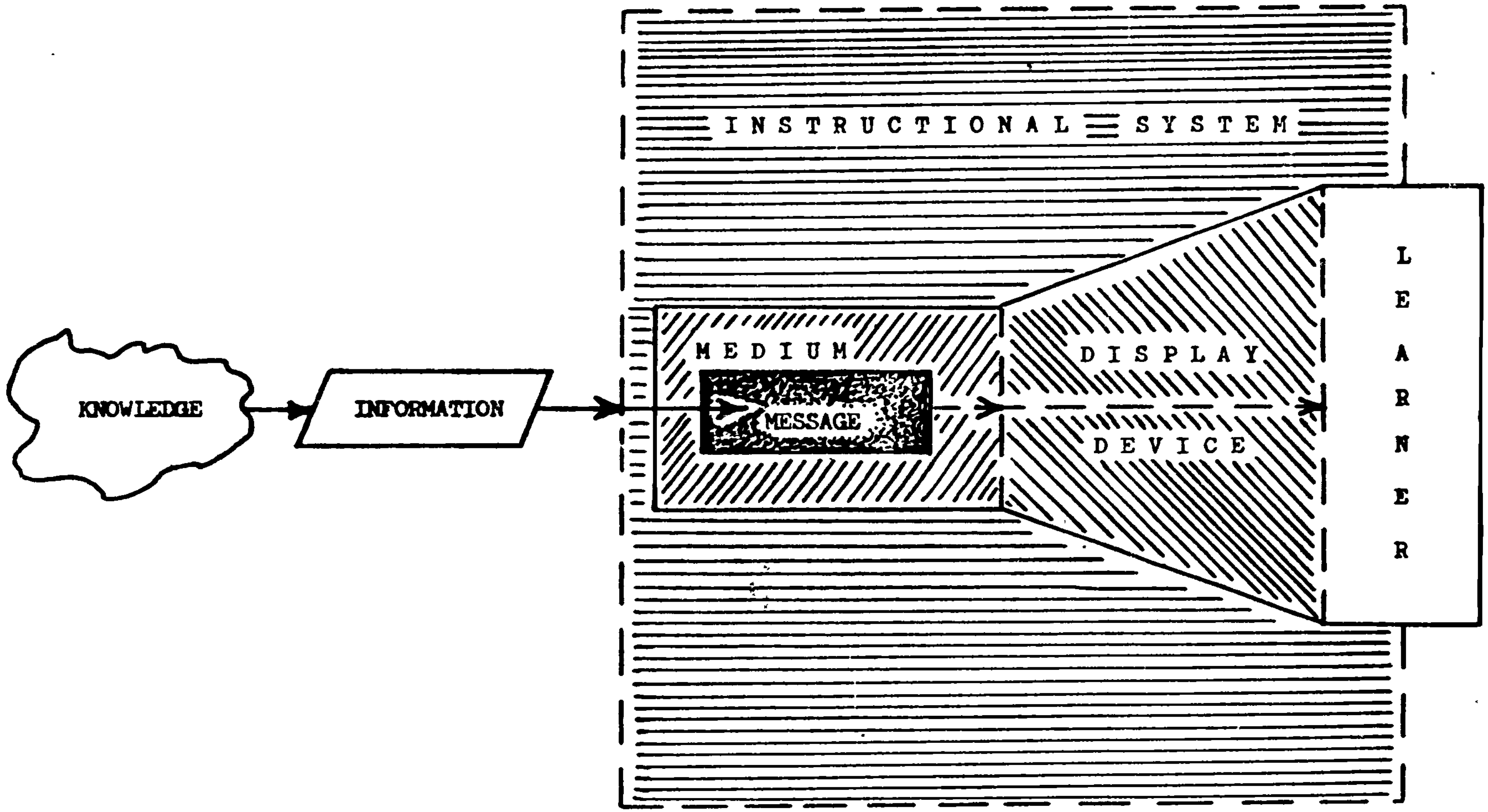

Figure C3-1 A MEDIA SYSTEM

transmitted through the medium, learning is effectively blocked. The display device used impacts on the learner because it enables or inhibits reference, is accessible or distant, presents material at appropriate or inappropriate speed and density, and is or is not interactive. Of those characteristics, current research shows that interactivity may not be important, based on present educational material and methods of investigation.

The analysis of media selection can be condensed to say that the medium chosen for a given instructional task must provide the information in a form and manner which are understandable and usable by the learner in question. It will be understood if it stimulates the appropriate senses of the learner in a comprehensible fashion (if he/she knows the code). It will be usable if the learner can gain access to it--if it is available to him/her; if he/she can control the speed and/or density of presentation and if the learner can use it again as he/she needs and wishes to do so.

The characteristics of current display devices were reviewed, including films, slides, television, computer assisted instruction, etc. Two devices--PLATO, a system of computer assisted instruction, and 8 mm. variable speed motion pictures--were felt to be of special potential interest to this project.

Given the learning styles of this target population, what can be said about suitable media? One should seek media which are physically and visually oriented. For most of this particular clientele, non-print media will be preferable, audiovisual materials will be preferred to texts. They often have language deficiencies and are from minority cultures, so the material should be both pictorial and culturally-tailored whenever possible. They may not absorb information quickly due to fears of inadequacy and failure, language problems, and lack of practice with symbolic manipulation, so the pace and density of presentation must be controlled, thus slide/tape or other step- or still-motion devices should be preferred over film or videotape.

All of this, then, says that actual skills practice and slow or semi-motion pictorials with aural descriptions should be used wherever possible. The initial material should be slowly paced and heavily pictorial. As the learner progresses and grows more capable, more heavily symbollic material (textual), faster paced and more densely presented material (more information in any given picture, page, etc.) should be used. Progressively increasing the complexity of the material will enable the learner to be better and better able to use and learn from the activities and opportunities of the larger society.

The potential for applications of media is great, if some of the bounds which have been placed on it are reduced or removed. The Commission on Non-Traditional Study puts it this way[21] --

> ...as self-directed and self-motivated learning grows as an academic ideal, more attention can be given to the role which technology can play in offering more individualized, independent study rather than substituting for other methods. In this connection, various components of educational technology, if properly employed, can provide increased educational opportunities for people who are excluded from traditional educational patterns because of location, economic status, age or family or business responsibilities.

Telecommunications (Appendix C-4) may not be recognizable to the average person by that term, but the technology involved is familiar to almost everyone. It includes television, radio, telephone, electronically reproduced print or pictures and computer data messages. Below are tables (table 3 and 5) drawn from the Appendix, summarizing the characteristics of some telecommunications systems and their costs.

Table 3

Alternative Transmission Systems

	Characteristics		Comments
Microwave Radio	Usually point-to-point private system.	Expensive to install and operate.	Can connect with cable, ITFS and broadcast for complex system.
	Best suited for longitudinal (bi-directional) system.	Permits multi-use (audio, video, teletype).	
	No limit to range (with repeaters).	Gov't regulated.	
	Multiple video channels possible.	No limit to number of locations.	
	Unlimited number of systems possible.	30 miles between repeaters.	
		No competing programs on system.	
ITFS (Instructional Television Fixed Service)	Point-to-point with capability for omni-directional transmitter and multiple receivers.	Low cost to install and maintain.	Simple, inexpensive system for special service.
	Best suited for radio system.	Up to 4 video channels possible.	
	Private system.	Gov't regulated.	
	Short-range - normally 20 miles.	No limit to number of receiving locations	
	Almost unlimited number of systems possible.	Normally only one transmitting location.	
		No competing programs on system.	

Table 3 (Cont'd.)

	Characteristics		Comments
Broadcast Radio or TV	Accessible to public - most citizens have receivers. Variable range, depending on location, power and operating frequency. Number limited by frequency band limitations. No limit to receiving locations.	Costly to install and operate. Heavily used for commercial purposes. Competing programming. Gov't regulated. Adapted to radial system. Normally one audio or audio-video channel per system.	Must compete for listener/viewer attention.
Cable	Very inaccessible except to those "on" it. Non-radiating. Variable range with repeaters. Unlimited number possible "on" cable. Can be private or commercial.	Costly to install, inexpensive to operate. If commercial, will have competing programs. Some gov't regulation. Best for longitudinal system. Can have multiple transmitting locations.	Strictly a "pipeline" but offers high quality.

Table 3 (Cont'd.)

	Characteristics		Comments
Leased System	Can be any or all of above. No initial cost but ongoing expense.	Potentially well maintained. Leasing only increment of total can offer favorable cost/quality ratio. Not "locked-in" by owning equipment.	Can offer quality and flexibility at a price.

Table 5

Transmission System Costs

Channels	Installation	Operation	Cost per Usage Unit
Radio waves	None	None	None
Satellite[1]	\$10-50,000,000 plus ground stations at \$2,000,000 each.	10-15% of capital cost.	Fully variable up to 8760 hours per year.
Coaxial cable[2]	Urban (buried) up to \$100,000/mile. Non-Urban \$4-15,000/mile.	Typically \$300-500/mile plus \$1-3.00/subscriber.	Fully variable up to 8760 hours per year.
Wire	60-90% of cable.	Same as cable.	Same as cable.
Transmitter/Receivers	**Installation**	**Operation**	**Cost per Usage Unit**
Broadcast Television[3]	Average \$940,000.	\$200-800,000 (Average \$500,000).	Fully variable up to 8760 hours per year. (Current Ave. \$160/hour)
Broadcast Radio[3]	Average \$150,000.	Average \$100,000.	Variable as TV (Current Ave. \$18.80/hour).
Microwave Radio[4]	\$1-10,000 per mile per channel.	30% of capital cost.	Same as Broadcast Television (No Current Ave.).
ITFS[4,5]	\$100-500,000	25% of capital.	Same as Broadcast Television (\$10-30/channel/hour).
Coaxial Cable	See under channels.		

Table 5 (Cont'd.)

Transmitter/Receivers	Installation	Operation	Cost per Usage Unit
Leased Systems[5]	None (Telephone Company has a termination charge).	Varies based on service required. (35-100/month/mile/channel for one-way video.)	Same as Broadcast Television (No Current Average).

[1]Source: An Educator's Guide to Communication Satellite Technology, Kenneth A. Polcyn, Washington, D.C.: Academy for Education Development, 1973.

[2]Source: The Here, Now and Tomorrow of Cable Television in Education - A Planning Guide, Toby A. Levine, Boston, Mass.: Massachusetts Advisory Council on Education, 1973.

[3]Source: 1974 NAEB Directory of Educational Telecommunications, Washington, D.C.: Nat'l. Ass'n. Educ. Broadcasters, 1974.

[4]"Inclusion of Time-Factor in Comparing Costs of Terrestial Telecommunications Transmission Systems," Robert D. Swensen and Kitty A. Montie, IEEE Transactions on Communications Technology, Vol. Com. 19, No. 5.

[5]Source: "Technical and Economic Factors in University Instructional Television Systems," Charles A. Martin-Vegue, Jr. et.al., Proceedings of the IEEE, Vol. 59, No. 6, July, 1971.

Most of the decisions which relate to the establishment of a telecommunications system are "management" rather than "engineering" decisions. Who is trying to communicate what with whom? Is communication necessary, or are there other alternatives? Must the communication be instantaneous and extemporaneous, or can it be delayed and/or edited? Is what is to be communicated economically justified? The decisions relate to the goals and objectives which are to be achieved much more than the mechanisms to be used. There are a variety of ways to communicate electronically, and the communication can be almost as sophisticated as one would ask; what is <u>really necessary</u> may be another matter.

One can envision an array of telecommunications systems which could be of value to the public institutions of higher education in Massachusetts. Public broadcasting stations (such as the Chicago TV College) can be used, for instance, to show college courses for the benefit of the general public. This is a fairly inexpensive way to reach a relatively large number of people. The people who will respond, however, will be narrowly self-selected and will be a very small proportion of the adult population of the state. Practically none of the disadvantaged have the characteristics which will enable and encourage them to participate in a broadcast-based system. Those who do participate, based on experience elsewhere, (at Chicago TV College, for instance) will be middle class, mostly women, averaging 30 years of age and having had some prior college education.

If pure and simple broadcast communications is not "right," closed-circuit systems of a variety of sorts could be used. A limited one could connect Boston with Worcester and Springfield via Amherst. That system would enable the majority of the public institutions of higher education in the Commonwealth to communicate with one another (in some cases one-way), and would include the transmission of television. Such a system would, potentially, make more information available between the institutions involved, but would not expand access to higher education generally since no "new" students would be reached by the closed-circuit system alone. (The expanded curriculum possible at any location would probably attract additional students at that location, but they would almost all be students who could and would have met their needs in other ways anyway.)

The limited closed-circuit system could be expanded to include all of the institutions of public higher education in the Commonwealth. The expansion would roughly double the cost of the system and might make it more palatable politically but would not answer the question or cautions raised about the more limited system. It would not resolve the purposes of the system and it would not really expand access to public higher education in the Commonwealth.

The uses made of telecommunications by higher education in other locations do not provide ready answers to the question - To what end? There are a large number of systems in operation. More are in the process of being installed. Generally they are tailored to the educational systems and geographical areas in which they are located. Whether an objective review would reflect that those systems are justifiable, is an open question. In most cases, not enough information is available to make a judgment. One system, which exists presently at Stanford, is apparently justified because it is financially viable, having received a large portion of its support from industry. The other systems, are justified, if at all, on the basis of the social needs they serve. Objectivity suggests that the capital investment often could be foregone and the needs met equally well, or better, by other less exotic and less expensive means. The Colorado State System of shipping videotapes rather than transmitting them electronically reflects one way of limiting the capital investment made.

Summary - Such then are the findings of the project staff. In some cases the above represents interpretations beyond those of the appendices themselves. Those differences occurred by design. The appendices were intended to refrain from interpretations and provide only background data. As a rule, that limitation was observed. The purpose of the body of the report is to explain, interpret, extend (if necessary) and use the information in the appendices. The application of the research data to the educational needs of the target population under consideration, shall be discussed next.

The Instructional System

What's Needed - If a learning system designed especially for the urban disadvantaged is to be established, what should it be like?

Specific suggestions are made in a number of sources. A major source is To Improve Learning, in which John Henry Martin in writing of technology and education of the disadvantaged suggests that educators should[22] -

Eliminate lock-step learning.

Eliminate pupil manipulation by applying technology.

First teach talking, reading and writing.

Provide quick feedback to the learner.

Eliminate competitive learning - use self-motivation.

Use multi-sensory media.

Use learner activated media.

Use "discovery" methods.

Before adopting any "ready-to-wear" solutions, however, the objectives of the system needed to be clearly stated and the various possible alternatives validated by the Community Advisory Council. The intent of the project is to serve the educational needs of the urban disadvantaged adults of the Commonwealth of Massachusetts, and to serve them in the way best suited to their needs, learning styles and personal characteristics. As has been the case throughout, the report does not contend that the target population is a single coherent group or that it fits any stereotypical image. The system described is intended to meet their general requirements with allowances made for variation as needed.

At their first meeting with the project staff the Community Advisory Council presented their ideas as to the instructional system which would best suit the target population designated in the study. Given the characteristics generally found in an urban disadvantaged learner--immobility, need for sense of control, little available time, poor prior experience with schooling, requirement for relevance, need for culturally specific material, limited geographical horizon and experience--it seemed apparent that some extension from the usual campus or building would be needed. Our target population has had generally distasteful experiences with the education system. They may not have readily available transportation. They frequently find it unsatisfactory to try to obtain services through established social institutions. Suggesting they go to the university would be unsuitable. They can't get there. If they do, it is the same system they left, flunked out of or were thrown out of earlier. All of the same problems would recur.

The idea of a store-front or similar learning center was presented and agreed on by the Council as a potentially valid approach. Council members proceeded to develop specific guidelines as to the way that center should appear and operate. Those guidelines are given below as Table 1--Characteristics of an Urban Learning Center. The characteristics state specifics about the Learning Center as directly and concisely as possible. This section of the report will elaborate on those points, showing the rationale behind them and defining what the various characteristics mean, while dealing with the subject areas to be taught, the approach to be used in teaching, and the type of organizational structure needed. Finally, this section will consider what communications network would be appropriate to the organization as detailed.

Table 1 - CHARACTERISTICS OF AN URBAN LEARNING CENTER

1. Located in the neighborhood it is to serve, possibly in space rented from some other existing operating community agency such as a Community Council, and there must be access by public transportation. The center should be attractive and inviting, but must be recognizably an educational resource.

2. Staffed by one or more people from the neighborhood (or an equivalent neighborhood if no local person is interested or available) who's prime ability will be to assist in selection of an initial activity and to help people use the resources of the center. If the neighborhood is non-English speaking or bi-lingual, the center staff must be bi-lingual.

3. The initial learning activity, and all others, will be chosen by the learner. The Center staff will be available for consultation and will aid the learner in selection through discussion and/or testing if desired.

   Diagnostic Testing should be self-administered and evaluated.

4. The learning materials in the Center will be organized to provide brief learning experiences as well as structured sequences comprising recognized (accredited) courses of study. Information of direct value and interest to the neighborhood will be included in addition to material of a remedial and academic nature.

5. Learning materials will be provided in books, programmed texts, film strips, slides, 8mm films and video-tapes. Audio tapes will be provided wherever possible for use with programmed texts, film strips and slides. All motion pictures and video tapes will have sound-tracks. Emphasis will be on audio-visual materials rather than texts.

6. The Learning Center's library of materials will be supplemented by a library of material in less frequent demand in the local community college, state college, campus of the university, high school or library The supplementary materials will be available for use in that other facility or for loan to the Learning Center on request.

7. The materials in the neighborhood center will be culturally tailored to the particular neighborhood, and progressively bi-cultural.

8. An inventory of neighborhood, local and regional sources of learning activities (business, government agencies, community agencies, schools, libraries, etc.) will be established and maintained.

9. Activity based learning (work-study, work experience and other non-traditional forms) will be encouraged.

10. Learners serving as resources, will be able to obtain additional "credit" by using their knowledge and/or skills to help others learn.

11. Discussion groups (classes) will be set up in the Learning Center whenever there's sufficient interest in a given topic or experience. Entry to discussion groups will be open, by agreement of the group. Formal classes will be held in the supplementary center (community oollege, etc.)

12. Certification will be provided for each course of study or skill level achieved. Testing will be performance based as far as possible. Self-administered pre-tests will enable learners to assess their own readiness for taking the certification test(s).

    Certification for academic studies will be "normal" -- undistinguishable from resident students of the University or College.

13. Locally (not each neighborhood) there will be a vocational training center where persons hired for specific jobs can acquire the entry level skills for their job.

14. Entry (Registration), will be open, there will no no semesters or quarters and learning canbe part-time or full-time. Learners will be able to start, suspend or end their program at any time without prejudice.

15. The Learning Center will be promoted through direct contact, other local groups and agencies, newspapers, broadcasts (TV and radio) and other marketing media. Culture specific (Soul, Spanish, etc.) media will be used wherever possible.

What Should be Taught? It will be necessary to provide a full range of information from the most basic survival data to college-level academic work and/or personal enrichment subjects. While it may not be practical to try to present the full range of the human experience under one roof, the system must be structured in a coordinated way--in a way that permits, encourages and invites a learner to enter, remain and progress. There must be enough material and a broad enough variety of material at the "entry" point (or points) of the system that the full range of potential learners will be attracted and will find something of direct, immediate and meaningful value to them.

The system must provide for learning activities covering "survival" or "coping" information--information directly pertinent to the daily lives of the learners. For disadvantaged people this kind of information would include how to obtain police protection, how to secure necessary improvements in housing, how to find and obtain Welfare assistance, how to get job training, and the like.

The next level of sophistication in learning materials, is "developmental". This category includes vocational training either for entry level jobs or for upgrading of skills. Also included would be information of a social sort, such as how to dress for a job interview, how to deal with the customs of this country, etc. Facts of this kind would be especially useful to people seeking to understand the general culture, including people recently arrived from foreign countries, or simply people with an interest in how things are done. The Spanish-speaking members of our Community

Advisory Council pointed out that some Puerto Rican young men were arrested shortly after they arrived here for doing things which were not a "crime" in Puerto Rico such as drinking beer on the streets. The youths were put in jail and did not know why. The Learning Center could provide the knowledge which would prevent such incidents as this.

The most "usual" category of information to be handled in the Center would be academic and would include Adult Basic Education (education to 8th grade level proficiency), education for the GED (General Education Development) high school equivalency examinations and college-level studies - introductory (lower division) college level material.

Another facet of "What Should be Taught?" involves the cultural basis from which most disadvantaged learners come. They are frequently minority people from black or Spanish-speaking cultures. When they are white, their cultural background may be so different or so deprived that material designed for people from middle-class backgrounds is unsuitable. A number of unsuccessful attempts have been made to develop I.Q. tests and other materials which are not culturally based. It seems better, therefore, to provide materials for this group of learners which are designed for them. They will find middle-class materials unrealistic or objectionable, so material designed for their own cultural group should be provided. Such materials are not readily available commercially, but could be generated through learning activities of the learners themselves.

Culturally tailored materials are especially desirable for the initial contact with the disadvantaged learner. The major effort in introducing the learner to the learning system should be to make him or her feel comfortable, understood and important. Providing materials for learning with which he or she can readily identify reflects recognition and a high degree of concern. It is a form of acceptance which is difficult to duplicate otherwise.

As the learner progresses to more advanced materials, there should be a choice of materials available to him. One objective is to provide him or her with the ability to function effectively (or more effectively) in the larger society. Thus, it is important not to persist in culturally isolating him or her. At the same time, there should be no need nor desire to divorce the learner from his own culture, so materials which "fit" culturally should also be available. The progression from one to two cultural bases should be slowly and carefully carried out so that it neither "shocks" the learners nor implies something "bad" about the culture from which he comes.

In an effort to be explicit about what it means to culturally tailor learning materials, some specimen materials were made up by consultants to the project staff. Two tape-slide presentations were developed around the idea of housing repairs in Springfield, one for blacks and one for Puerto Ricans. Two video tapes - again, one appealing to black people and one to Puerto Rican people - were also made up providing information about the University Without Walls program of the University of Massachusetts. Copies of those materials are provided with this report. The master copies are on file with the producer, Dr. Juan Caban, School of Education, Univ. of Massachusetts, Amherst. Appendix D-4 to this report deals with the way in which those materials were produced and the ideas they embody. The appendix describes how to develop such materials, gives the cost of doing so, and provides illustrative scripts of the slide-tape material. It illustrates that such materials could be made up as learning activities if the organization is structured to encourage it.

The final factor in "What Should be Taught?" is the requirement that the learner select his own learning materials. A sufficient range of materials which relate closely to the actual needs of potential learners must be provided to stimulate them. The materials must be designed to provide information from which irrelevancies have been removed. The learner should have as much freedom as possible to choose the goal of his or her learning and in that way delimit the constraints imposed by the requirements for specific certification. If a learner wants to know what kind of work an accountant does, he or she should be able to find out, without getting involved with materials necessarily leading to a degree or certification in accounting. Modularized materials will enable the learner to feel free to choose what he or she wants. Such freedom to choose and a system which then responds positively to that choice, immediately give the learner a sense of control. It is one step in the enhancement of the learner's self-image. It is a necessary concomitant of meaningful learning for the disadvantaged.

How Should the Materials be Presented? (Instructional Methods) - Curtis Ulmer in Teaching the Disadvantaged Adult says[23] -

> ....teaching must be problem centered to be practical and interesting, experience centered to be meaningful and understandable, and oriented to all the senses to facilitate the transition from the concrete to the abstract.

In summary, current learning theories indicate that the student does many of the tasks which have, in the past, been considered the province of the teacher. The student is really quite self-sufficient. He provides the motivation to learn, the objectives, and the plan of attack. He learns best by doing things himself at his own pace, and he is rewarded by his own sense of satisfaction.

The instructional method chosen first and foremost must be one oriented to learning not teaching. It must be responsive to the desires of the learner and supportive of him or her. It must provide close personal contact between some "agent" of the learning system and the people desirous of using the system--the learners. The staff's concern must be directed toward understanding and assisting the learners, not "teaching". Initiative for learning rests with the learner and so must the responsibility for what is learned.

The role of "learner" must be a flexible one. Learners learn most when they "teach" what they have learned, so they must be expected and encouraged to help others by passing along what they have learned. In addition, learners will bring much capability and experience with them from their individual backgrounds and should bring that to bear by acting as resource persons to others. Often they will have had jobs and can talk about what a particular job really is, or they will have obtained service from a government agency and will be able to tell others how to do so. Again, acting as a resource is a learning situation and should be recognized as such. Recognition, in the form of credits or their equivalent, should be given for service in tutoring or in acting as a resource.

The clientele under consideration in this report are not very mobile. They usually have transportation problems and often have to use public transportation. They have a minimum of free time. In many cases, they have numerous children and no one to help with their care. Extended periods of time are not available to them usually, and they may not have regular working hours. The combination of these factors suggests that learning activities which are modular and which are non-human, media-based would be best.

Modularization would enable the learner to spend whatever period was available to him or her without constraint by the length of the "lesson". Lessons of relatively short duration would enable additional ones to be tried, whereas lengthy "lessons" might preclude any use at all. Modules of 15-20 minutes in length seem "right".

As the duration of the learning sessions should be under the control of the learner, so should their frequency. A system which does not require regular attendance would be preferable to one where the learner had to be present at a fixed time each week. The client group under consideration often works varying hours or on seasonal jobs and simply cannot make regularized time commitments. They must be available when work is available. An arrangement which does not require attendance in scheduled classes, would be preferable.

Because of the use of non-human media and the individualization of the program, flexibility can and should extend also to the larger time frame normal to schooling. There is no need for such time segments as semesters or years. Learners should be able to come and go as they see fit, learning when they have the time and energy to do so and not using the center when they are involved otherwise. A learner must be free to enter, leave, and re-enter the system whenever he or she wishes. Without semesters and time-based course structures, there is no need to require that students work continuously, so extended absences would not be material. When a program is completed, the appropriate certificate would be issued. Were a learner to suspend his activities for a very extended period--say some years--he or she might need to repeat some material, but that would be determined by his or her ability to perform necessary activities, not by the time lapse alone.

Flexibility of attendance provides one type of individualization. Individualization of the program should be established in other ways as well. Appendix D-1 addresses learning styles and reflects that they vary with each individual. The combination of personal capabilities, attributes and attitudes each person brings to the learning situation is unique. Each has his own distinct style. As was pointed out in Appencix C-2 on the disadvantaged, there are tendencies and trends which are collective in nature, but within the general collective style, each person has variations. Insofar as possible, alternative presentations should be available so that the learning style of each person can be accommodated in some extent. The same lesson may have to be available in print, slide/tape, and video tape as well as in a number of experiential activities situations in order to provide the range of presentations needed by the students.

In addition to various presentations, the learners should be free to combine or select courses or learning activities as they desire. Again, this requirement suggests modular activities. Each module can be seen as an accomplishment and its satisfactory completion can be used to encourage further efforts. Specific combinations of courses may be required for specific certificates (as will be discussed below) but as wide a range of alternatives as possible should be available. In addition, combinations leading to special certificates or no certificate at all should be equally possible.

While some learners may want and need the discipline and competitive atmosphere of classes, others may not. The fragile self-image of this target population is more suited to a supportive than a competitive structure. Tutoring arrangements like those mentioned above reduce competition.

Working as an individual, but having other people available to help, precludes a competitive atmosphere. Setting up a testing structure which, except for certification tests, is self administered and reviewed would also reduce competition. Adult learners learn for themselves, not for a parent or a teacher. They are able to evaluate their experiences for themselves. They may need reassurance that their evaluation is correct, but they do not need or want someone else to do the evaluation in their stead. The system must always be oriented toward learner control and helping the student, not judging him or putting him in a competitive situation.

For those students needing and desiring classes, special arrangements would have to be made. Such requests should be anticipated. One concern of the population in question is that the learning they do be "real". They do not want makeshift or "special" arrangements. They feel they have been "short changed" through the years and have had programs and facilities which were not equal in quality to those of other groups. (In many cases they are correct, of course.) Their judgement of quality is usually made in terms of form since equivalence of substance may be impossible for them to assess. This concern is often expressed in demands for "school" in a classroom setting and for attendance on campus.

Given the needs for learner control, individualization of attendance, program structure, and modularization, it is clear that the program should be non-human media-based--that is, a system of films, slides, books, etc. rather than instructors and lectures. Having the learning materials in non-human media form will enable all of the needs noted above to be met.

While the use of non-human media seems to conflict with our target population's need for personal contact, that appearance is in error. In reality, the staff of the center, because they don't have to teach, correct papers, etc., will be available and trained to develop and maintain close helping relationships with their "students". The staff will be liberated to be guides and aides rather than sources of information.

Appendix C-3 illustrates that there are in existence many non-human media forms. These learners need a form or forms which are primarily visually and physically oriented. For academic subjects, slides, films and/or video-tapes are appropriate. Manipulative materials which can concretely illustrate the ideas to be learned are also needed as are experiential activities. Workbooks should be used at relatively low levels of the programs to introduce and encourage the learners to become familiar with printed, symbolic materials. Wherever possible, slides and filmstrips are to be preferred over motion pictures (or video tapes) because still or step-motion pictures present material at a slower pace--a pace more suitable to the clientele. At higher levels of the program, materials should also be presented on motion pictures to aid the learners in increasing the pace at which they can assimilate information.

A concern which always arises when heavy reliance on non-human media for instruction are suggested, is the acceptability of such media to the learners. No studies answering that question for the disadvantaged were found during the project. Information had been gathered, however, on traditional college students. In The Medium May Be Related to the Message, Dubin and Hadley have some very pungent comments on teaching in higher education and traditional students. They say[24] -

> In other words, no matter what the manner of teaching, be it by television, seminar, lecture or independent study, student achievement (measured by final grades obtained) remains constant.

They continue[25] -

> The college student as a consumer of teaching...will take whatever method or medium of instruction is offered, damn or praise it on its merits and get on with the business of pursuing his college education.

Presence of staff members to assist the learner in locating and using learning materials should fully compensate for the presentation of information through non-human media.

Two recent developments in non-human media deserve special mention--first, variable motion using 8 mm film loops, and second, the PLATO computer system (both systems are described in Appendix C-3). The variable speed movie system is currently available from one or two suppliers. It is a system which uses individual frames of 8 mm film as if they were slides; that is, the individual frame is held on the screen while an audio narration describes it. The machine also has the capability of showing the film at full motion picture speed, or at any intermediate speed as well. The result is a fully flexible film/sound system which can lend itself readily to the blend of needs of the learner and the characteristics of the material to be presented. It is a system which would be particularly desirable for this clientele because of its flexibility.

The other innovation worth considering is PLATO. PLATO is a system of computer assisted instruction (CAI) which, in itself, is of interest for this particular clientele. CAI offers much that would meet their needs because it can always be available; it operates at the speed the learner sets; it usually is programmed to present material in small discrete increments and it can repeat its sequences at the wish of the learner. Generally, however, CAI cannot service many learners, is very expensive to program, uses print to transmit its information, and cannot provide pictorial displays. PLATO provides for pictorial display and can service enough learners to provide a substantial base over which to amortize programming costs. Unfortunately, PLATO is still in the experimental stage. It may be a fully serviceable system within the next few years. Since it offers a number of real advantages, its progress should be closely monitored.

The instructional system should be activity oriented. Where audio-visual materials are used some form of work book or similar device requiring active participation on the part of the learner should be included. The program should seek to involve local businesses, government and cultural activities as much as possible. Such involvement should not be confined to "field trips", but should be an integral part of the learning program. The learning activities should be built around direct participation in community life. A variety of part-time jobs, internships and the like will be needed to insure meaningful interaction. Credit should be given in some meaningful form for non-traditional learning such as past working experiences of the learners, for other "schooling" (military or commercial) and for self-study they may have done. The point is that the instructional system should not restrict learners to the academic structure, but should insist on and take cognizance of actual life experience. Most of these learners will be seeking knowledge that will have direct value in their lives, so life should be a valued source of learning.

Organization - Based on what has been discussed above, is there any organizational structure that would be particularly suitable? Relatively immobile learners, needing a place to learn which is inviting rather than foreboding, and requiring personal attention, pose some problems. After considering a variety of alternatives, it appears that a neighborhood learning center supported by a local public institution of higher education is the answer. (In Boston more than one post-secondary institution would be needed because of the number of neighborhood centers which would be required.)

The term "neighborhood center" is meant to be very explicit. One learning center for a reasonable sized community is not likely to suffice. If there are two, three or four ethnic areas in a city, each should have its own Center. A major concern is the recognition of "ownership" by the projected learner group. It must be their own particular center, located where they live.

In Telecommunications in Urban Development[26] the suggestion is made that "...not only must an agency be located within a reasonable distance - usually walking distance - of its users, the users must recognize the agency as a resource worthy of being tapped. To a remarkable extent, the potential users are not aware of services, even those within walking distance of their homes." The authors go on to propose[27] that each ghetto community needs a community education center that includes -

Classes and independent study
Sound film strips and cartridges
Audio tapes
Conventional and programmed books
Computer Assisted Instruction

and should involve local and regional storage of educational materials. The center should have programs for literacy, 8th grade diplomas, high scool for adults, G.E.D. preparation, vocational education, televised college-level courses, tutorial programs and guidance counseling.

The Carnegie Commission on Higher Education proposed[28] that the elimination of inequalities of opportunities would be achieved by "1) The creation of a sufficiency of open access places, particularly at the lower division level, defined as places available at low or no net tuition and within commuting distance for all high school graduates who wish to attend..." They also point out[29] that "...we have initiated the idea of Learning Pavillions where students of any age can stop in to study and to discuss their studies..."

Such a neighborhood center can be informal and inviting. If it is truly in the neighborhood, it will be unthreatening and can readily be culturally tailored to the people it serves. It can be small and need not have a large staff. Using non-human media-based instruction, it can be flexible as to hours and days of operation. A number of such centers would be needed in any urban area, and some other institution would be needed to function as a "warehouse" of learning materials and supplies and as an organizational coordinator. Many urbanized areas of the Commonwealth potentially have such coordinating institutions in the campuses of the University, the state colleges and the community colleges. In addition, since vocational education must be a specific part of the system, a facility for it would be needed; such a facility should be centralized because of the capital investment required in tools and equipment. Thus, there would be three facilities involved in each community, a number of neighborhood learning centers, a central vocational education facility and a supporting local institution of higher education.

Appendix D-3 shows explicitly what a neighborhood learning center would be like. That appendix discusses the concept and provides details to the point of a basic floor plan and equipment requirements. It illustrates that a center capable of servicing a neighborhood does not require extensive space. Many store-front locations would be fully suitable. At the same time, the learning activities which could be presented in such a center would be limited principally by available program materials (software).

The center should introduce or reintroduce the student to education in a way and in a structure which will make it a rewarding and successful experience. If it is that kind of experience, the likelihood is that the learner will gain the confidence and motivation to continue his or her education and enter the mainstream of educational activity. The Chicago TV College illustrates this pattern. They have graduated 400 students with Associates degrees gained strictly through TV, and have had 2200 students transfer to resident study at the other Chicago Community Colleges. The "success" of a center may well be judged by the number of its "students" which do progress into the educational main stream.

The staff of the neighborhood center should be non-professional people, indigenous to the neighborhood. Their primary capability should be an ability to empathize with their neighbors and aid them in feeling unthreatened and at ease. The staff should not be teachers because they should not engage in teaching, as such, nor should they approach a learner from a professional educator's point of view. The staff member must be a guide or an aid allowing the learner control of his education at all times. The staff should be trained in the learning center in which they will serve or in other centers serving similar neighborhoods. The focus of the training program should be the ability to relate to people. Training would be needed also, of course, in the operation of the system and the handling of materials and experiences available.

One question that necessarily arises when non-professional staff are suggested is diagnosis. Who is going to decide what a learner needs to learn and how he or she should go about it? One member of the Community Advisory Committee responded to that concern by pointing out that the clientele in question consists of adults, who know what they know and what they don't know, though they may not readily admit it publicly. Even if they are not certain which learning materials to sample first, once they do try, they will know whether the materials are "right" or not. The point is that the learner can and will diagnose his own ability and skills to a large extent. Giving the learner the feeling that he or she is expected and encouraged to do so is another important illustration of where the control of the learning situation should rest.

In an effort to discover the state-of-the-art of diagnosis a consultant was sought out. His report, Appendix D-2, discusses one presently useful approach. The system discussed there--Cognitive Style Mapping--represents the only currently operative attempt at diagnostics the project staff found. Much of that system seems to be a matter of semantics and questionable pseudo-science, but the process of mapping and prescription seems to have some merit. An adaptation of the existing process, including the simplification of terminology, could be developed so that non-professional staff could be trained to use it. The process of cognitive mapping as practiced need not be very elaborate or time consuming and represents primarily an analytical framework. A "map" can be developed by observation and discussion, without detailed testing. Such an approach, together with the self-analysis of the learner, would be a far more rigorous diagnosis than is presently normally performed, and should serve to aid in ensuring that the learner's initial experience with the system is positive. In no case, however, should that early contact with the system include an extended series of tests, scored by someone else with the results given the learner as declarations of which certificate he/she should seek or which courses he/she should take.

As has been mentioned, the materials provided in the Learning Center should be carefully tailored to the target population. They should reflect the cultural base of the neighborhood and must reflect the needs of the people of the neighborhood. If the learners want to learn to speak English, then language materials must be available.

Regardless of the cultural base, the materials should be vocationally oriented. The primary jobs which the neighborhood people have the ability and desire to do should be analyzed carefully so that realistic requirements are determined. The learning materials in the center should include the information people really need in their jobs or will need for potential jobs. An index showing the learning activities that relate to a given job will be necessary. Such an approach represents a departure from present practice, but again, is especially necessary for our clientele. In commenting on training and education, Robert Miller points out[30] that -

> Training, like the psychology of child-raising, has many fads and local prejudices depending on subject matter. When a man is taught to drive, the instructor usually comes straight to the point and gives him practice in the various tasks of driving. The man is not given the physics of traction, or internal combustion engines. But when he is taught to become a ham radio operator, he virtually learns how to design and build the equipment which the task requires only that he operate. Training in many areas of human endeavor includes much of what seems from objective standards, initiatory and tribal rituals. Thus an actual description of performance requirements may

> often seem meager and trivial when compared with ritualistic forms of training which are provided the trainee. Science may guide the art of training by helping to differentiate the irrelevant and ritualistic from the essential.

Total relevance is simply unachievable with the materials available today, but it is an ideal toward which to strive.

A file of community and neighborhood resources and references should be set up and maintained as an integral portion of the learning materials of the center. From that file a learner should be able to find out who to see or where to go for most of the services or public facilities of his neighborhood or community. Information should be provided about governmental services and must be specific even to names, telephone numbers, addresses, etc. Unless such specificity is achieved, relevance will be questioned and the impact lost. Obviously materials so specific and so current will not readily be obtained commercially. One of the learning activities of the center must be that the students develop such materials themselves. Updating the materials offers the chance for continual use of the same learning experience by different learners. There must be four levels of materials provided--neighborhood, community, state and general. The first two or perhaps three levels can be undertaken locally, the fourth will have to be prepared and provided otherwise, either commercially or specially as the case may be.

Trying to serve more than one culture also poses logistics problems. The solution is to add materials gradually as they are developed, and to have them developed as far as possible through learning activities. There are many people of "other" cultures in Massachusetts. Were they being served better in education now, this approach would seem neither novel nor costly. There are increasing amounts of software manufactured commercially which are somewhat culturally tailored. As the need for such tailoring is more widely recognized more material will be developed.

It was noted earlier that it would not be possible for the Learning Center to contain the full range of materials needed and that a centralized "warehouse" in the community would be essential. The Center should contain a variety of materials such as "survival" or "coping" information, basic education, high school equivalency and introductory college level material. Material preparatory to taking CLEP (College Level Entry Program) or advanced placement tests specifically should be included. The "warehouse" would contain additional copies of material and copies of less frequently used materials.

Tailoring learning materials is not the only adjustment that can be made for the clientele. The forms and procedures used in a learning center must be made to fit the people involved. In most cases, procedures are designed for the organization's convenience rather than the client's. Special efforts must be made to ascertain what information in what form is really needed and procedures adapted accordingly. Without doubt the initial information required of a learner should be limited to name, address and telephone number. Only after he/she found some use for the Center, should any detailed data be sought and even then it must be obtained in an inoffensive way.

While a Learning Center must be inviting and not overwhelming, one major concern disadvantaged people have is with quality. As was mentioned above, they have grown wary of programs that do not provide the "same" education that others receive. "Different" has often later been used as the basis for "special" certificates which proved to be unequal in the real world. This concern for equivalence and quality must be considered in designing the learning center, but even more care must be taken when decisions are made about the sort of certification that will be provided at the end of the learning program.

There should be at least two forms of certification, one which reflects incremental progress and one which represents completion of a program. In the latter case, the certificate provided should be completely "normal" - it should be no different than one earned by any other route. If it is a high school diploma, it should be a state or community diploma, not a "learning center" diploma or equivalency certificate. The certificates must also be fully acceptable at any other institution of higher education in Massachusetts. If an Associates degree is earned, it should not reflect any variance from any equivalent degree.

The incremental certificates issued should be of two types - completion certificates and competency certificates. The first should reflect the various courses or materials studied and tests passed. The second should cover such things as the work experience, vocational training and service experience a learner has had. It should state in job-related terms the tasks he or she can perform. Competency certificates should state that the learner has learned the necessary skills and demonstrated competence to be a machine operator, or accounting clerk, or bank teller, or electronic technician, etc. It should also state the specific skills learned, or should provide that a list of achieved skills can be available to any interested employer.

There need be no prerequisites to taking any learning activity at a center. The knowledge gained from a particular activity will be determined by a test designed to assess whether the learner understands the material studied. How much of it he or she knew beforehand need be of no concern. If a learner wishes to assess his readiness to study some specific material, he should be able to take, and evaluate for himself, a test or tests covering the normal preceding material. If he or she then decides to proceed with the later material, that must be his or her prerogative.

Mention was made of the need for a community-based vocational center, or centers if the community is large enough. Those centers could be the current MDTA (Manpower Development Training Act) Centers or could use some other existing facility such as Springfield Technical Community College or local vocational or technical schools. Separate facilities would be desirable, but it is likely that some currently underused facility would be available.

The vocational center should provide for remedial academic education as it may be needed for an individual learner. The academic material covered should be deliberately, specifically and obviously limited to exactly that which relates to the job training the learner is taking and should not include general or extended subject areas. The Neighborhood Centers can provide the broader material.

Rather than being an unaffiliated training center, the graduates of which have to find jobs for themselves after training, the vocational center should train people to entry level skill for local business concerns. Most job training programs have failed for a number of reasons; a major one is credibility. Often the training was not "real world" in content or approach and the students could not find jobs after they graduated. A radically different approach should be used. This scheme requires that companies hire disadvantaged people, tell them what their job is to be and put them on the payroll. Then, for the first few weeks, the new employee goes to the training center rather than to his or her job. The period of training depends on the existing skills of the person and his or her learning progress. The performance requirements of a job must be "spelled out" explicitly for the Center staff by the employer of the trainee. Graduation is based solely on performance of the needed job skills and the judgment of competence is made by the future foreman of the learner, not by the instructors or the Center director.

While employers might be reluctant to engage in such a program, the current Affirmative Action Program of the federal government provides a good base from which to start. Many affirmative action programs flounder because people with needed skills cannot be found. Companies are required to establish training programs and a vigorous community-based effort with assurances of ultimate company control should be acceptable and effective.

One difficulty faced by programs for the disadvantaged is how to make known their existence. Often the best intended program does not attract very many users. (The current Adult Basic Education programs are estimated to be serving 5% of their potential clientele.) The Community Advisory Council felt that the best advertising for such programs is word-of-mouth. A number of the Council members had used one or another educational program at one time or another and universally learned of them through other people. If a program is valid, if it is doing a job that needs to be dor: and doing it well, the word will spread.

While word-of-mouth is best and most used by our target population, culturally-based, local mass media (radio, newspapers) can also help. In

Springfield, for instance, the American International College radio station, which is black oriented, is used as a valuable source of local news. (Springfield no longer has a local Spanish language newspaper, so that avenue would be closed.)

Existing organizations, especially those which are known and trusted in the urban area are another source of promotion. There are a number of organizations active in every urban area and the learning centers will need to establish a cooperative relationship with them, not only for promotional assistance but to coordinate efforts and minimize redundancy.

The medium of television should be considered as a promotional channel, since the urban disadvantaged generally have ready access to it. They do not use it as much for information as for entertainment, but the early evening news is heavily watched and could be a fertile time for spot promotional announcements.

Lastly, promotion can be handled by using brochures. They are an inexpensive and often effective approach. A brochure used for an Adult Education Center in Worcester was used as the basis for a discussion with the Community Advisory Council. They commented on it from their perspective and made suggestions for its improvement. The suggestions were many and significant. They involved primarily a reduction of informational content, cultural tailoring and an increase in "catchiness." The changes they suggested were made and copies of the original and the revised brochure are included with this report as Appendix E.

The system described above, then, takes the following form. There are learning centers in each neighborhood in each city. They are staffed by neighborhood people who are not professional educators and they contain a wide array of learning materials. The centers are non-human media-based and give utmost access to their services through long hours and year-round operation in addition to their neighborhood location. The materials cover information about the neighborhood and community as well as a range of subjects from basic reading, writing and mathematics through high school equivalency and introductory college work. Learning activities outside the center can be arranged and are encouraged. The center's programs are geared toward life experiences rather than academics, with the learners controlling and evaluating their own programs. As little superfluous material as possible is presented. Each community has a vocational training center where people are trained to entry level skills for jobs they have been hired to do. The neighborhood centers and the vocational center are coordinated through the local post-secondary institution which also serves as a central storehouse of learning materials. The centers stimulate learners to move onward into resident post-secondary education.

The essential differences between this system and those currently existing are three. It is designed for adults, it is one complete system, and it is designed to serve. Being designed for adults means that the system recognizes that adults control their own lives, are autonomous, and are fully able to discern the validity of an activity for themselves in their lives. Adult learners can decide for themselves what they do and do not know or want to know. Their need is for the opportunity to learn what they wish. If they have questions, they will ask. They will make their own judgments of their inadequacies and their needs. They do not need to be controlled and will not accept being controlled if they can avoid it.

It is a complete system rather than a segmented one. It is designed to meet the full range of its clientele's needs until the client has the psychological, educational, and hopefully, economic wherewithal to enter the normal post-secondary education system. It is a system which encourages involvement by its accessibility and flexibility and is able to respond appropriately when a learner seeks to become involved.

It is a system which seeks to serve, and therefore has been designed to meet appropriately the needs of its intended clientele. It is available when the learner has time to use it, is conveniently located, and is responsive to the desires of the learner. It is structured to be relevant and remains so by responding to the needs and desires of the learner and his "real" life situation.

Those, then, are the primary variances between the system evolved here and those currently existing. They are differences stemming from an orientation toward meeting needs rather than permitting clients to gain access to an organization--rather a dramatic change of emphasis.

Involvement of Existing Institutions - There are many ways in which the proposed system will relate to the existing public institutions of higher education in the Commonwealth. The role of the coordinating Institution has been mentioned. In each community where there is an existing public institution of higher education, it is preferred that it provide the facilities and support for the coordinating activity. Where the existing institution has suitable facilities which can be used, with reimbursement, as a learning or vocational center, they should be so used.

The faculties of existing institutions will have many opportunities to participate. There will be a continuing need for the production or evaluation of software, which is treated in more detail below. Consulting assistance will be needed in the organization and operation of the system. Students will need information and guidance, as they undertake college-level studies, as to their future program and institutional affiliation.

Students in existing institutions will find numerous opportunities in the new system. They can be involved in the production of learning materials, especially as guides and mentors to the Center's students. Many current students could serve as Center staff members, if they meet the criteria of neighborhood identification. Students can also serve as resources to the Center to aid Center students in their various learning activities.

There are a variety of materials needed - survival information, developmental information and academic information. All of the material, based on the operation of the Learning Center as envisioned, will be presented through non-human media - films, filmstrips, slides, video-tape, books, etc. None will be transmitted "live". Much will be at less than the post-secondary level.

The Nolfi Report[31] points out that most of the post-secondary institutions in the state have video tape equipment and are producing "software" for their own use. It also notes that there is little reciprocal or cooperative use of programming or hardware. The exact nature and quality of the materials available is not known, so its suitabi: ty to the neighborhood centers cannot presently be assessed. Depending on the financial arrangements made, it seems certain that a number of post-secondary institutions would be willing to make available existing materials, or, depending on the required format, etc., would develop new materials. One early need, were the Neighborhood Learning Center system to be initiated, would be to determine what sources in the present system could meet the new requirements at acceptable cost levels. A factor in that determination would be the accrediting problems which are addressed below.

A recent report by Arthur D. Little, Inc. for the Massachusetts State College System and the New England Board of Higher Education sets forth sources of audio-visual materials for higher education available around the country. A number of organizations outside Massachusetts have college-level materials "on-the-shelf" and would surely be prepared to develop more, if sources within the state could not be found.

One can look to the public institutions for more than learning materials. Many of the faculty members at such institutions around the state have experience in off-campus, urban programs. Whether any have exactly the appropriate experience and would be willing to assist this project has not, to date, been ascertained.

Is the system as described, feasible?--An instructional system designed specifically to meet the needs of urban disadvantaged adults has been set forth in this report. Before ascertaining what role telecommunications can and should play in that system it seems necessary to determine the practicality of that system--is it feasible? If it is feasible, what problems with it can be foreseen?

At the outset it can be stated that the system described above is feasible. While it differs from current approaches by its philosophical base and its coordinated structure, most of the components of the system exist; some are even flourishing.

Models - There are a number of Adult Basic Education, General Educational Development and Manpower Development Training Act programs and activities presently existing--all of which are designed for adult education. There are a number of adult education centers around the state under the aegis of the Adult Education Program of the State Department of Education. Some of those "centers" are in school buildings and some are more nearly neighborhood-based. The OWL (Onward With Learning) center in Springfield is one of the latter. It is essentially non-human media-based, although some classes are carried on; it has been serving some 100 or more learners each day during the school year. (Attendance drops somewhat during the summer.) According to the Community Advisory Council members, OWL has been exceptionally successful in establishing a feeling of control by its learners and in individualizing its program. Other similar centers can be found in most of the larger towns and cities of the Commonwealth.

A number of post-secondary programs have been instituted with the intention of providing greater access to higher education. The expansion of the community college system, the consideration of an Open University, the University Without Walls (U.W.W.) program, the Career Opportunities Program (COP) are some. U.W.W. recognizes experience and non-academic activities and uses independent study and internships as alternatives to classroom attendance. It does not, however, have recognized, permanent locations in the community and it is restricted to post-secondary studies. COP is a program of on-site teacher training designed to help teacher-aides obtain their degrees and teaching certificates. It is urban oriented. It also is limited to college-level work and does not have permanent facilities.

While there may be some vocational training centers in Massachusetts which could be models of the kind suggested here, there is one in Connecticut which came to the attention of the project staff. The United Aircraft Training Center in Hartford has been in operation since 1968 and has trained over 500 disadvantaged people, using the system described earlier of training already hired people to meet the specifications of an employer. Its base of community support seems to be lessening, but it has been successful in the past and a determined commitment to its function could revive it in short order.

So much for organizational models. They exist and need only to be synthesized into the composite system described. The media technology also exists. To some extent that is illustrated in Appendix C-3. It is also illustrated in the OWL Center in Springfield, the audio-tutorial course arrangements at Worcester Polytechnical Institute, the geology course at Arizona State University and in many other courses and places. Not many institutions use non-human media to the extent suggested here, but the reasons are organizational and political, not functional. Attempting to move from a "teacher"-based system to a non-human media-based system engenders much, often irrational, resistance on the part of the teachers. Establishing a new system with a technological base from the outset is entirely possible. There is a staff in the suggested system, but they serve a function which reflects an expanded definition of the concept of "teaching".

Thus, the components and technology for the system are currently available. It remains to put them together.

Economics - Any suggestion for a "new" system of anything speaks of financial considerations. There exist programs designed and funded to carry out the activity discussed here in different ways. While consolidations and the elimination of redundancy could provide an organization and funding base for a revised system, the political realities suggest that any expectation of such an occurrence would be extremely optimistic.

Initially a model or prototype approach certainly would be needed. To obtain a reasonable estimate of how the full-scale system would work, four neighborhood centers, a vocational center and a coordinating post-secondary institution would be required. Without relying on any existing programs or facilities, the initial capital cost for auch a prototype would be appreciably higher than might be the case if full community and state support were obtained. The centers could service about 2,000 academic learners and 500 vocational learners (who would be spread over the day, week and year). The generation of reliable cost figures would require knowledge of the location, availability of materials, administrative requirements, and the like.

United Aircraft assessed the costs of their Training Center vocational program for the Hartford business community. In 1973-74, they spent an average of about $1,300 per graduate with an average training time of 9.2 weeks. About 1/2 of their learners had been on welfare before training, but only 15% of their graduates were subsequently unemployed for a significant period.

In calculating the benefits of converting unemployed persons to employed taxpayers, economists include the wages earned and taxes paid on those wages as benefits derived by the economy. Such an approach ensures benefits that outweigh costs, since the costs of education are a one-time expenditure while the wages and taxes extend over the lifetime of the educated person. Henry M. Levin estimates[32] that on a national basis the return would be about 5½ times the cost, excluding the savings realized in welfare expenditures and losses due to criminal activity. The latter two considerations alone amount to about 15% of the costs of education and would enable the recovery of training costs in less than seven years. The costs and benefits applicable to Massachusetts would depend on which of a wide range of possible assumptions were made as to salaries, taxes and educational cost. The benefits will surely outweigh the costs in almost any case. The costs (or savings) in human anguish cannot be established in dollar form, but to some are an even more important concern than purely economic results.

Organization - The feasibility of successfully establishing the system will, in part, be a function of its basic "sponsorship" - the organizational umbrella under which it exists. That sponsorship should be state-wide in character. It should be centered in the Office of the Secretary of Educational and Cultural Affairs of the Commonwealth, the State Board of Higher Education or the State Department of Education. Other possibilities, but less likely choices, would be the University of Massachusetts or the Open University--should it come into being. Of the apparent choices, the Office of the Secretary or the Board of Higher Education seem most suitable. The Secretary is concerned with all education and the Board of Higher Education through the Title I program, is involved with Continuing Education programs for adults. In any case, a single agency should have the responsibility for the program.

While the ultimate sponsorship of the system must be at the highest state level, the operation of the system will require cooperation among existing local organizations. The various local Board of Education, post-secondary institutions, manpower programs and the like, need a focus for their efforts. The Neighborhood Center could be such a focus. To approach adult learning outside the existing programs would be costly and so threatening that intense resistence would necessarily arise. Expertise and facilities exist. Bringing them to bear in a coordinated fashion, will result in economies because of reductions in redundancy of effort and structure. The present drive for economies in education make such an approach almost imperative.

Having superordinate state-level control should enable meaningful certification. As has been stated, every certificate issued by the program must be uniformly acceptable across the state. The present uncertainties of the acceptability of the certificates of one institution to some other must be ended. The GED tests of high school equivalency have alleviated entry level problems for post-secondary students, but advanced placement or accelerated progress should be equally secure. For a Neighborhood Learning Center program to be effective, it must have legitimate and effective certification of accomplishment.

Another major state-level function would be the establishment and monitoring of certification criteria. What must one be able to do to get a certificate? In some cases, GED and CLEP (College Level Examination Program) for instance, the requirements are reasonably established. For basic education they are not so well settled. Defining those requirements and keeping them meaningful and up-to-date will be very important.

Finally, the state-level sponsorship should provide for some centralized functions. The selection and procurement of instructional machinery (projectors, etc.) should be centralized, although some variances must be permitted to provide local flexibility. Many instructional materials will be procured and/or developed centrally because they will be required at all the centers. In general, those activities which are system-wide and offer economies of scale, should be centralized to realize those economies. The state-wide sponsorship should also encourage, or even require, the use of existing facilities where they are available. (The new videotape reproduction facilities being set up at U-Mass., Boston is a case in point.)

Problems - If it is feasible to activate the system described above, what are some of the problems which will be faced? A number have been mentioned, the primary one of which is inter-institutional rivalry and protectionism. The present segmentation of adult education has established areas of vested interest which will have to see results of value to them before meaningful cooperation will occur. (Local School districts would see the system as a diminishment of their role, for example.) The present need for students and the growing financial woes of post-secondary institutions may make them more flexible than they might otherwise be, if they see a new source of students rather than a diversion of some who would otherwise accrue to them. Learning Centers, as has been said and as illustrated by the Chicago TV College, will be a new source of resident students for the post-secondary institutions and should, therefore, be favorably regarded. Questions of certification and coordination will be of concern, however.

The economies of the system have been addressed. Any new or added organizational structure implies some facilities and staff and thus the expenditure of funds. The potency of the basic sponsor organization will dictate the funding required, since the needed funding will vary immensely with the commitment drawn from existing organizations. Learning activities in the Centers should be cost-free since they will be primarily informational, non-college level and/or basic post-secondary. They should be used to provide education missed or ineffectively provided earlier or as an encouraging introduction to post-secondary learning. They should illustrate a commitment to full service, adult education.

Not only will the transferability of certification be a potential problem, as has been mentioned, but the kind of certificates awarded may be also. Again, certificates issued through the Learning Centers must not be distinct from others; they must be the same as would be awarded for "normal" high school graduation or course completion. If an Associates degree is achievable it, too, must be such that no stigma can be attached because it was earned through Learning Center attendance. Other forms of certification must also be available. Certificates of competency in specific occupational roles were mentioned and deserve reiteration. Since employment related study is necessary and greatly desired by all adults, specific studies should be available and special certificates provided.

Problems will undoubtedly arise because of the proposed heavy use of non-human media. Such use generally is viewed as a threat by teachers or faculty, although it might better be recognized as a liberating change. If faculty did not have to expend their efforts in transmitting information and insuring that they were understood, they could really aid individual students and determine effective learning activities. They could concern themselves with learning, rather than with teaching.

The philosophical reorientation to a <u>learning</u> system poses a number of other potential problems. The process will be not one of information transfer but of competency acquisition. It will necessarily be a more activity-centered process. Since the learners' needs and limitations will be controlling, there will be new organizational patterns -- hours of operation -- as well as new staff behaviors. The system will require a new centricity, moving from concentration on the institution (scholiocentricity) to concentration on the learner (anthropocentricity) as Cyril Houle pointed out at the Conference on Opening Higher Education (See Appendix C-1). Reorientations of that sort require many changes which cannot presently be foreseen and which will cause problems. The reorientation, however, would evolve to a system which, in the final analysis truly serves the people of the Commonwealth.

As was stated at the outset of this section, the system envisioned <u>is</u> feasible. It will be different and thus not without problems, but it can be achieved; enough illustrations exist to ensure that. Whether it is established will depend on the perceived need for adult education in Massachusetts, especially for the urban disadvantaged adult, and the commitment of the Commonwealth to meeting that need. It may be that the system can more easily be established or will function better through the incorporation of telecommunications. That possibility shall be considered next.

Telecommunications

The description of the instructional system which seemed most appropriate for the selected target population was rather long and detailed. A skeletal description would not have provided a real basis for evaluation. If the system were to be used as a basis for considering the potential for applying telecommunications, it had to be explicit and have real potential for implementation. The next step is to review the patterns of communications within the system as described.

Appendix C-4 raises some specific questions about communications which can be applied generally and which may be helpful at this point. The questions can form a framework for analysis. Essentially they are:

What need for communications exists?
Who is to be served? What needs do they have?
Must those needs be met? What alternatives are there for meeting them?
Where are the potential users located? How numerous are they?
What information in what forms must be transmitted?

There are two recognizable flows of information in the system - information flowing to and from the learner and information (generally of an administrative nature) flowing to and from the staff members. For present purposes each will be considered individually.

The information to the learners flows from some source or sources through a storage process (to enable it to be used at the learner's convenience) to the learner. The sources may be many and varied and are not presently fully identified. One possible source is a commercial learning material developer - a publishing house or its equivalent; another would be a local or regional educational institution or studio and a third would be the Neighborhood

Center itself. Since all of those sources would process their information for storage and playback, none must be connected directly or instantaneously to the learner.

To minimize the redundancy of materials, "warehousing" of learning materials at some central facility in the community is necessary. A means of accessing that "warehouse" automatically and transmitting the desired materials from the "warehouse" to the Learning Center or the learner is desirable. Enabling random access to and within the "warehouse" by a learner at a Learning Center would certainly reduce the cost of transportation and the amount of material stored at the Learning Center itself.

Administrative information can flow to the learner by face-to-face communications with the Neighborhood Center staff. The use of a personal interface, in fact, is desirable because the target population has a strong need for personal contact.

The same personal contact can be used to receive feedback from the learners about their learning activities and their new needs and requirements. For the system to be responsive, a mechanism which encourages such feedback and is capable of indicating acceptance is desirable. The most responsive "mechanism" is face-to-face contact.

As far as the learner goes, then, there seems to be a need for a communications system to connect the learner (or Learning Center) to the centralized storage facility. That need is very real since, if the system is to <u>be</u> functional, the learners must have access to more learning materials than can be stored in the Neighborhood Center. The basis of the system is its ability to serve well a diverse group of learners. Some means of securing the materials from the local storage facility is, therefore, an obvious requirement.

Alternative methods of operation do exist. The centralized storage idea could be foregone and all learning materials could be stored at the Neighborhood Centers. Without a better picture of the amount of storage involved, a fully valid assessment of that approach cannot be made. Ultimately, a large number of Neighborhood Centers are contemplated and if a wide variety of material is stored in each, it is likely that the costs of reproducing and storing the material locally would be substantial. At any one center the college-level material, particularly, would not be in constant use and efficiency dictates some sharing arrangement. A state-wide storage facility would be too remote for the quick response needed, so the local storage approach appears to be preferable.

The number and geographic distribution of the learners will dictate the distribution of the Learning Centers. Over the state, the distribution of the "target" population is shown on the maps in Appendix C-2. Communications, other than by mail, with the learners outside the Centers is not contemplated. In any given community the location of the Neighborhood Centers relative to the coordinating institution (the "warehousing" point) will be based on the distribution of learners in that community. There will be a number of Neighborhood Centers, so their distribution is more apt to be radial from the "warehouse" than lineal.

Lastly, the information to be transmitted to and from the learners should be considered. The learner will need both audio and video material and the video should have some motionability--the motion rarely will need to be full, fluid motion. Their feedback could be in the form of data signals for automated operation, as in computers, or in audio form if a human operator were used. The system would transmit the audio-video one-way (from the central storage facility to the Center) with audio or data feedback.

For administrative purposes there is an obvious need for communications between local facilities--the Neighborhood Centers, the Vocational Center and the Coordinating Institution - and between local facilities (or at least the Coordinating Institution) and the State-level sponsoring agency. Less certain requirements exist for intercommunity communications, but some provision should be made for that, if possible.

The various activities need coordination of effort and the ability to give and receive assistance in a timely manner so that at least some of their communications can be instantaneous.

If the overall system is to remain functional, there is a strong need for communicating administrative information. The Neighborhood Centers might be able to operate autonomously, but would have to contact some other agency (agencies) to secure funds.

The effectiveness of the system would be very much influenced also by the level of cooperation and coordination with other localities. Learning materials and equipment will undoubtedly have to be transferred from one location to another and some means must be provided to arrange and coordinate such transfers.

Alternative organizational patterns could be established for administrative purposes. A three level system, such as that suggested, should provide thorough coordination and a minimum of organizational superstructure. Eliminating the local coordination as a general case, would serve only to expand or overburden the state-level group. In the case of very large or very small communities some change in structure may be required. For very large communities some sub-community level of coordination may be needed and very small communities may need to be grouped for regional coordination. Such changes do not represent anything significant from a communications standpoint. There would be little change in need as a result. If the organization becomes very closely controlled and coordinated at the state level, which does not seem probable, then the need for administrative communications could become a major concern.

As was mentioned in discussing communications with the learners, the number and location of the Centers and Institutions cannot be forecast exactly. When the full system is implemented (after any pilot program phase), there will be a number of coordinating institutions - roughly one per community - each of which will service at least one Vocational Center and one or more Neighborhood Centers. The communications pattern will flow between the state central group to and from the coordinating institutions and from them to and from the various centers.

In general, the administrative system will have to be two-way throughout and the need will be for audio and textual transmission. While video information might be needed, that need would be very sporadic and extraordinary. Most visual material could readily be transmitted by use of still pictures.

Thus, the two systems are rather different in their requirements - one having primarily heavy one-way "traffic" and needing video capability and the other having two-way needs oriented toward audio and printed matter. What kind of communications system (or systems) could accommodate these requirements?

Since the administrative network is the less complex of the two, it will be considered first. It requires essentially the same level and kind of communications as now exist between or within many governmental agencies or business organizations. At the outset there does not appear to be any reason for an exclusive telecommunications system to meet these requirements. The existing public telephone system and U.S. Mail should be adequate. As the educational system develops, the level of communications between administrative groups should be monitored to see whether the amount of "traffic" warrants some more complex arrangement. The next step would be to lease one or more "private lines" from the phone company, which would permit greater use at less cost than normal one-at-a-time telephone calls. The need for transmission of print can be served by mail or, if the need is found to be for rapid exchange, by facsimile using normal telephone circuits. Again, the level of usage envisaged at the outset would not warrant any exclusive network.

The requirements are more complex for a communications system to meet the needs of the learners. Since the primary need is between the learner (at his Neighborhood Center) and the centralized "warehouse" of additional learning materials, no statewide network would be warranted. Nor would a network linking various Centers within a community seem necessary--the interchange of materials between Neighborhood Centers is not expected to be very extensive.

The system in each community, then, would link the Neighborhood Centers and the Vocational Center to their Coordinating Institution (the supporting post-secondary institution). Since the relative locations of the various facilities cannot be forecast, a radial system would have to be projected. It would need to provide for audio-visual (with some motion-ability) one-way -

from "warehouse" to centers, and some "command" information (information indicating what was wanted) in the reverse direction. More than one channel should be available to each Center and each Center's channels should be segregated from those of other Centers. With even a small number of channels devoted to a Center, it is unlikely that all will be busy continuously, so a sharing arrangement would be desirable. Finally, since the materials requested by any Center at any time will be random, some random accessing arrangement would be needed at the central "warehouse."

Some of these requirements are more easily met than are others. Connection by cable would be expensive. Wire would limit the potential usage and would also be very costly. A radial system providing a limited number of channels (4) could be provided readily by an ITFS system, but not more than four Neighborhood Centers could be served by each system unless some channel sharing arrangement was provided. In addition, the number of ITFS systems which can be installed at any one location is limited by licensing constraints, so the number of Neighborhood Centers which could be served from one "warehouse" would be limited also by that constraint. The present limit is two systems in a given location so eight channels could be provided. How many Neighborhood Centers could be served would depend on the amount of contact each would need with the "warehouse" and thus the sharing of channels which could occur.

Even if the available channels are sufficient, providing for random access at the "warehouse" is a major problem. A number of computer controlled systems have been developed which can provide some level of random access, but the computer and required storage equipment is complex and expensive. Most such systems also do not provide full random access because they do not include many duplicate programs - for cost and storage reasons - and thus either only one learner at a time can use a particular program or the program is accessed while partially run. As a result, automatic random access does not seem feasible. An arrangement providing manually controlled transmission could be set up, but would be costly, since there would need to be staff available at all times. There does not seem to be enough need for the rapid response provided by such an arrangement to warrant the cost.

The PLATO System, which has been mentioned, would fit very neatly the requirements existing here. It operates over telephone lines so no special transmission system would be needed. It provides random access. It would be costly, because a large centralized computer is used, so regional storage would be more appropriate than local. As has been stated, however, PLATO is not yet fully operational, and, for now, offers only a tantalizing prospect for the future.

Other telecommunications systems--broadcast television, radio, teletype, etc. - are not as feasible as ITFS. Generally, they cost more, are not as well suited to the specified requirements, and will not provide random access to the materials in the "warehouse."

For the present, then, it seems that telecommunications cannot meet economically the needs of the learners in the educational system as designed. There are possibilities for the future, but they can be adapted to the use of existing basic facilities on a part-time basis forestalling the need for the investment in yet more transmission systems. A system of physically transporting tapes from "warehouse" to Learning Center appears to be a more suitable choice at present and for the medium-term future, say 5-10 years.

What About Other Populations?

Up to this point, the report has dealt with the definition and elaboration of a system of education particularly suited to the urban disadvantaged and with the communications system which might be used to support that educational system. The structure which has evolved is somewhat different from that which might have been projected because the needs of this particular target population dictated that it be different. As a result, the supporting communications system may also be peculiar to the original target population. Other populations may exhibit differences that need to be reflected in different instructional systems and the telecommunications support suggested may then vary.

Initially it is important to restate that the needs and characteristics of this clientele are not wholly peculiar. They are adults who want to learn. As a result, much information about them would be equally applicable to other adult groups. At the same time, certain learner characteristics or system components are especially important. The level of motivation, types of needs, learning styles, location, availability and mobility of the learners are all important to the design of the educational system. The required learning materials, sources of learning materials, and instructional media employed are system components of critical importance from a communications point of view.

Critical Factors - The level of motivation of the learners will dictate how responsive the system must be. If the learners have determined that they must have a degree, they will accept almost any constraint or discomfort to obtain it. If their need is not so great, or if they take the interaction with the institution as being personally directed and are dismayed by it, they will not adapt and will quit. Motivation may well be simply a function of the perceived value of the potential reward. If great future value is expected, the intrinsic value of the activity increases and the willingness of the learner to adapt follows. If the reward is perceived as being uncertain or is not as highly valued, motivation may be much less. Some of the research on educational television showed that traditional students adapt themselves to whatever teaching method is used, normally without strong objection. Lack of motivation has been used to excuse a number of problems such as poor teaching, irrelevant materials, inappropriate location of the facilities and financial problems. Motivation, however, whatever it really represents, is a critical factor in assessing other learner populations.

Educational needs may vary from population to population. The kind of results sought and their diversity are particularly important. As stated earlier, the disadvantaged need more "survival" information than would a businessman or suburban housewife. While 87% of these in Massachusetts over 25 years old have not completed college, only 42% have not finished high school.[33] Those groups would have somewhat different needs in the academic area. Needs dictate the subject matter to be provided by the system.

Learning styles may vary also from one learner group to another. The critical aspects of style are the facility with which a group manipulates symbols (especially print), the amount of tactile (physical) involvement needed, and the preferred group setting (individual, small group, large group). The detailed breakdown of the Cognitive Style Map approach probably is not warranted for a collective style because the individual variations within the group are too great. Nonetheless the "average" style of a population group will predict to some degree the instructional methods which can be expected to be used best with them.

The location of the learners, their geographic distribution and their concentration are important. As the learners grow more dispersed (even if they are numerous), the potential methods of contacting them economically become fewer. As their numbers shrink, again, economic limitations come into play. The mode of communications most feasible will be controlled by the number and location of learners.

The availability and mobility of the group also affect system design. If they can be available when and where classes are held, classes are feasible. If they are available only sporadically, then more individualized scheduling is necessary. If the learners are mobile, the learning resources can be centralized, but if the learners cannot move to the resources, then some means of dispersion--decentralization or communication--must be found. Constraints are imposed by such factors as jobs, families, community commitments and institutionalization.

The characteristics of the learners thus impact on the educational system through the type and method of presentation of learning materials which suit the target population. The media used will also have to be adjusted depending on the intrinsic qualities of the learning activities required. If they use factual or aesthetic materials, if they require motion rather than still pictures, or if they require physical activity rather than sedentary receptivity, the media must be selected accordingly.

The nature of the learning materials will also affect the potential sources of information. One institution normally is not prepared to provide basic reading, vocational skills and college level academic material. If all material is presented in delayed form, the sources become of less concern, so long as economically acceptable sources are available. If the learners simply could and would use the existing institutions, the organizational structure would be no different than it is at present. As the need for new organizational forms develops and as it varies from learner group to learner group, the structure must vary as well.

The communications technology applicable to each learner group will depend on the appropriate educational system. The educational system can be designed to serve best the needs of the learners. The technology is available to support almost any system configuration chosen. Whether telecommunications is used and how extensively, can be answered first based on the intrinsic needs of the system and secondly on the economics involved.

The Other Populations - Adult learners reflect a wide array of potential groups. Beyond the urban disadvantaged who have been the "target" thus far, the rural poor, the institutionalized, "second chance" students, business-based students and traditional students are categories which should provide a good sampling of other "populations". The educational system(s) that evolve when the critical factors just discussed are applied to each of these groups follows.

The rural poor have been found to have the same needs, motivational problems, learning styles and most other characteristics as the urban poor. They are more dispersed, but are somewhat more mobile. Television would enable more ready contact with this group, but they have not been responsive to TV alone in the past. The University of Wisconsin "RFD" broadcast television program was carefully designed to appeal to rural families. Its cost was high and its effectiveness was still at a small (under 2%) percentage of its potential viewing audience.[34] The State University of Nebraska is trying presently a system combining television broadcasts and learning centers, but since it is not yet in operation, nothing can be learned from the program as yet. Kentucky will soon have a series of GED preparatory television programs specially designed for rural viewers. Indeed, the number of such programs is growing, but television does not seem to be attractive as a learning media.

A test series of programs could be run in the Western part of Massachusetts and the results carefully analyzed, but the likelihood is that they would not attract enough viewers to be economically acceptable. If they are not, then a pilot group of learning centers should be established. (The tailored programs designed for television could be, of course, available in the learning centers- as will be the case in Nebraska.) Approximately 15% of Massachusetts' population who are over 25 (473,000 of 3,142,000) live in rural areas, so they are a substantial group.[35] Unfortunately, it is unlikely that they can be economically served.

The institutionalized are not really a homogeneous group. Those in hospitals include the full range of adult learners. Those in prison are somewhat more coherent and might warrant special treatment as a result. The common factors those people in institutions do have are their extreme immobility and the fact that they usually have a great deal of available time. For present purposes, then, institutions can be represented as neighborhoods, the citizens of which have a diverse set of needs, but who are likely to be enthusiastic recipients of educational services. Those characteristics suggest that a learning center tailored in size and content should be projected for each institution.

"Second chance" students are those who, for one reason or another, did not complete their education in the normal time frame. Again, they are a diverse group, some having left school at elementary level and others at later stages along the line. Those whose education ended in the lower grades would likely be included in the initial target population discussed - the disadvantaged. Those who left school later are more likely the ones to be considered at this time. They can be divided into two groups - those who dropped out of college and those who dropped out of high school. They are relatively large groups - almost 15% (501,000) of the population over 20 in Massachusetts started but did not finish college and another 18% (640,000) started but didn't finish high school.[36]

College drop-outs often have high motivation and their needs would be for normal college-level academic material or the vocational and/or enrichment data usually found in Continuing Education courses. They are dispersed and mobile, but their jobs and families may restrict the time they have available.

Textual material is fully appropriate for them. These are students who are reasonably typical of contemporary American adults and, as a result, there exists little social pressure to provide them new educational opportunity. They would be desirable to institutions of higher education as students, because they would "fit" readily into the current system. They are the group for which broadcast television is most feasible. They are numerous enough that even the small percentage attracted to television courses is a large absolute number. Since so few are attracted by educational programming on broadcast TV, if a majority of them are to be served, a better means than television - possibly learning centers - will have to be devised.

High school dropouts are a more difficult group to serve. They are apt not to be as affluent as the college group and thus may be more constrained (financially, in mobility, in time, etc.) in their ability to take advantage of educational opportunity. They need more basic material to start and have a longer (possibly more difficult) commitment to make if their goal is a college degree. Again, if a small percentage--in this case probably even smaller than that for the college drop-out group--is acceptable, broadcast television can be used. If a real commitment to them is felt, again, a more vigorous form of outreach is implied.

In general, "second chance" students are students for whom there is not much social pressure to provide educational opportunity because they are "getting along" reasonably as is. They are reasonably able to use the existing system should they really wish to do so, but could enrich their lives through the "right" educational opportunity.

Business-based students are another group whose characteristics and needs should be assessed. Those are students who take courses directly related to their employment, who usually are professionals and whose employers frequently share some or all of the costs involved. Such students are normally interested in technical - scientific or engineering - courses at the graduate level. As students, these people are more capable than most others, and, because of the direct relationship to their employment, more motivated. They are able to use textual material and can work with a high degree of independence. Since they are employed, and often have families, they are not as available as some other groups, but they are relatively affluent and mobile. The nature of the information they seek limits their sources to certain graduate schools. The factual nature of the material lends itself to textual presentation, with some laboratory work.

A number of ITFS systems have been installed for the use of business-based students. Except in the case of laboratory courses, ITFS provides greater capability than is normally used since the normal format is to transmit a classroom lecture as it occurs. A relatively ideal arrangement would be to connect a single academic institution to a number of surrounding industrial concerns. The cost of the telecommunications equipment is kept low and, if there are a number of businesses involved, the businesses will often defray the cost of the system and its operation. Interconnecting academic institutions on such a system, which then requires some lineal transmission system, generally would be uneconomic. The classic illustration of a single institution system is that of Stanford University. Its system "feeds" some 30-35 business concerns and is rented to Santa Clara College for a portion of the time. Strong business support makes the system financially viable.

Other means of telecommunications could be used to meet the needs of this student group, but no others offer the potential for economic operation of ITFS. The number of students and their specialized needs are not susceptible to broadcast operation.

The Colorado State University SURGE program (See Appendix D-4) offers an alternative worthy of consideration. A video tape system is used which sends tapes of classroom lectures by commercial delivery to the remote locations where the students are. The CSU system has been successful both in cost and response and under the right circumstances--relative location of off-campus facilities and number of students--is more economic than ITFS or other electronic transmission.

Traditional students are the last group whose needs will be reviewed. They generally are highly motivated toward degree preparation. They are more literate than most other groups. They are numerous and are spread throughout the state. Their availability and mobility are generally high. They are acclimated to the existing system, so special arrangements are not necessarily required. The flexibility they provide enables the system to optimize its own operations. If learning centers are set up, this group can be directed to a learning center or away from it depending on the exigencies of the time. They could learn from broadcast radio or television if necessary. Any arrangement that served other groups could also serve this one. How well the present system is meeting the needs of traditional students has been an issue of much debate which shall not be reopened here.

Telecommunications Applications - As a general case, in considering alternative telecommunications arrangements and their suitability to various target populations, there are some aspects of the communications system and its application to higher education which will not change appreciably. There seems to be no need for real-time contact between a teacher and his or her students; interaction is desirable, but not necessary. The devotion of a telecommunications system to one use or user group of often uneconomic. If the system is used during the day by one group, in the later afternoon by another and in the evening by yet a third, the usage might be heavy enough to become economically acceptable. Better yet, if the basic system, the microwave radio for instance, were used to carry a number of users' information--maybe the state government's as well as the educational system's--then the economic base becomes substantial. Devoting a system to higher education might stimulate some creative uses, but they would be hard to justify from a budgetary standpoint.

The use of broadcast television is a rather basic decision. It is effective in presenting complex information to a motivated but disperse clientele. It is not very flexible since it is a one subject-at-a-time device, and it is expensive. It will not reach a very large proportion of its potential audience, but the audience can be so large that even that small percentage can be a substantial number. It would be suited to "second chance," business-based and/or traditional students--an influential, but less needy set of groups.

A closed-circuit system, without broadcast television as a component but with ITFS included, could be of interest technically and would serve as a stimulating adjunct to the educational system. It could diversify the offerings, at any terminus, but would not inherently expand the student body beyond those presently active. The ITFS component of a closed-circuit system could be established independently, without the expense of the interconnecting system, and could serve the same clientele it otherwise would. Unless other uses were established a closed-circuit system alone could not be justified for higher education, or even education generally.

Cable television offers only the lure of free access. The latest development in the cable TV field--the Whitehead Report--which proposes to give cable TV common-carrier status, is very apt to remove the "free" from the access. The basic attributes of cable TV are no different than broadcast and the same questions and problems exist. It can offer access to homes via TV, but not really better than broadcast. If a decision were made that broadcast were "right", the cable TV companies would also carry those broadcasts. As a result it does not seem worthwhile to try to build a system around cable TV as a separate, distinct entity.

Colorado State University, as mentioned above and in Appendix D-4, has developed a number of off-campus programs using low-cost communications methods.[36] Their Colorado State University Resources for Graduate Education (SURGE) program uses video taped class sessions with supporting written materials shipped to off-campus locations by commercial delivery service. The students in SURGE are business-based and use their employer's facilities for laboratory sessions in electrical engineering. In 1972-73 over 30 courses were offered in this program and over 1200 students participated. Evaluations of the program consistently indicated that students in the remote classes were attaining levels of achievement equal to that of on-campus students and preferred video tape classes to the other options available to them. The costs of SURGE average $52 per quarter credit versus $65 per quarter credit for on-campus instruction.

Colorado State also has a Cooperation Via Televised Instruction in Education (CO-TIE) program in which the same video taping facilities and methods used in SURGE are used to provide course material to a number of cooperating colleges. CO-TIE also has a statewide audio network - a telephone network - which enables real-time recitation periods and is used for blackboard-by-wire and slow-scan television. The marginal value of the audio network is not assessed in the published information.

The advantages of video tape operation noted by Colorado State University are as expected -

--freedom of scheduling

--reuse for those absent

--reuse for reviews

--no geographic limits on use

--lower capital cost than broadcast

--self-evaluation by faculty of presentations

These programs at C.S.U. serve to illustrate that a vigorous, successful outreach program in higher education need not be based on the use of telecommunications and where used, if used creatively, it need not be elaborate or costly.

As is pointed out in Appendix D-1 (Pp. 18-19), the economic comparison of videotape delivery versus radio transmission depends on the number and location of the organizations (or students) to be served. If the number is small or if the number is large but they are widely dispersed geographically, a tape delivery system will be more economic; if the number is large and they are nearby, a radio system is feasible. For the other reasons cited, a tape system would generally be preferred.

In summary, it appears that there is no present justification for an elaborate communications system for the use of public higher education in Massachusetts, whether for a specially designed educational system or for that which presently exists. Two possible uses of telecommunications which are of limited utility do offer some improvement in access for two populations --

Broadcast television could be used for the general adult population, but it is not very effective.

ITFS can be used for institutionalized or business-based learners because they are concentrated in groups. (When businesses are involved, they may provide enough support to offer financial viability.)

A system of video tapes delivered to remote locations seems to offer a number of attractive advantages over a radio transmission system.

Next Steps

Telecommunications does not offer an alternative to learning centers whether for the urban disadvantaged or other populations.

Should the Board of Higher Education decide to establish a pilot program of learning centers, then, what would be the next steps in the process?

Initially a plan would need to be formulated setting forth specifics such as --

The community in which such a program could be undertaken based on tentative commitments to cooperate of the local school district, post-secondary institution, businesses, government and other agencies.

The costs of setting up, staffing and operating the requisite centers in that community for a three year period.

The organizational structure involved, including specific manning levels and job descriptions.

The specific learning materials to be procured and/or produced, and the specific sources of their supply.

Such a plan, developed to a reasonable degree of detail, would require about 9-12 man-months of professional effort over a 6-8 month period at a cost of approximately $40,000.

As a part of the planning process, a determination would have to be made or assumed as to the locus of the state-level control of the system. Otherwise a number of organizational questions could not be resolved.

A large composite group of representatives from various organizations should <u>not</u> be involved in the development of the plan itself, although such a group should be established to <u>advise</u> the planners and <u>provide needed contacts</u> with affected organizations.

Having a detailed plan, the Board could determine whether to proceed with the pilot program or not. If the decision were to proceed, the next step would be the establishment of the program itself. To establish the program would involve -

Locating and hiring the coordinating and training staff for the community headquarters.

Obtaining the necessary space, equipment and materials.

Recruiting and hiring the staff for the individual centers, unless local resources were to be made available, which would be preferable.

Initiating the Coordinating Institution activity.

Initiating one Neighborhood Center and subsequently the other NLC's and the Vocational Center.

Operating the Centers, evaluating their operation and adjusting as needed to optimize operations.

As part of the implementation process, the Board should employ its own evaluation agent and should seek interim evaluations from that agent, the project staff <u>and</u> the other organizations involved.

The funding needed for the implementation of the pilot program cannot really be estimated at this point. The planning process will establish that. A well-drawn plan should enable the acquisition of federal and/or foundation support for the program, and local industrial and commercial support should also be forthcoming.

Conclusion

The preceding report has reviewed telecommunications as it currently applies to higher education. The Telecommunications Project staff has tried to evolve an educational system particularly suited to a specific target population and to see what current telecommunications technology could contribute to that system. These findings were extrapolated to other populations to determine what role telecommunications could play for them with the conclusion drawn that no exclusive telecommunications system seemed warranted, given the present instructional system or that designed for this target population. There are presently two potential applications - Broadcast television as an attempt to provide broad general access to higher education and ITFS for special business related uses.

At the same time, there are needs for adult education and broader access to higher education which are not being met. Those needs extend to the general populace but are acute for the disadvantaged members of society. Their resolution seems to require a somewhat different instructional model--a learner-controlled, individualized, non-human media-based system--a system that for urban areas would be embodied best in Neighborhood Learning Centers.

The technology of telecommunications is not likely to change sufficiently in the reasonable future (10-15 years) to alter the current situation. The potential for cable TV is clouded and cannot be viewed optimistically. A technological improvement that does offer hope is PLATO (the computer-assisted instruction-system). PLATO offers the potential for economic computer assisted instruction with visual display capability.

Whatever method is chosen to meet the recognized needs, should serve to aid each individual who has a concern about his educational future. In Diversity by Design, Gould says[38] -

When we speak of opportunity for the individual, we speak out of concern not only for that individual alone but for the quality of life within American society at large. Millions of people among us could obtain both enlightenment and material benefit from further study, yet they fail to do so. Some are even to be found in the most economically and intellectually advantaged parts of society, because present practices of higher education do not interest or challenge creative people. Yet most of those who do not fulfill their potential have had obstacles in their way because of certain group characteristics: they are poor, they are women, they live in the wrong place, they are confined by law, they come from a restricted racial or ethnic background, or they are beyond traditional college age...

Full opportunity to learn cannot be limited to the young; it must be for everyone; in any walk of life, for whatever purposes are beneficial. It cannot be reserved to a single period of life; it must be a recurrent opportunity: An opportunity to update a skill, to broaden the possibilities of a career whether old or new, or to add intellectual zest and cultural enrichment throughout life. No longer can it be the single opportunity of a lifetime, now it must become the total opportunity for a lifetime.

Higher Education is faced with a vast array of problems - its mission, its finances and its structure. Telecommunications cannot alleviate those problems significantly at tolerable cost.

It appears that for higher education to maintain itself in our present society, it must revise its orientation and become not "higher" but adult education - a coordinated, coherent, flexible system determined to serve all adult needs. This report suggests one possible blueprint by which such a change could be started.

Telecommunications Report

Footnotes

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Appendix A

Minutes of Community Advisory Council Meetings

April 4, 1974

May 3, 1974

June 5, 1974

October 18, 1974

Community Advisory Council Meeting - 4/4/74

Those in attendance -

Edward Donowa
Gloria Donowa
James Moore
Julio Rivera
Hector Olivera
Naomi White
William Dearman
Anna Brewster
Iris Egan

Project Staff

The meeting was held in the Campus Center at Amherst.

The major points which were made in the discussion were:

The concept of providing meaningful access to education to the urban disadvantaged is most appealing. The council is skeptical about the prospects however, because they have seen many such projects in the past which were ineffectual.

In order to establish what needs might best be served by the telecommunications project some of the reasons people return to school were discussed. Women who leave school to marry may want to return because their husbands grow while they become stagnant; welfare women without husbands need a skill to become self-sufficient and to demonstrate an appropriate role model for their children; ex-cons may need to go to school because their job possibilities are often limited to rehabilitation, for which they need special training.

Motivation to return, however, is not enough. Certain problems beset the non-traditional student, making it difficult for him or her to fit into the educational system. The most outstanding of these is fear - of all the red tape that must be gone through (forms to fill out, SAT's, meaningless prerequisites that must be met before the prospective student can enroll, courses that don't seem particularly related to the student's life, though they purport to be in the field he is pursuing, etc.)

People generally have something to bring to a class because they have developed skills on their own, but those skills often go unrecognized by the university or by the individual professor. (For example, experience in such a thing as mothering is valuable as a particular skill in areas like sociology or psychology.)

Due to personal and financial problems and lack of experience in the institution our target group will probably need more support than the traditional students need. The university should be open enough to allow people to drop out and return at a time convenient to the student, rather than to the institution. If a student appears to be having trouble in a course or in a field, he should be able to depend on counselors to help him resolve his problems or to help him find a field that he might like better.

Tangible rewards must be established so that the student becomes motivated to achieve. Once he has reached a realistic goal, no matter how small, he has established a successful experience in his repertoire and becomes both further motivated and confident in his own abilities.

Since the non-traditional student has difficulty identifying with the formal institution, he needs to see that someone with a background similar to his has achieved the same goals he wants to meet. The Council felt that one way to reach the target population is for people they can identify with to go to the people where they live (neighborhood bars, street dances, etc.) and show them that it's possible to come from "the neighborhood" and go through the system. Any programs established must obviously relate to the life of the people to be served. A "middle class" program will not be believable to them.

Employers need to be educated too -- made aware of the fact that job candidates who lack a diploma many times have skills that compensate for lack of a formal education.

With these points in mind, then, such an educational system would have to:

(1) have centers located directly in the communities it was designed to serve;
(2) be operated by people from the community and
(3) be designed to provide the kind of information the people really need - such as
    a. where to get help or information about housing, welfare, etc.
    b. for newly arrived members, the laws of the area, the "way people do things."
(4) teach skills directly applicable to a job without a variety of non-essential material;
(5) work with and through existing trusted people and "agencies" (agencies here meaning community centers, not governmental organizations).

Additional matters of concern which were discussed are the following:

There are a number of existing activities which could form part of the educational system - such as OWL in Springfield and the Adult Basic Education Program at the Spanish Center in Worcester.

Particular note was made of the problem of the political viability of such a system - whether support would be withdrawn if the populace became very vocal as a result of the information gained.

A possible program suggested was on-the-job training with local businesses where the wages of the learners were paid by the educational program.

A basic educational tool in Springfield would be a locally oriented Spanish language newspaper - the only present one prints New York news.

Minutes

CAC Meeting 5-3-74

Attendees:

Agopito Silva	Gladys Bacquez
Ed Donowa	Maria E. A. Silva
Gloria Donawa	Maria A. Bithorn
Bill Dearman	Maria Luis Ayala
Lois Lavoie	Elena Ayala
Dan Cameron	Julio Ayala
Iris Egan	Juan A. Vazquez
Eleanor Hawley	Ernestine Planadeball
Naomi White	Eladia Planadeball

and Project Staff

Again, as at our first meeting, the Council's discussion was carried on in two groups to enable all to participate and a more thorough discussion to take place. In general, the groups agreed on items of importance. The focus of the discussion was the list of Characteristics of an Urban Learning Center which had been sent to everyone in the mail.

The major points made in the discussion were:

1. The O.W.L. Center in Springfield was a reasonable illustration of an urban learning center. It has many desirable features - student control of learning, individualized instruction, concern for students, convenient location, student feedback group, use of advanced students to help teach, etc. Some drawbacks of the enter - were the lack of a bi-lingual teacher, the location in a commercial area and heavy use of books.

2. If tests are used they should be very carefully structured to ensure that the learner feels in control and that the tests are non-threatening. Discussion and self-corrected and evaluated tests might be used to permit student to decide whethr he's ready for certification tests (GED, etc.). In this way they also serve as a learning process.

3. The center and program must be attractive and meet a variety of needs. It would be ideal to obtain welfare support for food, baby-sitters, and transportation, to avoid forcing students to come in order to meet employment compensation requirements, and wherever possible, to make no charges for Center services or certificates.

Within the center should be a concerned, friendly staff, a flexible program to meet individual needs and capability to provide standard certification, should it be desired by the learner. The fact that the center is an educational resource must be recognizable to potential students.

4. Individualized learning can be failure-proof and embarrassment-proof very easily, since it is non-competitive.

5. The potential of a mobile resource center should be considered as an economical way to expand available materials.

6. Coordination with other activities (schools, etc.) can broaden available alternatives and preclude or reduce redundancy. Financial stability is imperative.

7. The use of culture-specific media for promotion - Soul or Spanish radio, newspapers, etc. - would have a very positive effect on our target population.

Community Advisory Council

Minutes 6-5-74

Attendees:

Dan Cameron	Agapito Silva	Guests: R. Morrow, Director of Adult Education, Spfld. Public Schools
Lois Lavoie	Maria Silva	J. Yestramski, U-Mass.
Ed Donowa	Gladys Vazquez	
Gloria Donowa	Julio Ayala	
Naomi White	Maria Luisa Ayala	
Ana Brewster	Jose Torres	
Hector Rivera	Elena Ayala Rivera	
Cristobal Rodriguez	Juan Vasquez	
Maria Bithorn	Bill Dearman	

Project Staff

A new version of the Characteristics of an Urban Learning Center were distributed. The Characteristics had been revised to reflect the comments put forth at the CAC meeting in May.

Suggestions were made as to potential subjects for some sample learning packages in the form of video-tapes or other audio-visualmaterials. Some of the suggested subjects were:

Community customs and laws

Sex, drug or health education

Consumer information

Availability of Spanish GED

Confidence building sessions

College dropout explaining why he dropped out

Volunteers were sought to aid in producing the tapes and Maria Silva, Julio Ayala, Cristobal Rodriguez, Naomi White and Gloria Donawa said they would be willing to help.

The Worcester High School Certification Program brochure was examined in detail and suggestions were sought as to how the brochure should be revised to make it more appropriate to urban learners, especially those of varying cultural backgrounds. Maria Bithorn, Maria Silva and Julio Ayala agreed to revise the brochure to direct it toward Puerto Ricans. They will contact the project staff when they are ready to discuss their ideas in detail or when they have a sample brochure ready.

Some of the specific comments on the brochure were:

Outside format:

Something catchy is needed to intrigue the reader; as it stands, the brochure looks too businesslike.

The logo and slogan are not simple to understand.

Use of photos is good, but the one on the cover is too formal.

"High School Certification Program" is a threatening description of the program, since it states a specific goal--one that will not appeal to everyone.

If the brochure has the "wrong look" on the outside, people won't even open it.

Inside format:

The inside design is basically good because it isn't overly wordy, but is somewhat overstructured. Skill level, may have to be considered, using more visual attributes and fewer verbal ones, for people who can't read at all.

A little less formality could be achieved by using color and by breaking up the 3 column design.

The photos do not seem to include Puerto Rican people, and again, are too posed.

The use of quotes is good--they make the reader feel like he can identify with someone who has come from the same background and achieved something realistic.

Bold type for the quotes emphasizes the individual also. It's important to state that each person has something to bring to the center, which the brochure does.

It would be better to avoid naming subject areas, since most of them are threatening to the prospective student. He can find out what they are once he feels comfortable at the center.

Care must be taken to make certain that no statement in the brochure be open to misinterpretation.

The next meeting will be held about mid-August. Before that time, the project staff will send each member of the CAC a rough draft of the report, so that everyone will be able to examine it for discussion at the meeting. The time and place of the meeting will be specified then.

Community Advisory Council Meeting 10-18-74

Attendees -

Julio Ayala	Gloria Donawa
Maria Ayala	Iris Egan
Ana Brewster	Elena Rivera
William Dearman	Agapito Silva
Edward Donawa	Maria Silva

Project Staff

The Council viewed the videotape of their May meeting as a means of informing them of the results of the taping.

The Council reviewed the slide/tape learning package and commented on it. Generally it was felt to be satisfactory, but it was suggested that some people in the street scenes would add a needed dynamic element.

The members commented on the draft report. Generally, they were somewhat overwhelmed by the bulk of it.

They expressed various concerns about portions of the program--the heavy use of media, the need to operate machinery, etc.--but maintained that the options chosen were the best, all things considered. They reiterated their concern about the need for the center to concentrate on job preparation and the need for providing employment or employment contacts for the "students."

All committee members desired to retain their draft reports and to receive a final report when it was available.

The project director thanked the Council for their participation and cooperation. All expressed hope that the project would be brought into operation.

RSD/as

Appendix B

Minutes of Local Resource Group

Meeting

June 27, 1974

Local Resource Group
Meeting 6-19-74

Media Group	Instructional Design Group
Godwin Oyewole	Leslie Squires
Charles Keenan	Douglas Ruhe
Juan Caban	Fran Koster
Raymond Wyman	Sydney Hedderich
Marjorie Harrison	Robert Henderson
Arnold Feingold	Frank Llamas
Jeff Rabidoux	

An orientation briefing by project staff members was given providing the background of the project and some of the findings to date. After a brief question and answer period the group divided with one section discussing primarily media and the other instructional design.

Media - It was suggested that the project not produce anything which can be adapted from existing soft-ware and not adapt anything which can be used as is.

Instructional packages on filling out forms, following instructions or being interviewed were suggested since those were felt to be common problems for our target population. PIP, Cue-See, and MIVR (Mediated Interaction with Visual Response) machines were suggested as being particularly suitable to the project because of their operating characteristics.

Additional Contacts mentioned were:

W. Meierhenry - Dept. of Education - S.U.N. - has a grant to visit and study all non-traditional education available for a particular group of people (possibly similar to our target population).

Purdue University - offers a number of media courses

Joanne Sanders - U.W.W. student who works with Neighborhood Youth Corps in Northampton.

Instructional Design Group - The problem of breaking into the community was discussed primarily in this group. Social improvement programs have failed so often that the target population has become wary of participating.

Institutionalizing the program to avoid losing it under soft money, making credits available for courses offered and working with the real leaders of the community (not the titled ones) are necessary steps to take for a successful program.

An alternate suggestion was made to use broadcast TV rather than a learning center, since many centers have failed already. Since the development of a time-base corrector it is possible to minimize the cost of telecommunications. People might be more ready to deal with TV also, particularly if local people set the tone for the programming.

Suggestions of other sources:

The People's Yellow Pages - Greg Speeder (former U.W.W. student) A book of information similar to that which the project hopes to dispense.

Burns Electronic - Hartford (time base corrector - $12,000).

Appendix C-1

THE DISADVANTAGED

A REPORT

For

Telecommunications Project
321 Arnold House
University of Massachusetts
Amherst, Mass. 01002

by
Robert S. Donnelly
July 31, 1974

C-1

THE DISADVANTAGED

The purpose of this appendix is to provide information about the group of people chosen to be the focus of the body of the Telecommunications Report--the group frequently termed at present, the disadvantaged. It is essential that the reader know the characteristics, learning needs and learning styles of this group, so that the conclusions and recommendations in the report proper will be read in context.

Definition

The label disadvantaged has been used to imply "deprived," "underprivileged," "impoverished," etc. It has been used to describe a number of attributes--economic status, ethnic origin, physical capabilities, sex and age. Of itself the term is not very definitive; what is a disadvantage to one person may not be to the next. It has come to mean anyone whose behavior is artificially constrained due to some personal characteristic, but with a definition that broad, everyone can be considered disadvantaged in one way or another. For the purpose of this report, then, a definition had to be formulated based on the nature of the study being performed.

This study is directed toward public higher education. It is funded under an Act concerned with urban problems and the "disadvantaged" population. Those "disadvantaged" members of the urban population who could be served by public higher education are properly the "target" population under consideration.

The 1970 U.S. Census provides demographic information about living patterns differentiated by economic status, sex, racial origins, home ownership and a number of other parameters. To derive some idea of where the "target population" in question is located in Massachusetts, it was necessary to define "disadvantaged," in terms recognizable in the Census data. The parameters ultimately chosen were education (those with less than a high school diploma and those with less than four years of college) and economic status (two times poverty level). One further limitation was imposed--location in urban areas. Finally, since the concern of the report is with higher education, focus was limited to adults - the Census data distinguishes those over 25. (This particular limitation should not be absolute, however. Rather than age, per se, the constraint should be intellectual ability. Those who can gain from the offerings, should have access, even if they are 12 years old.)

In the context of this report, then, the target population consists of those adults living in urban areas of the Commonwealth of Massachusetts who earn less than two times the federal poverty level income and who have attended less than four years of college. The numbers of people included, their location by census tract, and other detailed data are set forth in Appendix C-2.

Levels of Disadvantagement

The definition chosen was deliberately broad so as not to be exclusive, but there are certain segmentations that can be seen. Besides ethnic, sexual and racial segments, there are certain behavioral qualities that tend to group themselves together. The Appalachian Adult Education Center, which has been in operation over a period of seven years, has examined its disadvantaged populations behaviorally and found the trends shown below. These are worth considering in viewing the target population in Massachusetts.

Group I - People economically and personally secure. They believe there is a return from education, library and other services. They can be recruited and served in groups, so can be dealt with economically.

Group II - People who suffer some discomfort due to undereducation. They are easy to reach and serve and become "star performers." The chief adjustment needed to serve this group is time, because they work overtime, on the swing shift, seasonally and/or have large families.

Group III - People who are well below the G.E.D. level and usually below a living wage, but still believe there is a return from public services. They need individualization of services.

Group IV - This is the smallest group. They believe they have no control over their own lives. They are unemployed and unemployable. They must be served in their own homes.

Some other characteristics of Groups III and IV are that they -

- are people oriented.
- need clear subgoals because they are so far from main goals.
- don't see needs as informational.
- use mass media for recreation, not information.
- use people for information.
- disbelieve printed information.

It should be apparent that Group I people may be disadvantaged, but they don't feel or act disadvantaged. They are contributing, functional members of society. Group II people have some feeling of disadvantagement, but have not been debilitated by it and are able to improve their situation given a reasonable, recognizable opportunity. Group III needs much more and more carefully structured help...but will respond. Group IV may be extremely difficult to help, but should be taken as a challenge, not given up and foregone.

As the report discusses educational needs, learning styles and characteristics, it will be focusing on a composite that tends to center on

Group III. That group will exhibit the most salient characteristics of Groups II and IV and is representative enough to function as the model for our analysis.

Educational Needs

Every segment of the adult population has wide, and growing, educational needs. A few years ago many engineers, regardless of degrees, needed retraining so they could reorient their careers. The current surplus of teachers suggests a similar need for them now. Other adults would like to upgrade their occupational skills given the opportunity.

The basic difference between the disadvantaged and the rest of the adult population is in the urgency of the need. Often the need a disadvantaged person has is one of crisis--a place to sleep that night, medical help for a sick child--needs not ordinarily viewed as educational ones. There are needs that are not of crisis proportions, but still demand immediate attention. If one can't speak English, it's difficult to get a job in the United States. So is it if one can't read and write.[1] Living on welfare or at subsistence level gives rise to a feeling of desperation that is strongly felt, but may not be recognized as a need for change.[2]

These needs can be defined in terms of levels of education that must be provided. Again, at the lowest economic level the need is for information aimed at survival--how to get on welfare, how to find housing, how to obtain police protection. Information that's needed immediately in order to get through the day, or night is essential. As one progresses up the economic ladder the needs change. Once survival seems assured, information about jobs is necessary--how to find one initially or how to find a better one. Job related information must include remedial academic work where necessary. The need for remedial education is served normally by Adult Basic Education.

The next step in the educational hierarchy is skills improvement, which could involve both vocational and academic education and prepares the student to pass the high school equivalency (GED) test. The final level is the normal entry level for higher education, post-secondary education and enrichment.

People who are disadvantaged can and do fit anywhere within the range of needs just stated. There are mothers on welfare who have attended college, and there are people just arrived in the city - from rural areas or other cities as well as from overseas - who have no place to sleep. In some respects the portion of those needs which will be met is a question of the commitment of government. Retraining professional people has a quick and significant economic pay-off, and is a response to a politically alert group. It certainly should be of no higher priority, however, than helping a family find food or housing. Public higher education is much better prepared to do the former, but has an absolute responsibility to do the latter if necessary. The question is, how?

Attempts to alleviate both problems presently are ineffective, as is evidenced by the numerous volunteer and non-governmental agencies involved in that effort. Possibly a more coordinated effort would be more efficient and effective.

Characteristics

In an effort to understand this target population from an educational standpoint, one needs to consider those of their characteristics which pertain to the Telecommunications Project. First and foremost, they are adults. As adults, they have a number of characteristics which distinguish them from younger students, some good, some less so. They "enter a learning activity as responsible grown-ups--not as immature learners."[3] For them, instruction must be "direct, meaningful and have a specific relation with reality."[4] They work and have many family and community responsibilities and so do not have the time or energy for irrevelant or immaterial courses or studies. "...Most adult students, because of economic factors, must secure the desired information in the shortest possible time. They are willing to attend long periods of instruction... but...must at all times see the results they are obtaining."[5] Adults bring a wide array of experiences and interests into the classroom and the structure of their "school" and classroom must take cognizance of it.[6] Adults have been found to learn as well as younger people; they do not suffer a loss of I.Q. with age,[7] and generally are more highly motivated and have higher standards of performance than traditional students.[8] They do have some physiological problems--they can't sit as long, or see and hear as well as young people. Individual adults may feel ashamed also of "going back" to school, so while they may be determined, they may see themselves in retreat.[9] Adults can and do outperform their "traditional" counterparts, but as William Rehder puts it, "Almost by definition, the adult student is a person attempting to carry out his education in the hands of an institution, the main purpose of which is the education of someone else. It is an institution that, by and large, has made only tentative adjustments to the fact that adults do not become less adult simply because they become students..."[10] One of the problems then is to find a way to serve adults specifically.

If the target population's age can pose some problems for educators, being disadvantaged adults compounds some of those problems. One characteristic of the very poor--black/white, male/female, old/young--is a feeling of helplessness. They are aware that they do not have much control over their lives and feel that nothing they do will influence their future.[11] That feeling conflicts with their sense of being adults and thus capable of deciding what they want and why. The structure of their educational organization must take that feeling into account in every possible way. The learner, from the first instant, must be given a sense of control; a sense that what he or she wants matters and that his wishes will influence what happens to him.[12] Atron Gentry, a former Director of The Westside Study Center in Pasadena, Calif. suggests[13] that "Before people could put their energies and thoughts into learning to read or holding a meaningful job, they had to see a chance to win, some avenue through which they could get ahead." This display of control should be evident from the manner in which someone is greeted when he first contacts the educational center. The personnel in the organization should approach him by asking what he wishes to learn, rather than testing him to find out what he already knows and legislating what he therefore should study. Jonathan Kozol suggests that even one-answer learning materials might be inappropriate because they preempt control,[14] and participation in organizational activities and decisions should be the right of the student. The prisoners at Framingham Correctional Institute felt that a major failing of their University Without Walls program was that they had not helped set course content. They felt that the courses available reflected the interests of those teaching rather than those of the prisoners, the learners.[15] This issue of control was the major point made by the Community Advisory Council of the Telecommunications Project at the second meeting in May, 1974. It was what distinguished the OWL Center in Springfield from every other educational organization to which they had been exposed. It cannot be overemphasized. On it hinges the possibility of establishing a "different" approach to learning for the target population--an approach with potential for real success.

The disadvantaged need a great deal of positive reinforcement in their learning ventures.[16] They are not secure in their own evaluation of how they are doing. Because they have a long way to go to reach "normal" performance, clear subgoals must be provided,[17] and their progress clearly shown. Their need for reinforcement seems to stem from the poor self-image which appears to be typical of disadvantaged people,[18] so win-lose, competitive situations should be avoided. They are concerned that their education not be second-rate and often insist on a form they feel confident in - "legitimate" classroom lectures. Unfortunately, the class group structure conflicts with their need for a non-failure (non-competitive) environment.

Another significant characteristic of the adult disadvantaged is that they do have the capability to learn. They know much with which broader society is not acquainted and which enables them to get along in their world. As one of the project's Community Advisory Council pointed out, a pimp in the ghetto often is a very shrewd, very successful businessman. Often, however, practical knowledge, like the ability to work with one's hands may be crucial to getting someone through the day in the ghetto, but may hinder him on a standardized test.[19] In Learning for Mastery, Bloom states that 95% of the population can learn almost everything society demands, if given enough time and the proper instruction to do so.[20] Poverty alone does not predict below average scores on a number of intelligence and educational tests.[21] On the other hand development of ability has been found to be related to socio-economic status.[22] Thus, while the disadvantaged have the ability to learn, the likelihood is that they have not done as well as they are capable of doing, especially in areas recognized by society in general. One reason surely is that "a major component in learning is the learner's expectation of later use. If he expects to have a need for the information later, he will be able to 'store' it in his memory much more readily than if it is not apparently relevant."[23]

A somewhat more mundane characteristic of the urban disadvantaged is their immobility. They have to depend on public transportation and thus cannot travel far or to many locations as could other groups. Coupled with that lack of transportation, of course, is the lack of time, because of long working hours and/or heavy family responsibilities; so time consuming, lengthy trips by public transportation become even more overwhelming. The result is a need for available opportunity, if it is to be real opportunity.

All of this is not to say that the disadvantaged learner does not have any characteristics which are peculiar and of concern here. He does. "In addition to problems of health, the disadvantaged student usually has a number of learning disabilities, all related to his poor language development. His inability to pronounce words correctly--many ABE students use some kind of dialect--makes it difficult for him to spell, read, or even talk to others. Because the ABE student's vocabulary is usually limited to words which describe concrete objects, he cannot speak or think in abstract terms. His unsophisticated vocabulary does not function well for fine distinctions or precise definitions, both of which are needed in the classroom."[24] One study showed that disadvantaged black children did not understand from 20 to 50% of the words used by their teachers.[25] These language problems, both dialect and non-English, cause disadvantaged learners to prefer pictorial stimuli to print.[26] They also reflect a need for special efforts at language development which is, to a degree, in conflict with the desire for obvious tangible reward. To resolve the conflict special efforts to incorporate language development into vocationally oriented studies may be necessary.

Another characteristic of concern is the dependence of disadvantaged people on nonverbal information. Because "in his day-to-day life the ABE student relies heavily on gestures and facial expressions to help him convey his meaning,"[27] the cognitive, symbolic manipulations of the classroom are something in which he is not practiced. This reliance on visual clues for meaning obviously suggests the use of visually based learning materials. One aspect of this characteristic pertinent to the educational program is that nonverbal behavior is culturally specific. An instructor unfamiliar with the norms of nonverbal behavior of a given group, especially if they are particularly sensitive to nonverbal behavior, can develop significant difficulties in communications and be totally unaware that difficulty exists.[28]

A summary of the characteristics of adult learners and disadvantaged adult learners is given in Table C1-1. The characteristics of adults are compared to "traditional" students, i.e., students of normal high school or college age. The disadvantaged adults have the same characteristics as any other adults, but show them in a heightened or more severe form. In addition, they have some which are not shared by their more advantaged counterparts.

Characteristics of Adult Learners

Adult	Disadvantaged Adult
Experienced, realistic	Strong cultural variations
Settled in thinking	Significant knowledge gaps
Voluntary participant	Feels helpless, passive fatalism
Slower learning, perseveres	Highly sensitive to non-verbal behavior
Impatient	Needs frequent reassurances, reinforcement
Demands relevance	Physically, aurally oriented
Needs more light	Slow, careful, persevering
Less keen hearing	Low self-confidence, poor self-concept
Conflicting responsibilities	Prefers non-print materials
Wants to participate	Has urgent learning/information needs
More heterogenous	May have severe linguistic deficiency
Seeks concrete application	Reasons inductively, not deductively
Highly motivated	Spacially, not temporally oriented
Fears failure	Harsh past experiences
High standards of performance	Group oriented, extrovert
More fatigue	Has had unpleasant school experiences
May see school as "going back"	

Table C1-1

Information - Gathering Behavior

While the learning styles and psychological characteristics of the disadvantaged impose certain requirements on an educational system, their information gathering behavior is also of significance. It has been found that the "information transfer characteristics in ghettos differ from those of the general urban population."[29] Ghetto residents rely heavily on other people for information. One survey done for the National Advisory Commission on Civil Disorders showed that 79% of ghetto residents heard of riots in their own city by word of mouth.[30] It has also been found that the disadvantaged learn about educational programs through friends, relatives and neighbors.[31]

The use of informal information channels is combined with heavy television watching. In this regard the Commission on Civil Disorders found that 75% of ghetto residents watched the news on television and of that group, 86% watched news between 5 and 7 PM. Childers points out that one result of the heavy reliance on television and radio is the accumulation of information about "ends" rather than "means;" "means" information is supplied more by print media--newspapers, magazines and books.[32] As a result, aspirations are built up but information about how to realize them is not provided.

In all, the information system used relates to the general social situation of the disadvantaged. They often do not see problems as having solutions, though solutions may exist. They don't know how to get information and often don't persist when they do try. They are, in a sense, "stuck" in a deficient information system and don't recognize it.[33] As a result, they are cut off from opportunities which are available to others.

It is worth noting that low-income blacks and whites "show no consistent differences in the media they prefer for local news."[34] Childers also notes that the information needs and patterns of communications for rural poor are the same as for urban poor.[35]

Reward System

It was mentioned above that adults, and especially disadvantaged adults, sought recognizable, tangible rewards for their educational efforts. One basis for judging the likelihood of such rewards, according to the Community Advisory Council[36] is the apparent specificity of the learning material. If the material is intended to relate to housing, it must relate locally, not in a vague, general way. The more culturally specific and locally specific the material, the more believable it is and the greater is the incentive to use it. The "grapevine" will quickly report as to its validity, so superficiality will not suffice. One way in which this specificity has shown up in children's learning has been the success of "bootleg" learning for ghetto children. In a number of cases black militant groups have had much better success teaching ghetto children to read than have professional teachers in schools. That success has been attributed to the fact that normal school reading materials are white, middle-class and the ghetto children cannot relate to them[37] but can to the materials used by the militant groups.

Another point brought out strongly by the Council[38] and other project consultants[39] was that for the disadvantaged, education means jobs. In a sense, they are asking to be taught what they really need to know. "Skills of observation" don't have much significance when survival is at stake.[40] The "real almost tangible results expected" means the ability to get a job or get a better job. Information about welfare and housing is also necessary, and at times may be more urgent, but when the disadvantaged think or speak of "education," it is in a vocational context. That emphasis on jobs suggests that academic efforts might best be encompassed within the vocational setting.[41] It also, however, can pose some problems because personal independence and self-direction require flexibility which seems to require "high critical reading and computational skills--at least a 10.5 grade level...The same level needed to pass GED test comfortably."[42] Thus, while it is essential to teach what is really needed, care must be taken not to be excessively specific and needlessly limit the benefits derived.

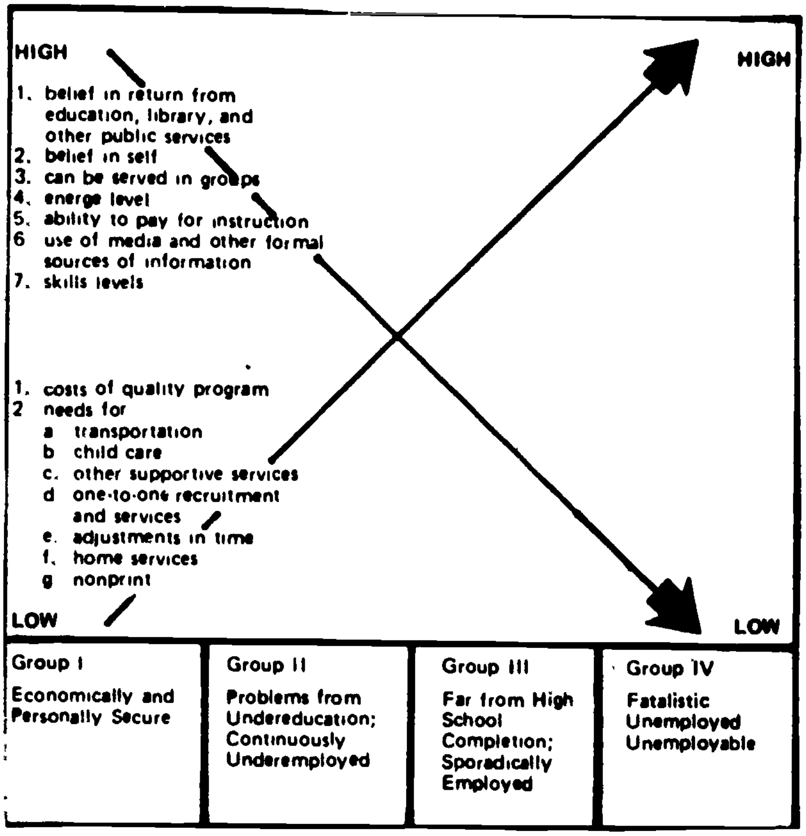
Alternative Learning Requirements

Having developed a profile of the "disadvantaged" learner, it is necessary to return to the four group segmentation discussed early in this Appendix. The profile can be used as a kind of "average" characterization with variations extending from Group I through II and III to IV.

It might be worth noting that a similar segmentation could also be made of adults not suffering the economic deprivation of our target population, but also having educational needs. Regardless of their economic status, some adults have educational needs and recognize them. Some have educational needs (even much greater needs) but need help recognizing them. If a system is established which aids the second group, both those economically deprived and those who are more affluent can benefit.

The four AAEC groups can be presented graphically as shown below. The presentation reflects the major characteristics of the subgroups and the relationship of the characteristics to the different groups.

The segmentation, as done by the AAEC obviously suggests that a variety of approaches to provide services is needed. It is helpful to reflect that any single approach will vary in its degree of success from group to group. At the same time it may be that an approach which is suitable for Group III may also be suitable for Groups I and II. The reverse is not apt to be the case. The requirements of Group III are more strenuous than those of Groups I and II, and those of Group IV are more strenuous still; so while serviceability may extend upward, it likely will not extend downward. The same situation, of course,holds on a more universal basis. A structure which meets the more extreme needs of the disadvantaged could certainly also serve other population groups. The initial cost might be high, the costs to educate the least advantaged third of our population are recognized to be much higher than for the other two-thirds,[44] but warranted by the degree of need. The marginal cost of serving less disadvantaged students, once the system were operating, might well be tolerable. In any case, the system which meets the needs of Group IV must remain within acceptable cost limitations.



SUMMARY OF FOUR GROUPS

Relationship Between Individual Characteristics of Adults with Less Than High School and the Design of Delivery Systems of Public Services.

Figure C1-1

Summary

The term "disadvantaged" was defined herein as those people, in urban areas, with family income at less than two times federal poverty level and education of less than four years' college. Their location and numbers are given in Appendix C-2.

The educational and/or informational needs of the disadvantaged are much the same as anyone else's but are more urgent. Their needs run the gamut from coping or "survival" information to college-level academic work. Public higher education is not prepared to meet that range of needs, but it must be met.

The characteristics of the disadvantaged which are of particular concern from an educational system's point of view are that they are adults with all the strengths and frailties of adults. They also have some characteristics peculiar to their life situation. They feel out of control of their lives, without options and without hope. They need frequent positive feedback because they feel unable to trust their own perceptions. They can learn. They are not mobile. They have severe language deficiencies and are especially sensitive to non-verbal behaviors.

Their behavior patterns and viewpoints are also significant. They have unusual information gathering behaviors and a poor information gathering system available to them. They want specific materials to ensure the relevance and thus "pay-off" from their efforts. For them, education means jobs.

The disadvantaged, while having same generalizable characteristics, are not a single, coherent group. One segmentation of them into four groups seemed particularly interesting since the groups reflected the same differences as might appear between the "advantaged" and the "disadvantaged."

The disadvantaged are adult people with some rather subtle but important differences. To be successful, an educational system will have to recognize those differences and adapt to them in a meaningful way.

The Disadvantaged

Footnotes

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[14]Kozol, Ibid.

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The Disadvantaged

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[33] Ibid., p. 25.

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Appendix C-2

THE DISADVANTAGED

LOCATION AND MAPS

A REPORT

For

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August 15, 1974

THE DISADVANTAGED LOCATION AND MAPS

Introduction

In an effort to isolate a population which could serve as a basis for the design of an idealized instructional system, the urban disadvantaged were chosen. They were chosen for the reasons stated in Appendix C-1. As one function of their selection, their location and numbers had to be determined. This Appendix reports the results of that determination.

The terminology used in this Appendix is that developed by the U.S. Bureau of the Census. The major terms used and their meanings are:

Poverty status - is an index which provides for a range of poverty income cutoffs adjusted by such factors as family size, sex of the family head, numbers of children under 18 years old, and farm and non-farm residence. At the core is a nutritionally adequate food plan designed by the U.S. Dept. of Agriculture for "emergency or temporary use when funds are low." The Weighted Average Thresholds of Poverty used in 1969 are shown in Table 1.

TABLE 1 Weighted Average Thresholds at the Poverty Level in 1969, by Size of Family and Sex of Head, by Farm and Nonfarm Residence

Size of family	Total	Nonfarm			Farm		
		Total	Male head	Female head	Total	Male head	Female head
All unrelated individuals	$1,834	$1,840	$1,923	$1,792	$1,569	$1,607	$1,512
Under 65 years	1,888	1,893	1,974	1,826	1,641	1,678	1,552
65 years and over	1,749	1,757	1,773	1,751	1,498	1,508	1,487
All families	3,388	3,410	3,451	3,022	2,954	2,965	2,767
2 persons	2,364	2,383	2,384	2,320	2,012	2,017	1,931
Head under 65 years	2,441	2,458	2,473	2,373	2,093	2,100	1,984
Head 65 years and ever	2,194	2,215	2,217	2,202	1,862	1,863	1,861
3 persons	2,905	2,924	2,937	2,830	2,480	2,485	2,385
4 persons	3,721	3,743	3,745	3,725	3,195	3,197	3,159
5 persons	4,386	4,415	4,418	4,377	3,769	3,770	3,761
6 persons	4,921	4,968	4,962	4,917	4,244	4,245	4,205
7 or more persons	6,034	6,101	6,116	5,952	5,182	5,185	5,129

Urban population - is those persons living in an area consisting of at least one city of 50,000 inhabitants or more in 1970 and the surrounding closely settled area, and persons living in a) places of 2,500 or more inhabitants incorporated as cities, villages, boroughs or towns, and b) unincorporated places of 2,500 or more inhabitants, and c) other territory included in urban areas.

Rural Farm population - is those persons living on places of 10 or more acres from which produce sales are $50 or more in the preceding year or persons living on places of less than 10 acres from which produce sales were $250 or more the preceding year.

Rural Non-Farm population - is all persons in rural areas who do not live on places classified as farms.

Census Tract - small areas into which large cities and adjacent areas have been divided for statistical purposes. Tracts were designed to be relatively uniform in population characteristics, economic status and living conditions. The average Tract has 4,000 persons. Boundaries were established cooperatively by a local committee and the U.S. Bureau of the Census.

Standard Metropolitan Statistical Area - (SMSA) - Except in the New England states, a SMSA is a county, or group of contiguous counties, which contains at least one city of 50,000 inhabitants or more, or "twin cities" with a combined population of at least 50,000. In addition contiguous counties are included if they are socially and economically integrated with the central city. In the New England states, SMSA's consist of .owns and cities instead of counties.

The information available to us, the PHC (1) booklets of the SMSA's in Massachusetts and the PC (1) book for the state, limited our ability to enumerate and locate our target population. "Education completed" data was limited to persons over 25. "Poverty level" data was given by family rather than individual. In general, however, the degree of precision possible in any case was not enough to make such limitations significant. For instance, in Massachusetts, the percentage of people over 25 years of age without four years or more of college was 87%. For those 16-24 not in school, the equivalent figure was 91% - not a radical difference, so the use of the more limited data (the data for persons over 25) should not result in distortions of concern.

What Does the Data Show?

Massachusetts is an urbanized state. Of its 1970 population (5,689,000 people), 84.5% live in the urban areas, 14.1% in rural non-farm areas and under 1% in rural farm areas. Of the total population of the state 55% (3,142,000) are 25 years of age or older, and of that group 85% (2,671,000) live in urban areas.

Of the group 25 and older, 42% (1,306,000) did not finish four years of high school and 87% (2,748,000) did not complete four years of college.

The distribution between urban and rural, based on education attainment, is given in Table 2 below. It shows that people with less than four years of college are distributed between urban and rural areas in the same proporttions as all of those over 25, while those with less than four years of high school are concentrated slightly more in urban areas. The lower portion of Table 2 shows that of those lacking high school fewer are found, on a percentage basis, in the Boston SMSA than is true of their general age group. The variation does not seem to be significant, however.

Table 2
U.S. Census Data - 1970
(Rounded to 1,000)

	Persons in Mass. 25 years and older	%	Persons in Mass. 25 & over with less than 4 years college	%	Persons in Mass. 25 & over with less than 4 years high school	%
In Urban Areas	2,671,000	85	2,346,000	85	1,133,000	87
In Rural Non-Farm Areas	462,000	14	392,000	14	168,000	13
In Rural Farm Areas	11,000	0.3	10,000	0.3	5,000	0.3
Total	3,144,000	55 (of total pop.)	2,748,000	87 (of those 25 & up)	1,306,000	42 (of those 25 & up)
		% of Urban		% of Urban		% of Urban
In Boston SMSA	1,529,000	57	1,288,000	55	544,000	47
In Springfield SMSA	291,000	11	263,000	11	135,000	12
In Worcester SMSA	194,000	7	175,000	7	92,000	8
Total	2,014,000	75	1,726,000	73	771,000	67

Table 3 shows the distribution of those economically disadvantaged. It shows that while 8% of the families in the state have income below federal poverty level, 24% are below two times (2x) poverty level. The distribution of those below 2x poverty level is slightly higher in urban areas than the general population of the state (86.5% to 84.5%) or those over 25 (86.5 to 85%).

Essentially these figures reflect that the distribution of educationally or economically disadvantaged people does not vary much, on an urban/rural basis, from the distribution of the general population or the population over 25. To review the distribution on a SMSA basis, Table 4 was developed.

In the data shown on Table 4, few SMSA's show any significant variance from the average on any of the four scales, except Fall River and New Bedford. Both cases show a higher concentration of older, less educated and more poverty stricken people than the other SMSA's. Table 4 is organized with the most populous SMSA's on the left, so Fall River and New Bedford positions to the right reflect that they are not among the most populous SMSA's.

(To return to Table 2 and 3 for a moment. The distribution of economically disadvantaged people to the Boston, Springfield, and Worcester SMSA's in Table 2 shows a distribution to Boston less than that of people with less than four years college (from Table 2) and more than that of those with less than four years high school (also from Table 2). That variance seems to relate to the higher concentration of poor people in New Bedford and Fall River.)

After reviewing the data along the selected criteria for disadvantaged, it is apparent that, aside from New Bedford and Fall River, the disadvantaged tend to follow the distribution of the general population group (those over 25) from SMSA to SMSA. It is possible, however, to distinguish within SMSA's, from census tract to census tract. The definition of census tracts could apply to neighborhoods, and thus might be of real interest for organizational purposes. (The validity of the continuity and uniformity of any given tract could be determined only by an inspection of its homes and population, so too much cannot be expected in regard to "neighborhood" status.)

It should be noted that the PHC(1) booklets did not give poverty status on an individual basis, so while individuals were used in Tables 2 - 4, families are used on the tract maps.

The Maps

To illustrate the distribution of the disadvantaged within SMSA's, maps of each SMSA in the state were coded to reflect the disadvantagement, if any, of the population of each census tract. Figure C2-1 is a map of the Commonwealth showing the SMSA's in Massachusetts.

The maps of each SMSA display four items of information about the people living within that tract.

1. A circle (O) shows that less than 60% of those 25 and over living in the tract have completed four years of high school.

Table 3
U.S. Census Data 1970
(Rounded to 1,000)

1.	Population of Massachusetts recorded in families or unrelated individuals.*	5,524,000	97% of total
2.	Persons in Mass. recorded as having family income at less than poverty level.	474,000	8% of 1
3.	Persons in Mass. recorded as having family income at two times poverty level	1,531,000	28% of 1
4.	Persons in Mass. over 25 years old	3,073,000	56% of 1
5.	Persons in Mass. over 25 years old with income less than two times poverty level	737,000	24% of 4
6.	Distribution of 5.		
	In Urban areas	638,000	86.5% of 5.
	In Rural Non-farm areas	96,000	13% " "
	In Rural Farm areas	3,000	0.4% " "
	Total	737,000	
	In Boston SMSA	327,000	51% of Urban
	In Springfield SMSA	73,000	11% " "
	In Worcester SMSA	44,000	7% " "
	Total	444,000	69 " "

* Except inmates of institutions, members of Armed Forces living in barracks, college students in dormatories and unrelated individuals under 14 years old.

Table 4
U.S. Census Data - 1970
(Standard Metropolitan Statistical Areas)

	State Average	Boston SMSA	Springfield	Worcester	Lawrence - Haverhill	Lowell	Brockton	Fall River	Fitchburg - Leominster	New Bedford	Pittsfield
% of population over 25	55	55	55	56	56	52	53	58	54	59	55
% of those over 25 with less than 4 years of college	87	84	90	90	91	91	92	95	92	94	88
% of those over 25 with less than 4 y ars of high school	42	35	47	46	46	46	41	68	50	67	43
% of families with income less than two times poverty level	28	20	24	21	22	23	21	31	24	32	22

2. A dot (.) shows that of those 25 and over in the tract 2000 or more people have less than four year's college.

3. Vertical lines (|||) show that 20% or more of the families in the tract have incomes less than two times poverty level.

4. Horizontal lines (☰) show that there are 200 or more families in the tract whose income is less than two times poverty level.

Criteria 1 and 3 are thus indications of degree while 2 and 4 are reflections of absolute magnitude.

In each case, the overall map of the SMSA appears first and it shows the other associated maps as insets to it. The insets are areas from the overall map which had to be enlarged in order that individual tracts would be visible. The amount of enlargement is not standard since the size of each census tract varies widely.

To illustrate the distribution of disadvantaged people with a SMSA, the maps covering Brockton and Fall River can be used.

In Brockton, the map of the SMSA (Figure C2-3) shows the outer areas of the town with an inset map (Figure C2-3A) showing the central area. C2-3 shows no areas including all four criteria, although tracts 4564, 6001, 5252, and 5251 have three of the four. Of those tracts all but 5252 reflect populations with 20% or more families below 2x poverty level; 200 or more families in each tract who are below 2x poverty level and 2000 or more in the tract with less than four years college. Tract 5252 reflects the same economic criteria but shows that less than 60% of its over 25 populace have completed four years of high school.

The inset map for Brockton shows seven tracts which meet all four criteria, tracts 5104, 5108, 5111, 5112, 5113, 5114 and 5115. There are also five tracts, 5102, 5103, 5105, 5106, and 5110, which meet three of the four. although not the same three criteria in each case. Where there are disadvantaged meeting three criteria, in all but one case, two of the three were economic criteria. It is clear that the disadvantaged in Brockton are concentrated toward the center of the city.

In Fall River (Figures C2-4 and C2-4A) it is only the northeastern section of the city (given the orientation of our maps) which does not show a high degree of disadvantagement. Of the 34 tracts in the SMSA one (6423) shows none of the four criteria, one (6425) shows only one -- less than 60% having four years of high school -- and one (6421) shows two criteria -- high school and more than 20% at less than 2x poverty. All the remaining tracts show three or four of the criteria.

It should be noted that the failure of a tract to reflect criteria 2 or 4, (2,000 people with less than four years college or 200 families at less than 2x poverty) sometimes is a result of the number of people in the tract, not the level of disadvantagement they suffer. Tract 6421 in Fall River is an illustration -- while 42% of its families are at less than 2x poverty, the total number of families is only 472 so the threshold of 200 families was not reached. That same tract shows it has only 1,115 people over 25 living in it, of a total of 1,760, so there cannot be 2,000 or more who are not college graduates. This distortion was recognized when our criteria were chosen. It was felt that some minimum concentrations, in absolute numbers, were necessary and, since the average tract held 4,000 people, the absolute numbers chosen were felt to be reasonable. In reality, of course, the four criteria must be viewed in concert to gain the needed picture not only of level of disadvantagement, but absolute numbers as well.

The maps are not, by any means, the ultimate answer. Designation of a "neighborhood" could only actually be done by the people in a given area, or by someone thoroughly familiar with the area. At best the maps can give some idea of the distribution of the disadvantaged people within the various SMSA's, which is, of course, what was intended at the outset.

The maps of the other SMSA's are not analyzed here since, although each has peculiarities in the distributions depicted, none are felt to show significant variances from those of Brockton or Fall River of impact to this study.

Counties, Standard Metropolitan Statistical Areas, and Selected Places

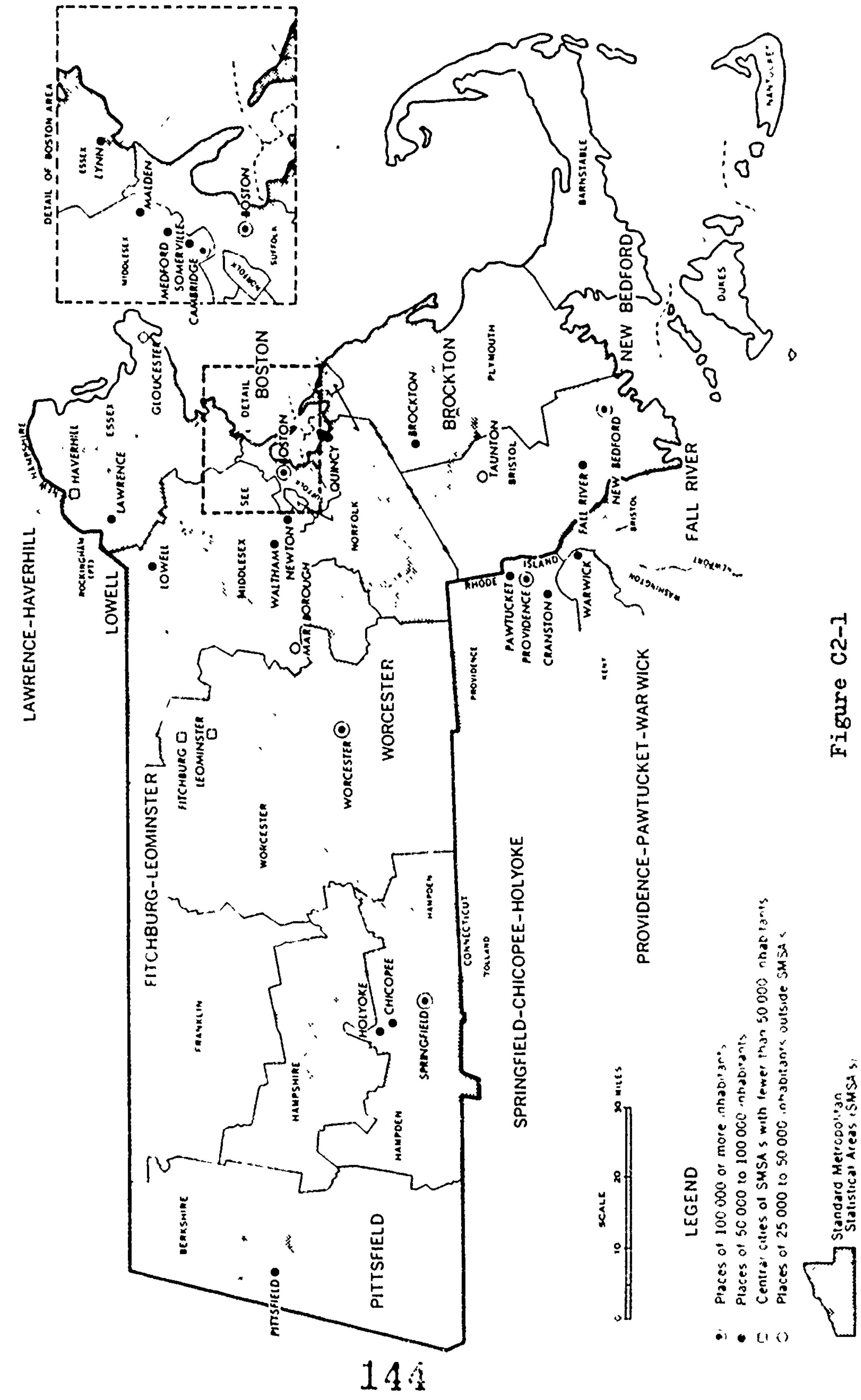
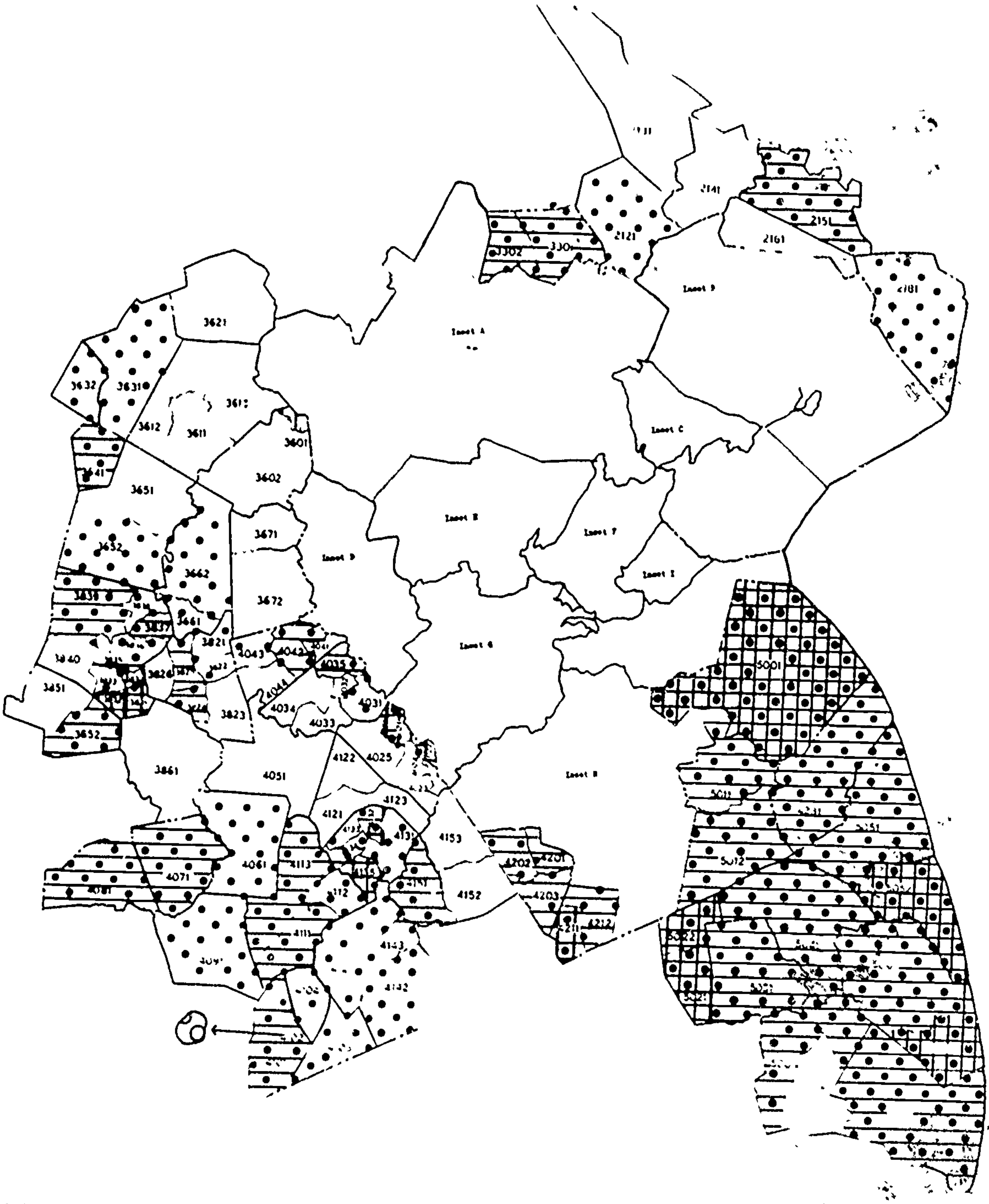
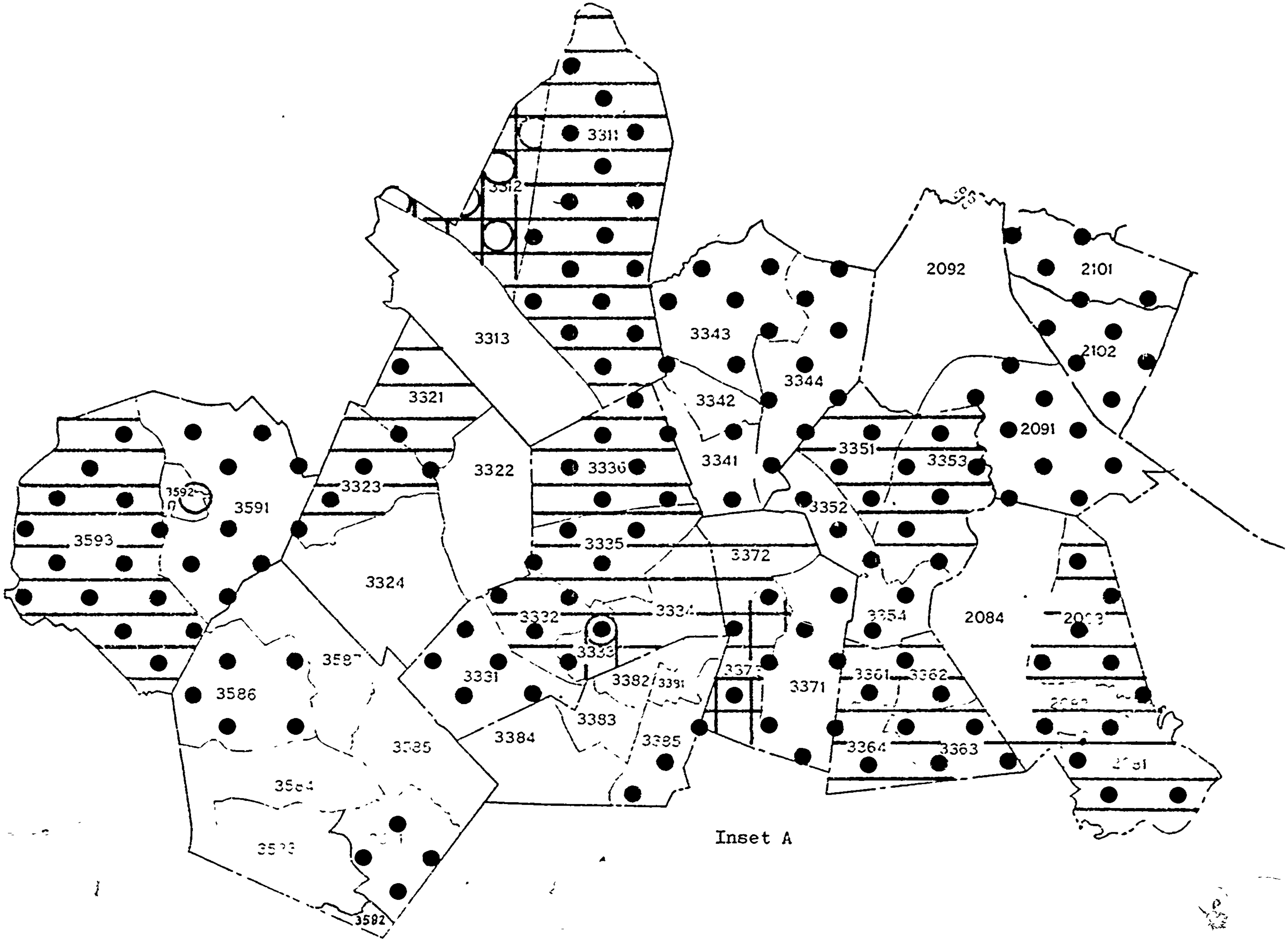


Figure C2-1



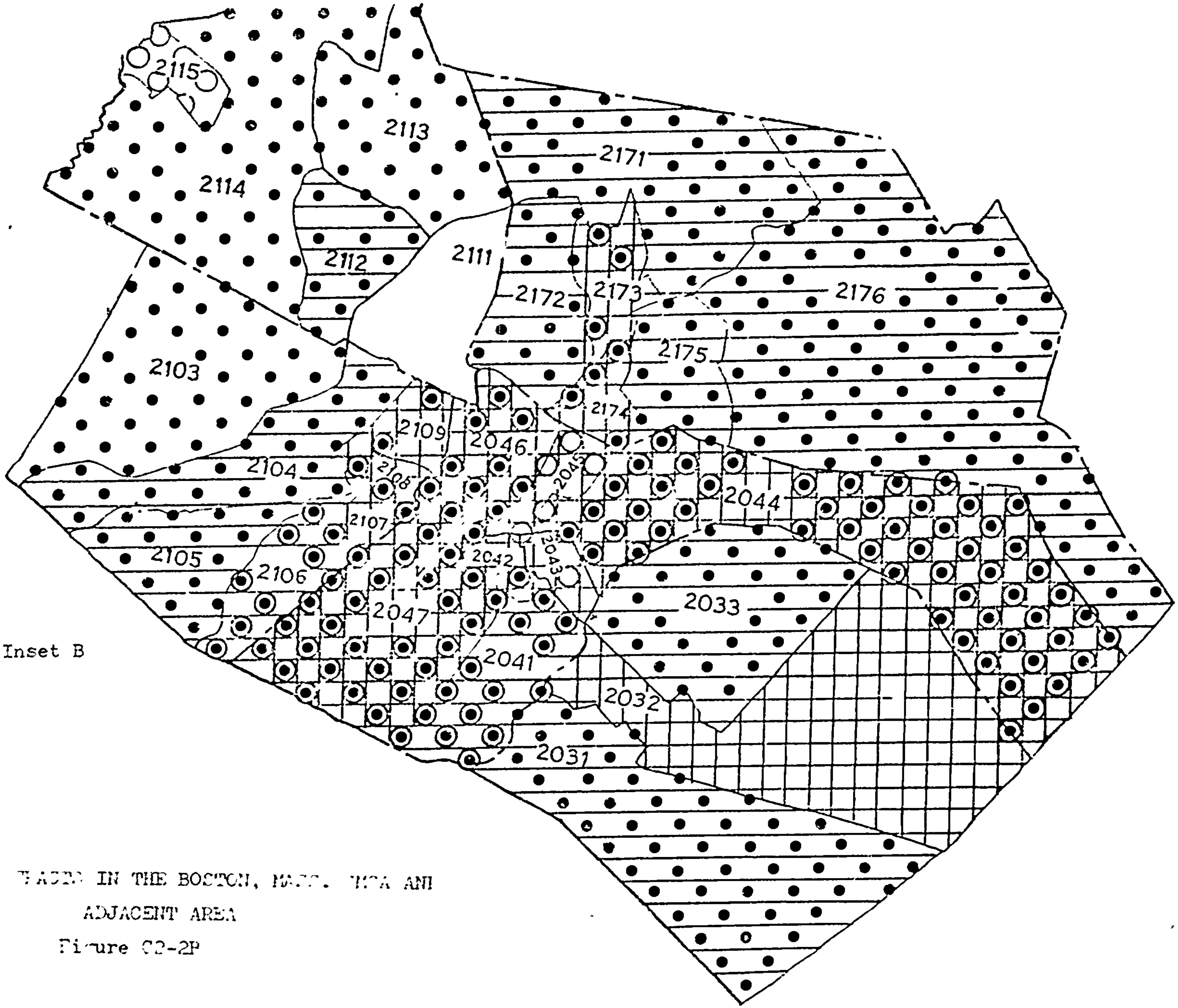
CENSUS TRACTS IN THE BOSTON, MASS. SMSA AND ADJACENT AREA

Figure C2-2



CENSUS TRACTS IN THE BOSTON, MASS. SMSA AND ADJACENT AREA

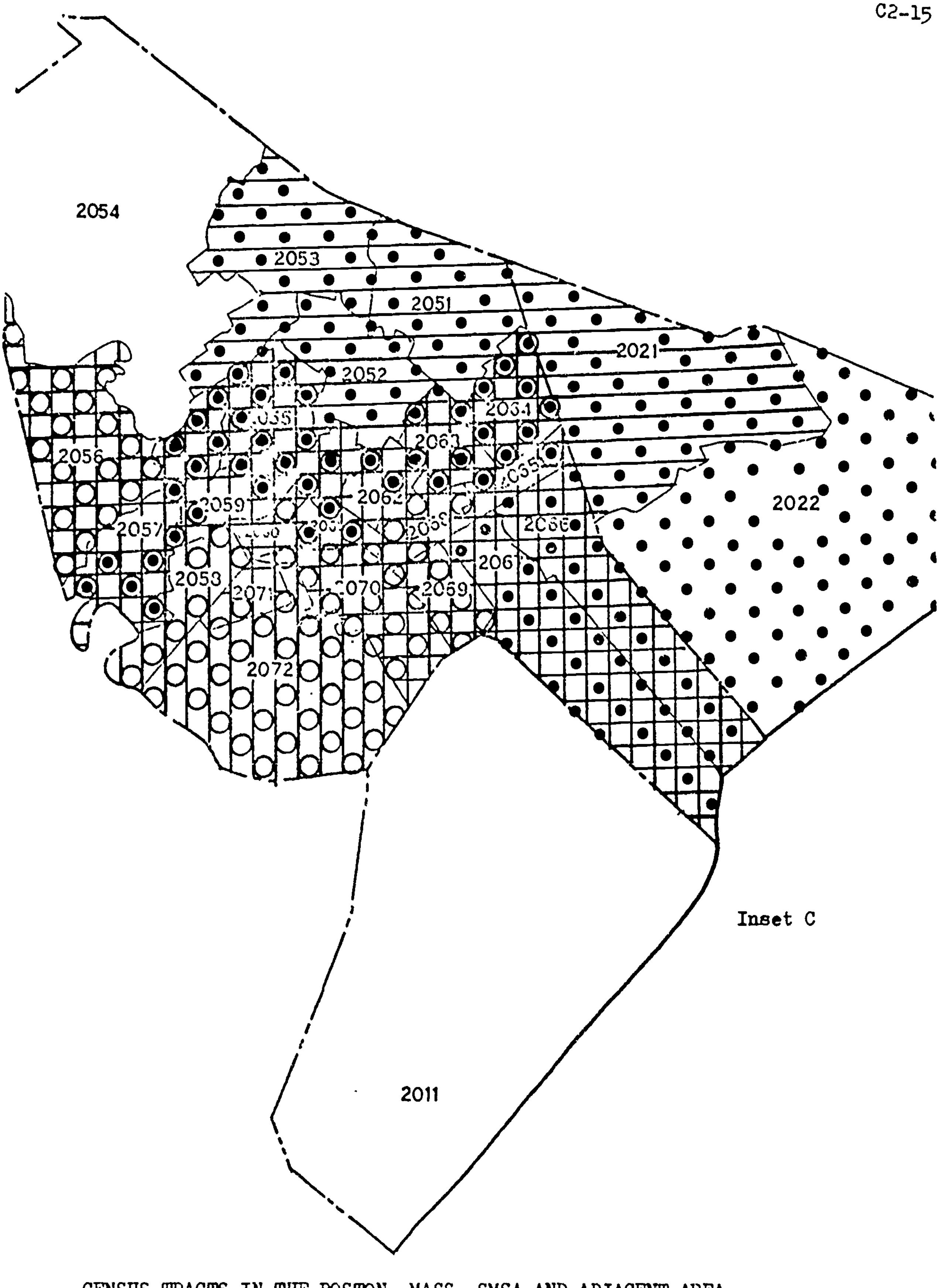
Figure C2-2A



Inset B

CENSUS TRACTS IN THE BOSTON, MASS. SMSA AND ADJACENT AREA

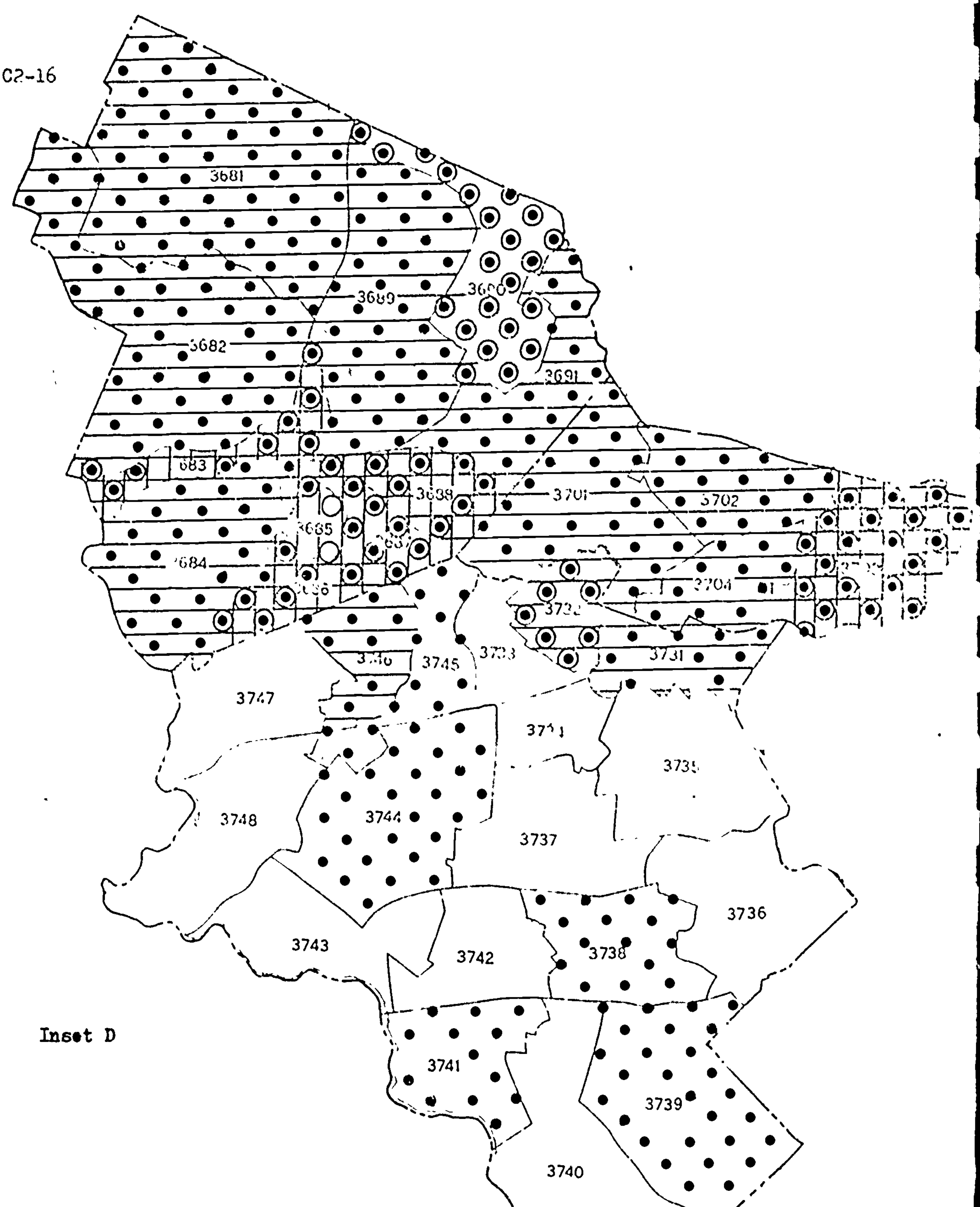
Figure C2-2B



CENSUS TRACTS IN THE BOSTON, MASS. SMSA AND ADJACENT AREA

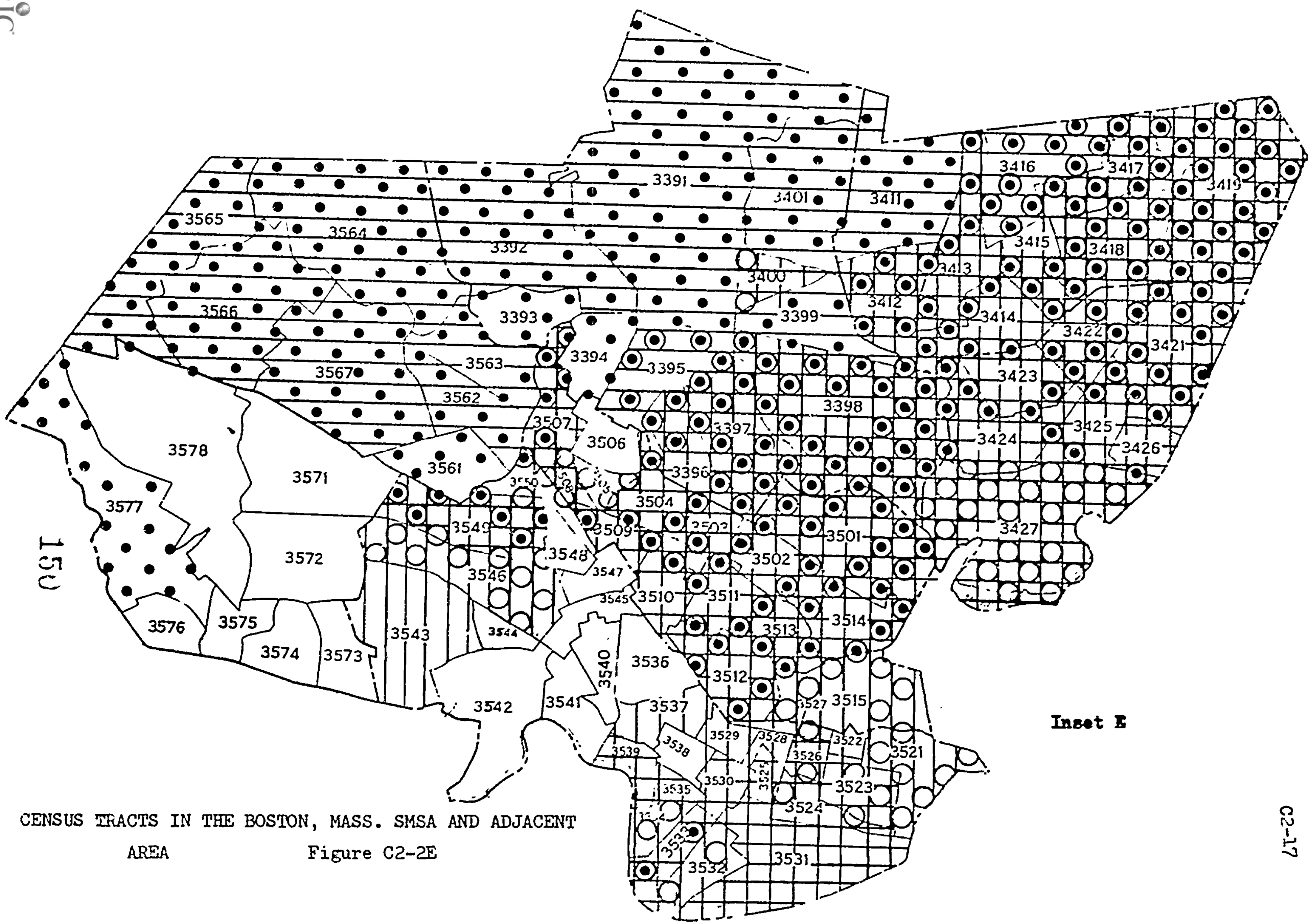
Figure C2-2C

C2-16



CENSUS TRACTS IN THE BOSTON, MASS. SMSA AND ADJACENT AREA

Figure C2-2D



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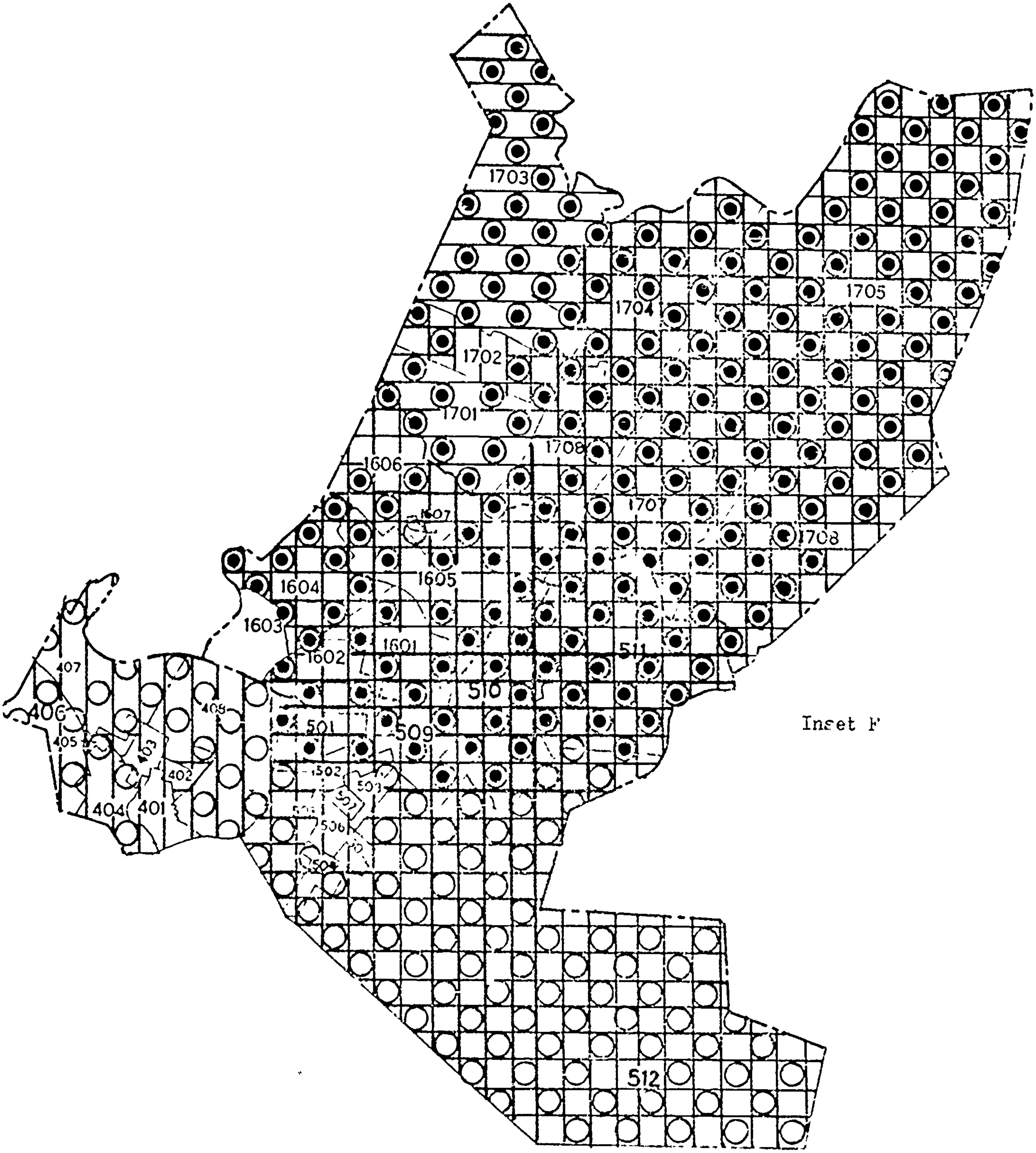
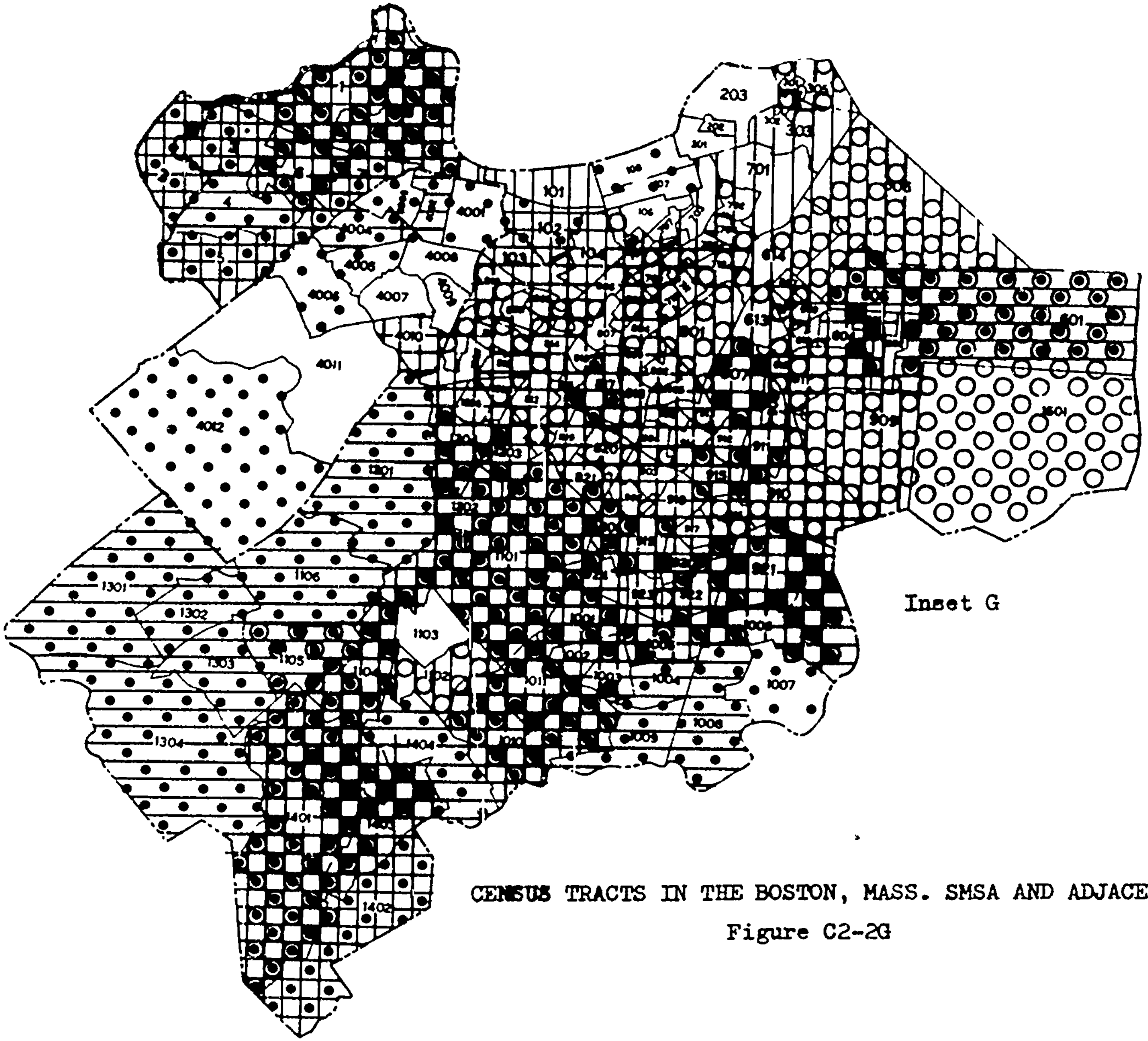
CENSUS TRACTS IN THE BOSTON, MASS. SMSA AND ADJACENT AREA

Figure C2-2E



CENSUS TRACTS IN THE BOSTON, MASS. SMSA AND ADJACENT AREA

Figure C2-2F



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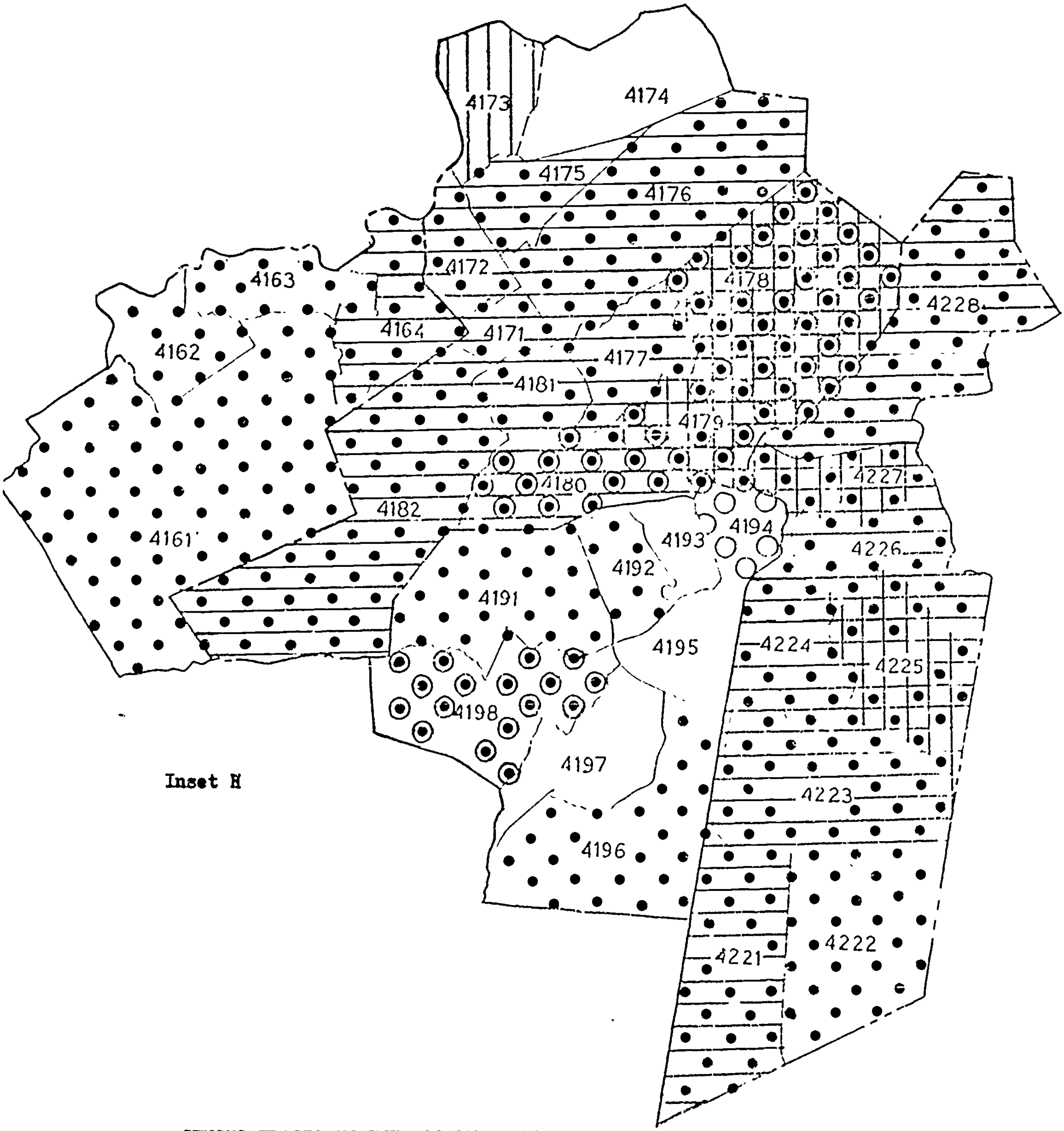
CENSUS TRACTS IN THE BOSTON, MASS. SMSA AND ADJACENT AREA

Figure C2-2G



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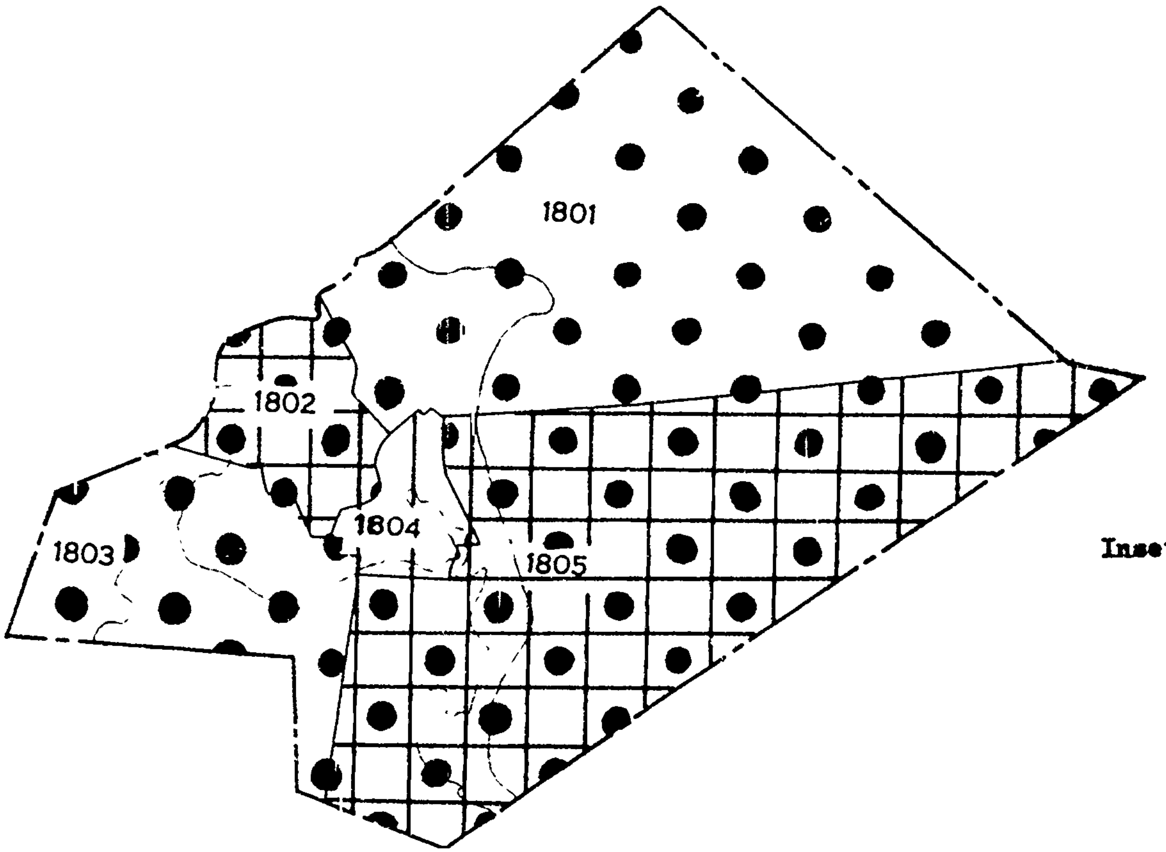
CENSUS TRACTS IN THE BOSTON, MASS. SMSA AND ADJACENT AREA

Figure C2-2H



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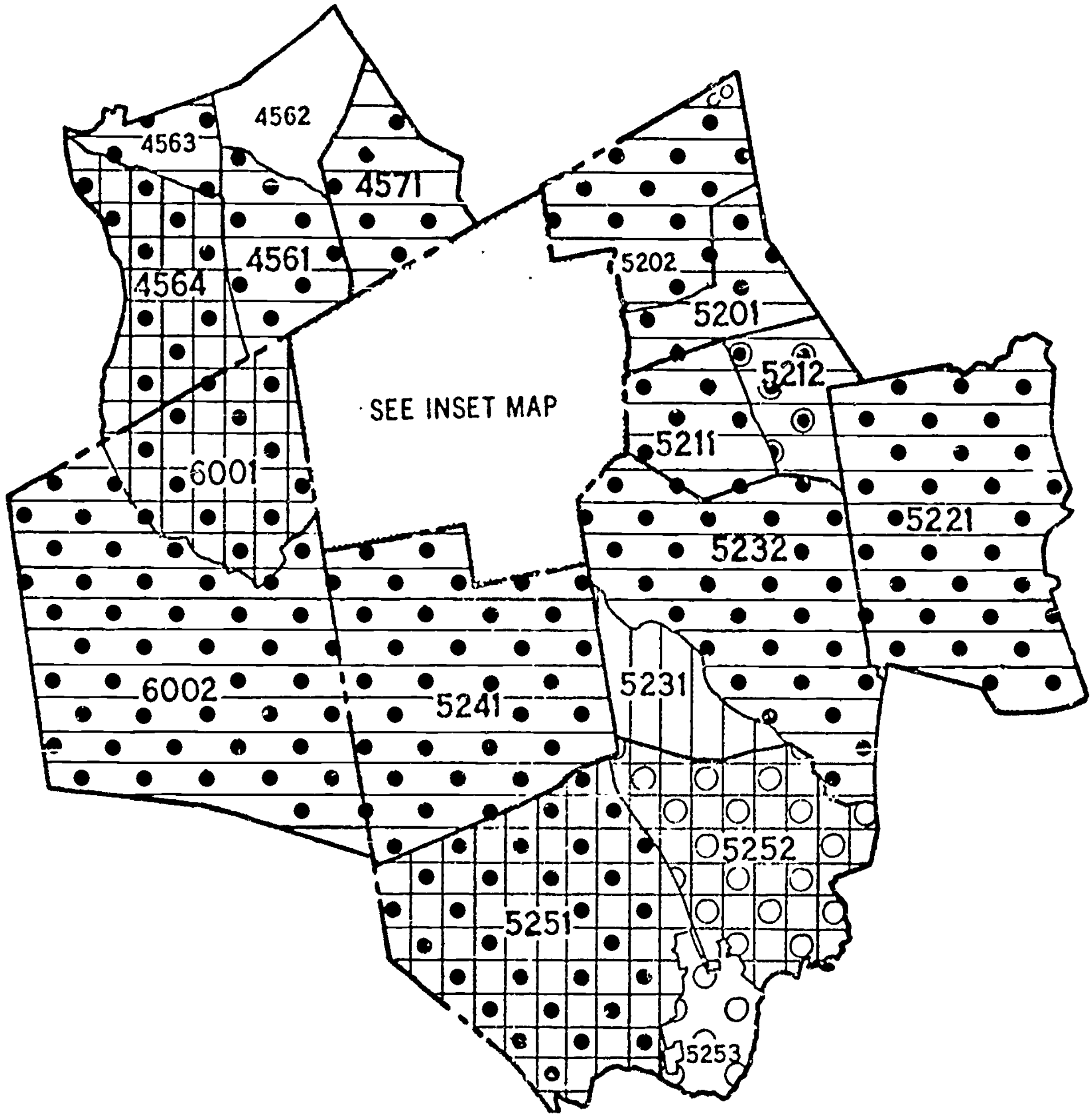
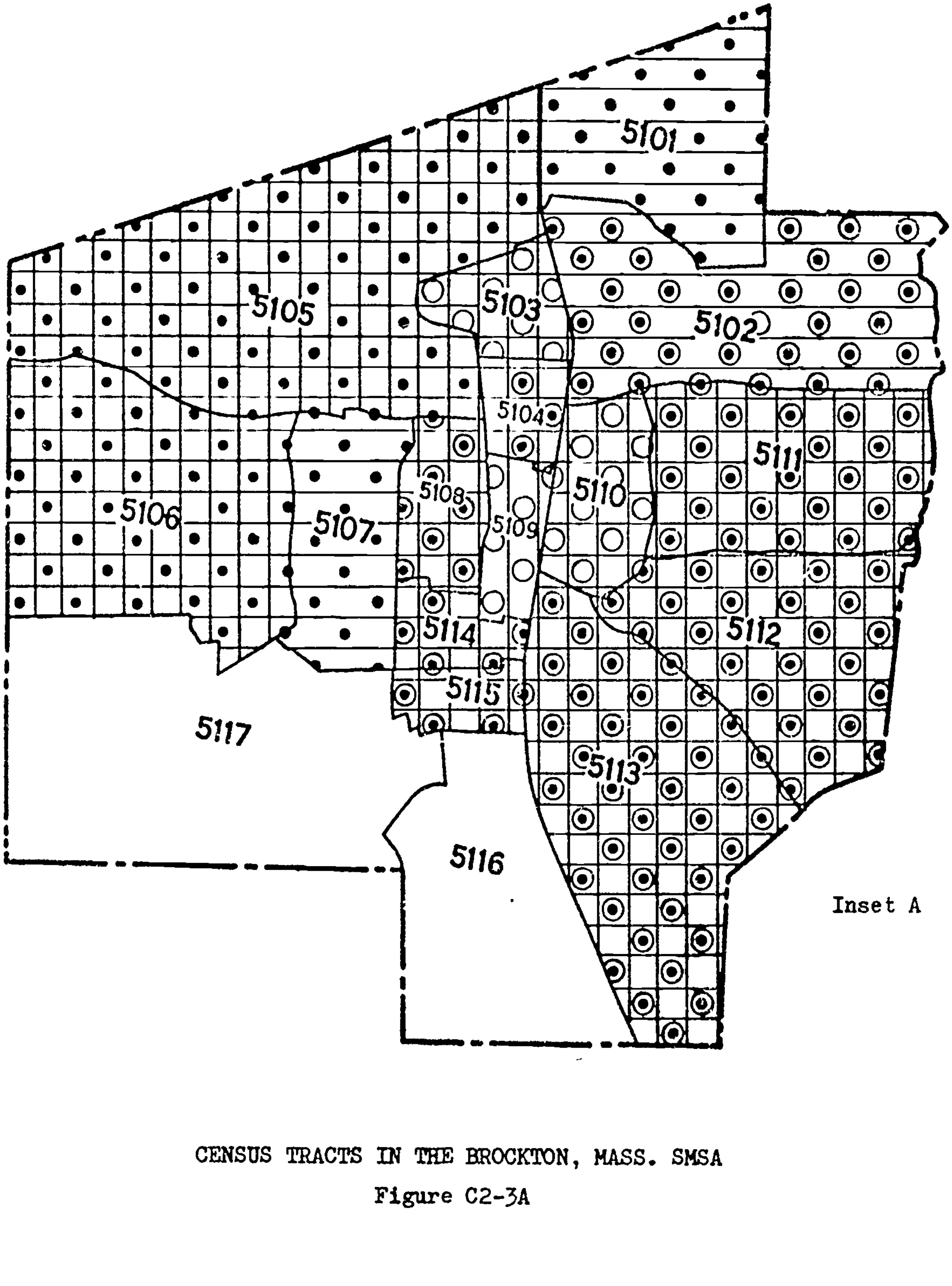
CENSUS TRACTS IN THE BOSTON, MASS. SMSA AND ADJACENT AREA

Figure C2-2I



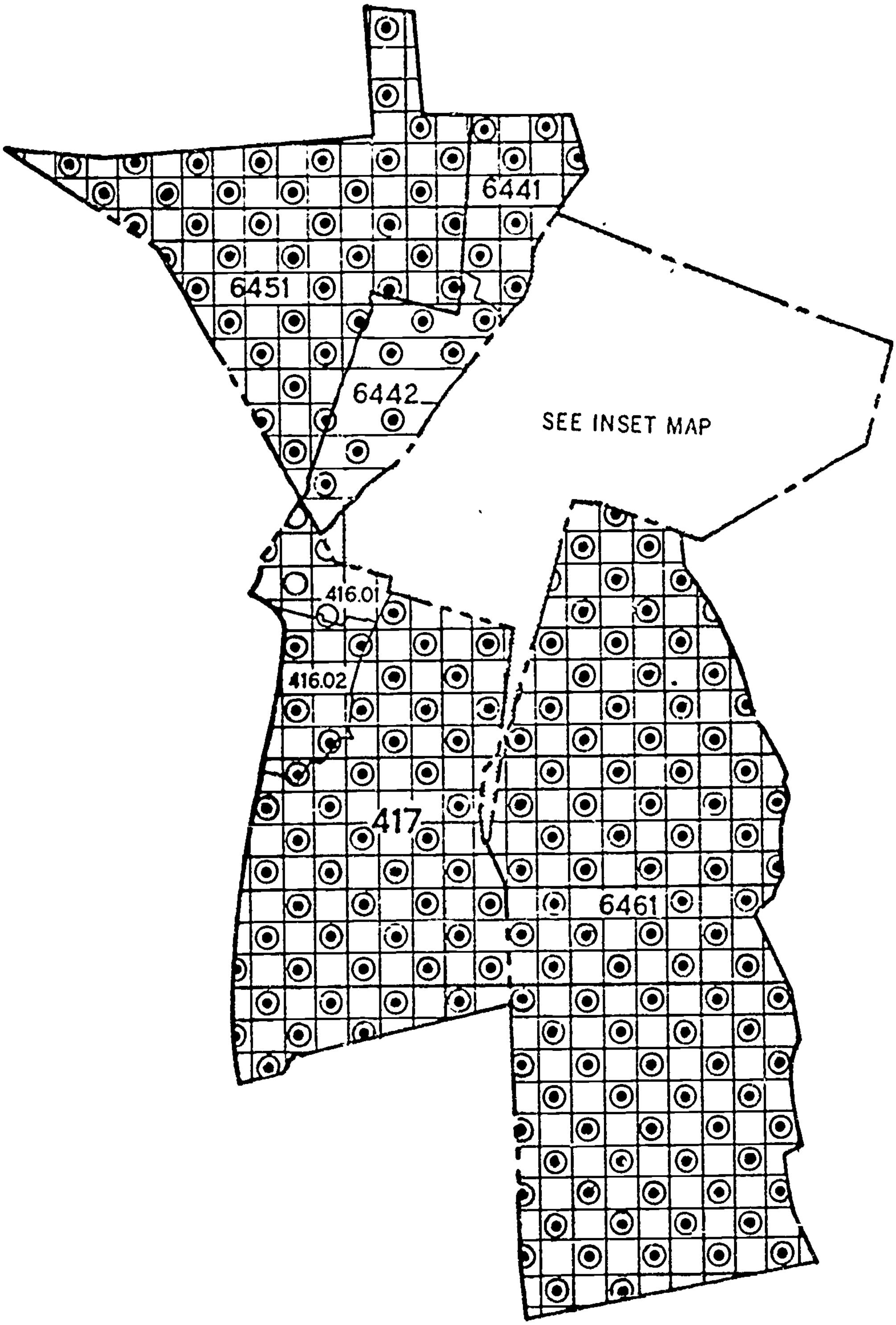
CENSUS TRACTS IN THE BROCKTON, MASS. SMSA

Figure C2-3



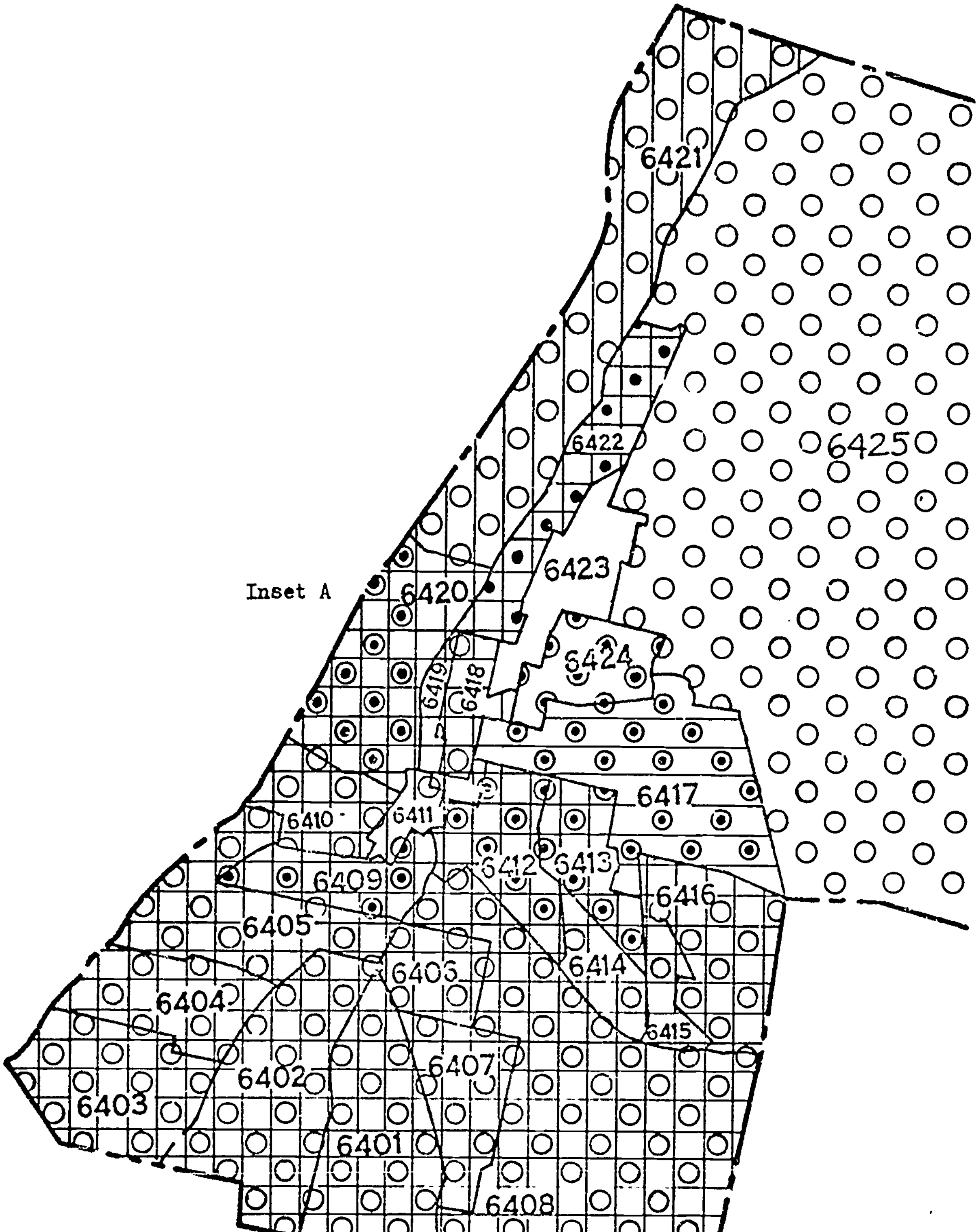
CENSUS TRACTS IN THE BROCKTON, MASS. SMSA

Figure C2-3A



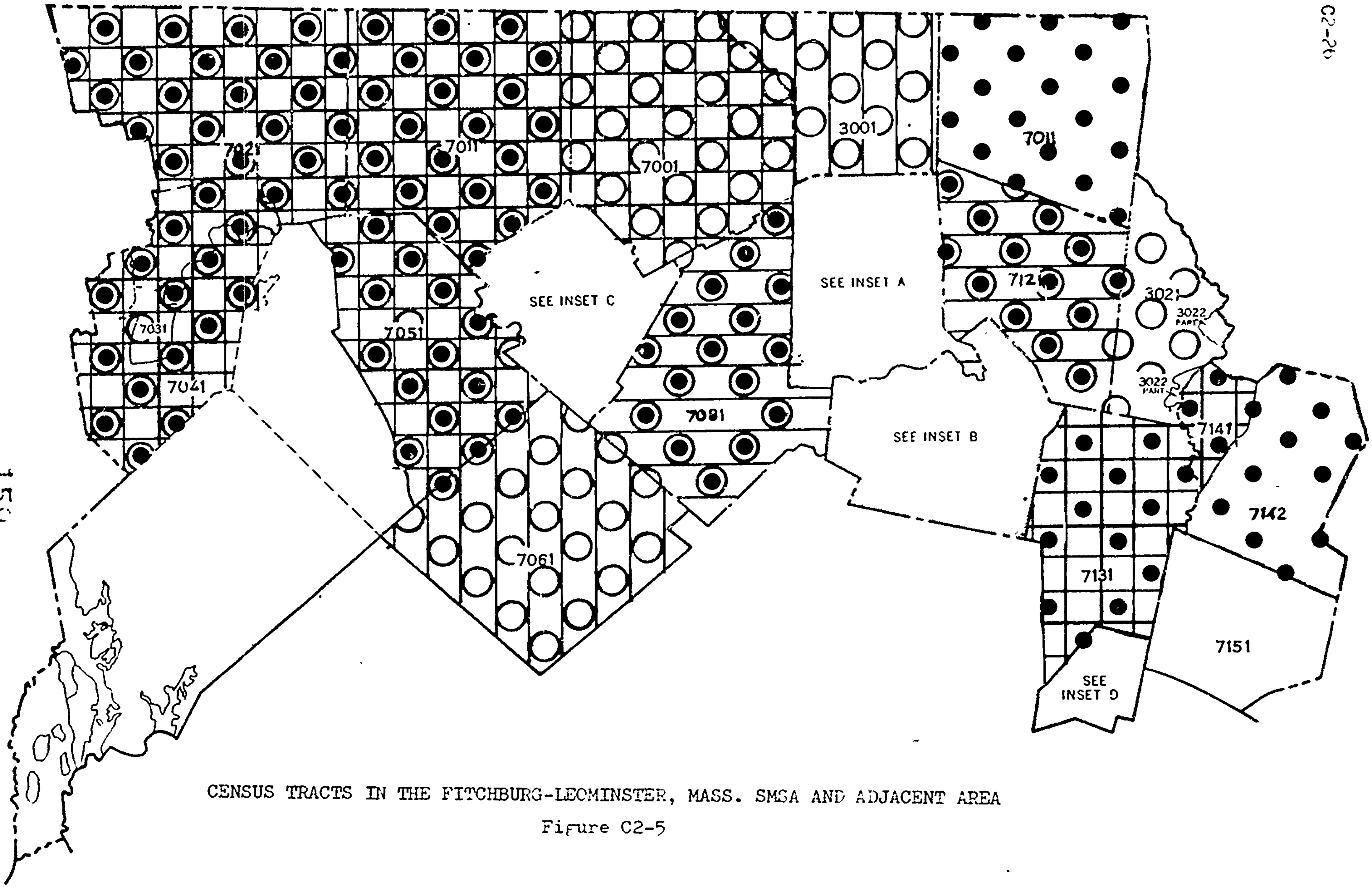
CENSUS TRACTS IN THE FALL RIVER, MASS.-R.I. SMSA

Figure C2-4



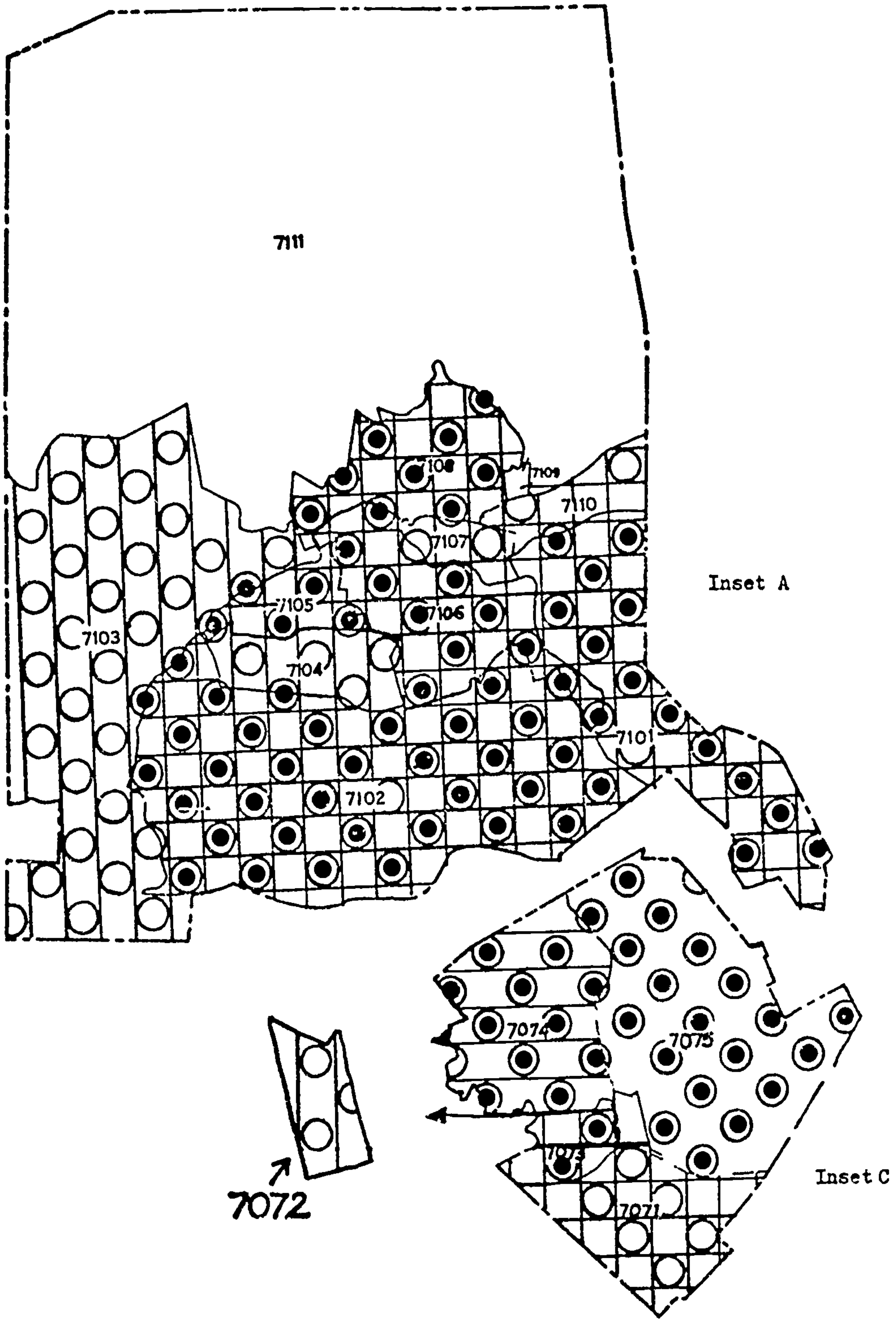
CENSUS TRACTS IN THE FALL RIVER, MASS.-R.I. SMSA

Figure C2-4A



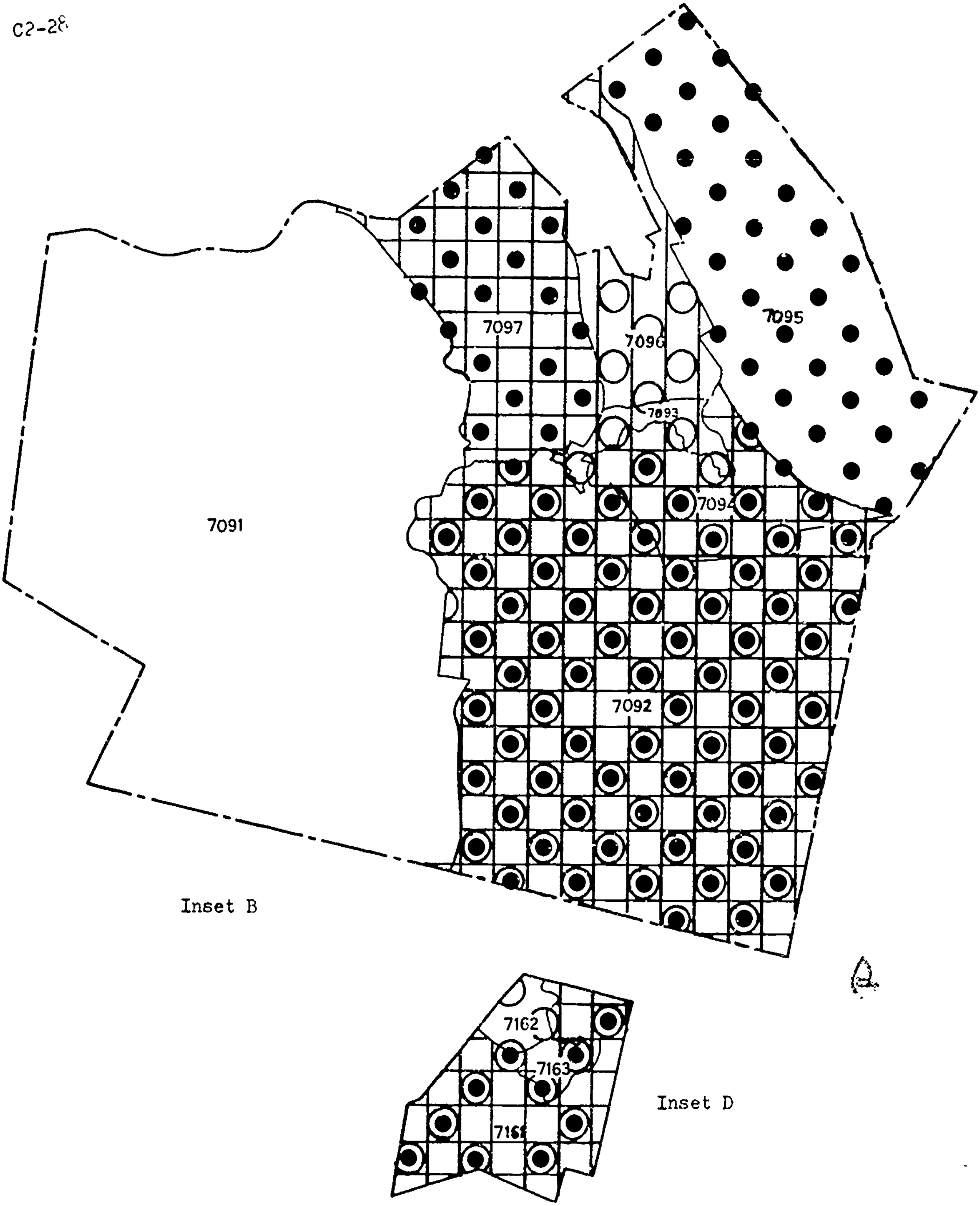
CENSUS TRACTS IN THE FITCHBURG-LEOMINSTER, MASS. SMSA AND ADJACENT AREA

Figure C2-5



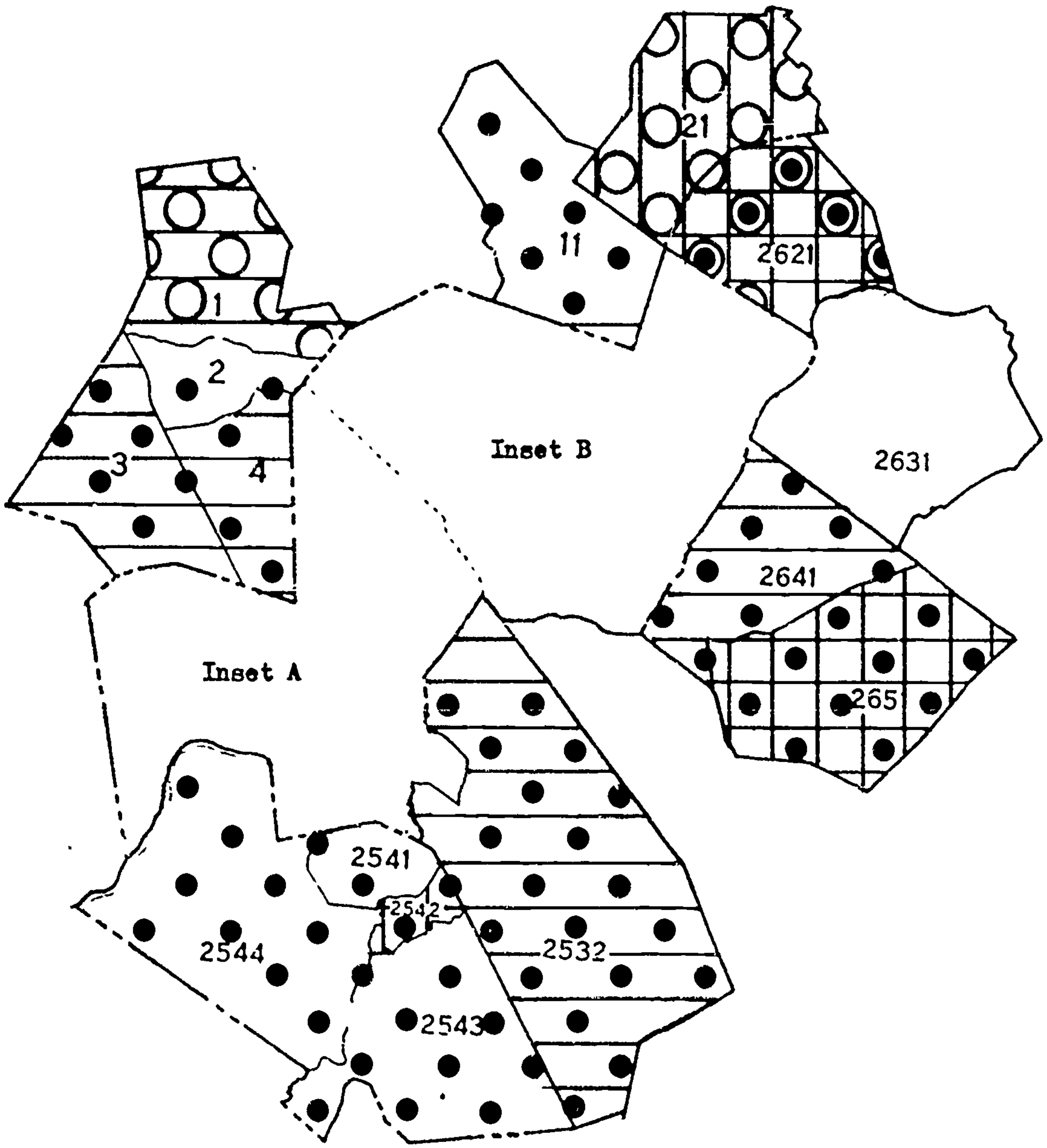
CENSUS TRACTS IN THE FITCHBURG-LEOMINSTER, MASS. SMSA AND ADJACENT AREA

Figure C2-5A



CENSUS TRACTS IN THE FITCHBURG-LEOMINSTER, MASS. SMSA AND ADJACENT AREA

Figure C2-5B



CENSUS TRACTS IN THE LAWRENCE-HAVERHILL, MASS. SMSA

Figure C2-6

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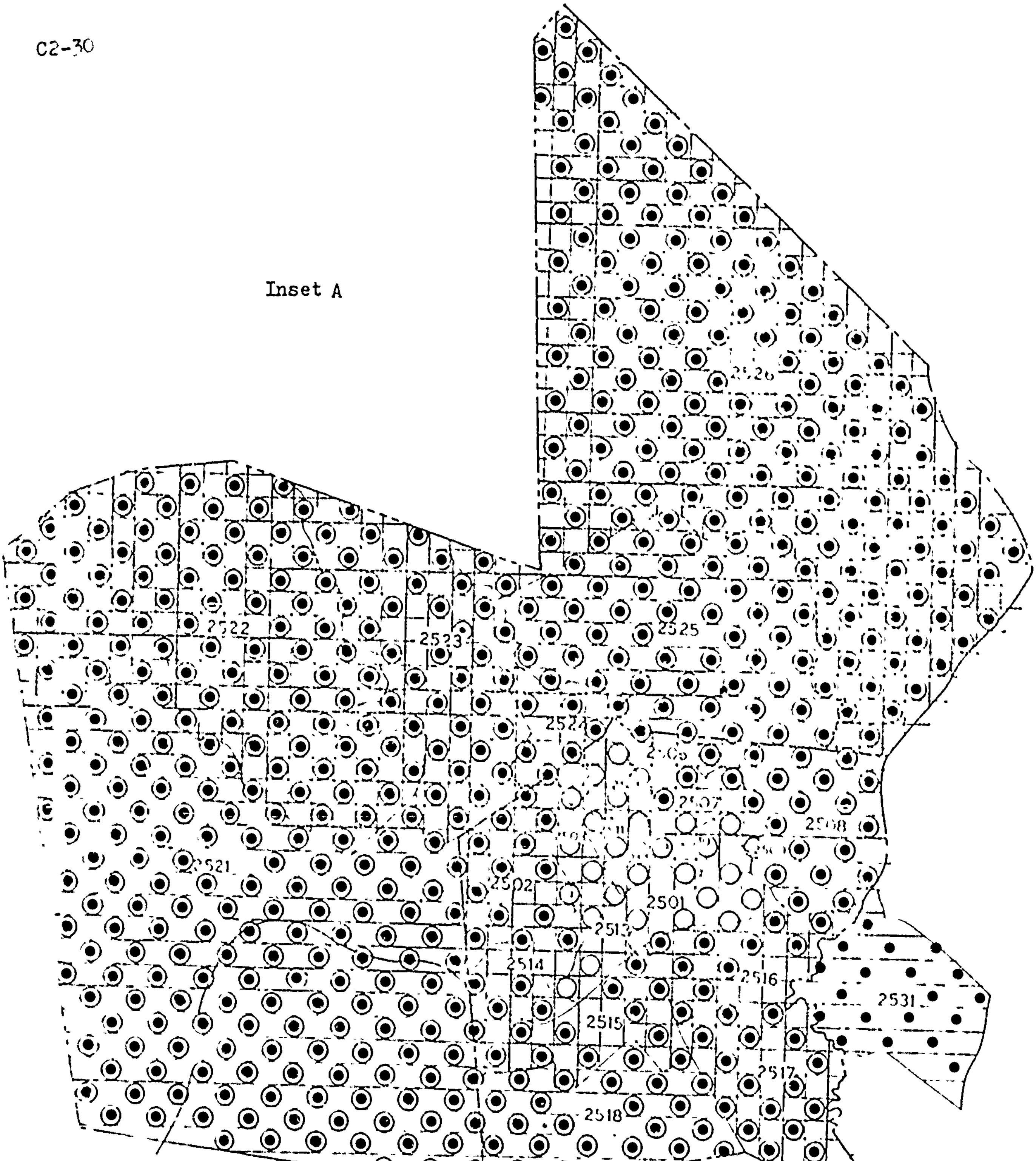
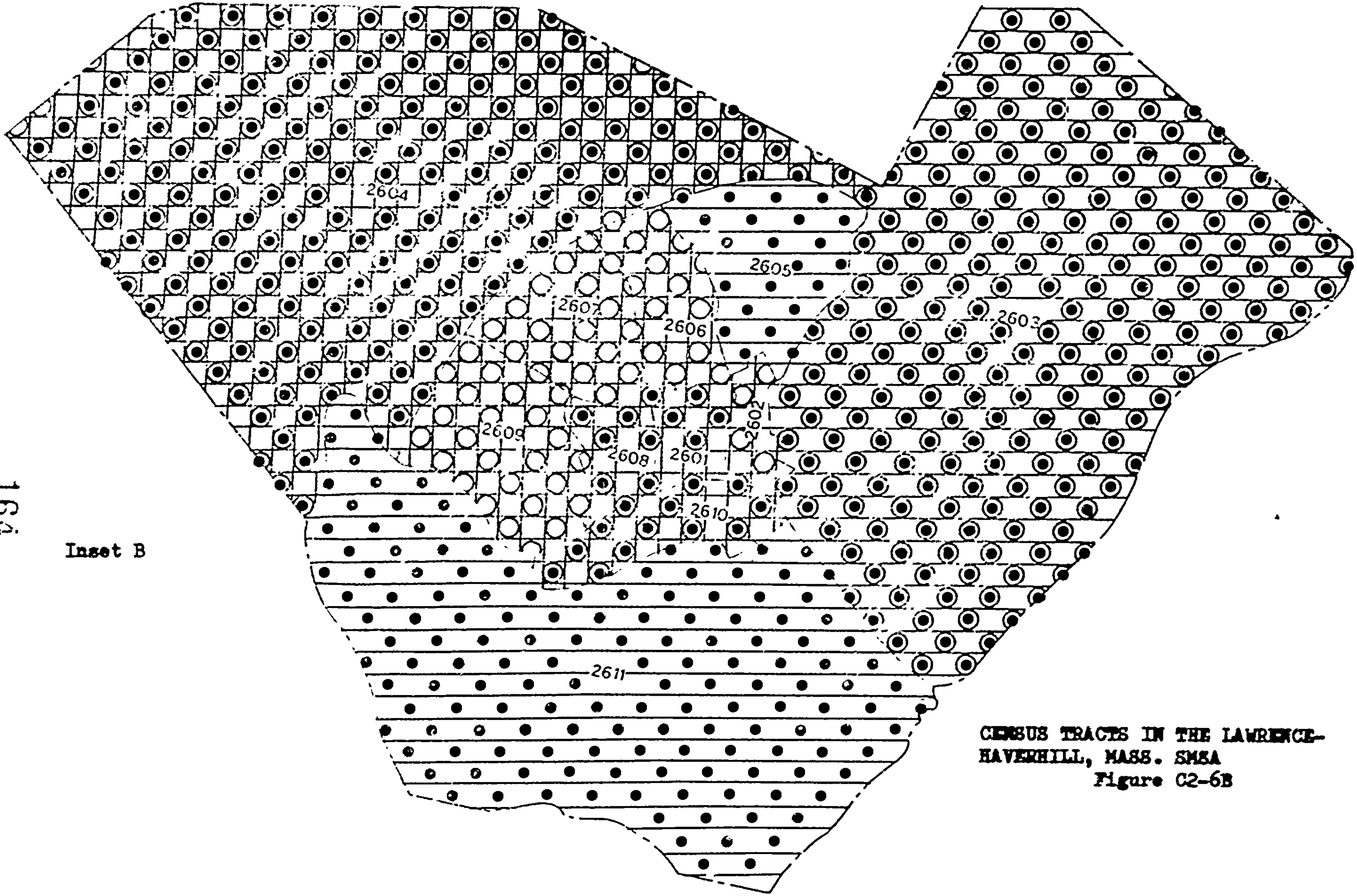


CENSUS TRACTS IN THE LAWRENCE-HAVERHILL, MASS. SMSA

Figure C2-6A



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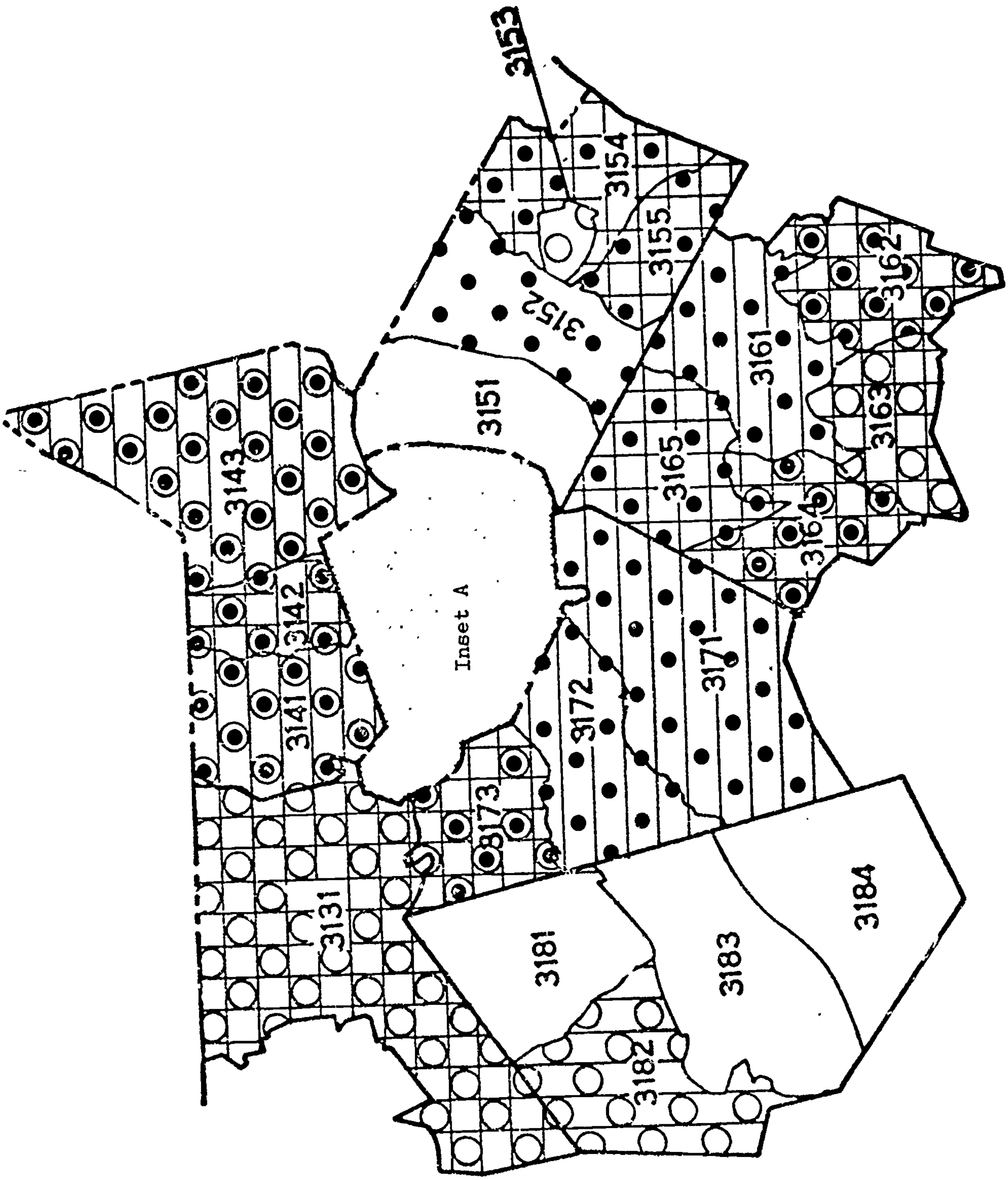
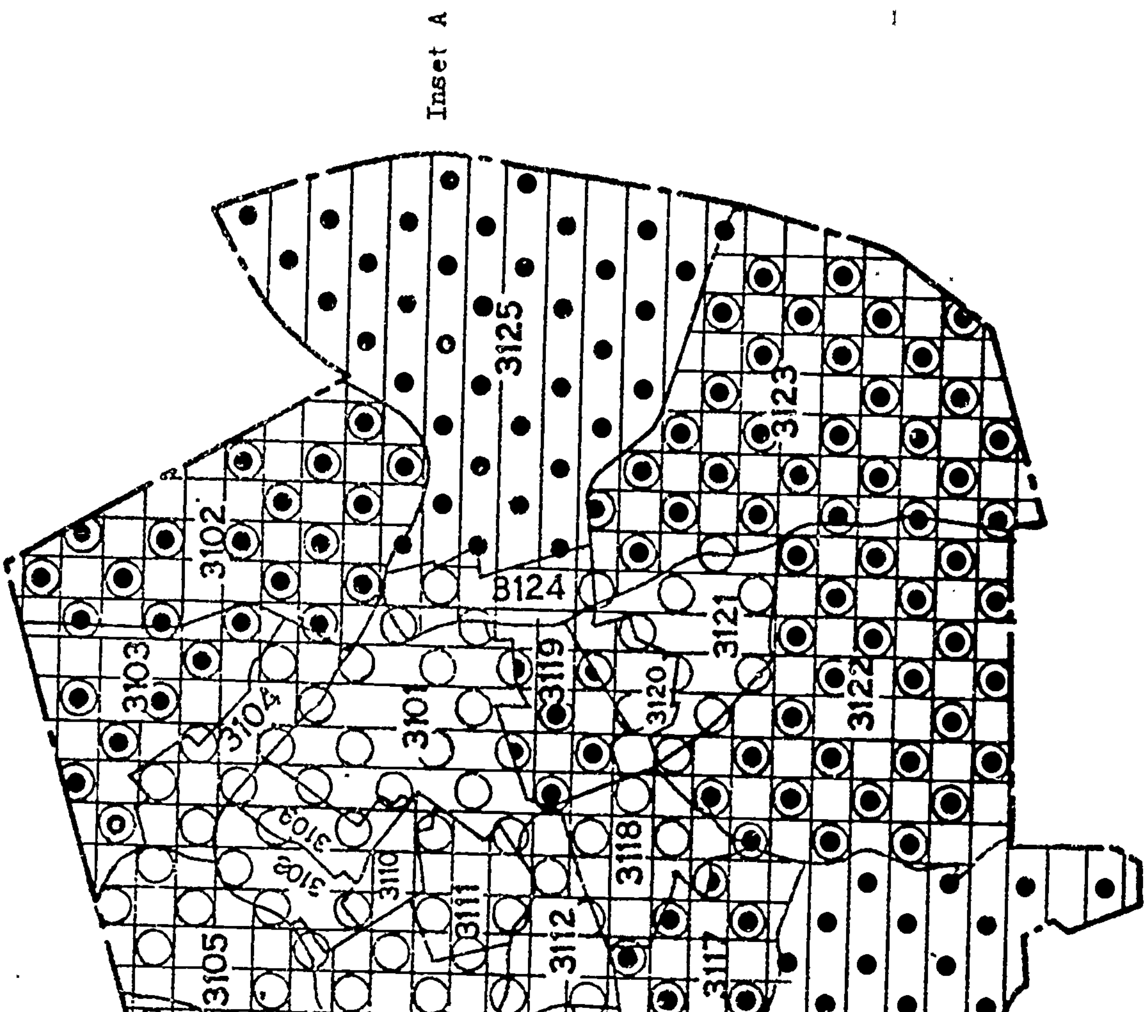
CENSUS TRACTS IN THE LAWRENCE-HAVERHILL, MASS. SMSA
Figure C2-6B



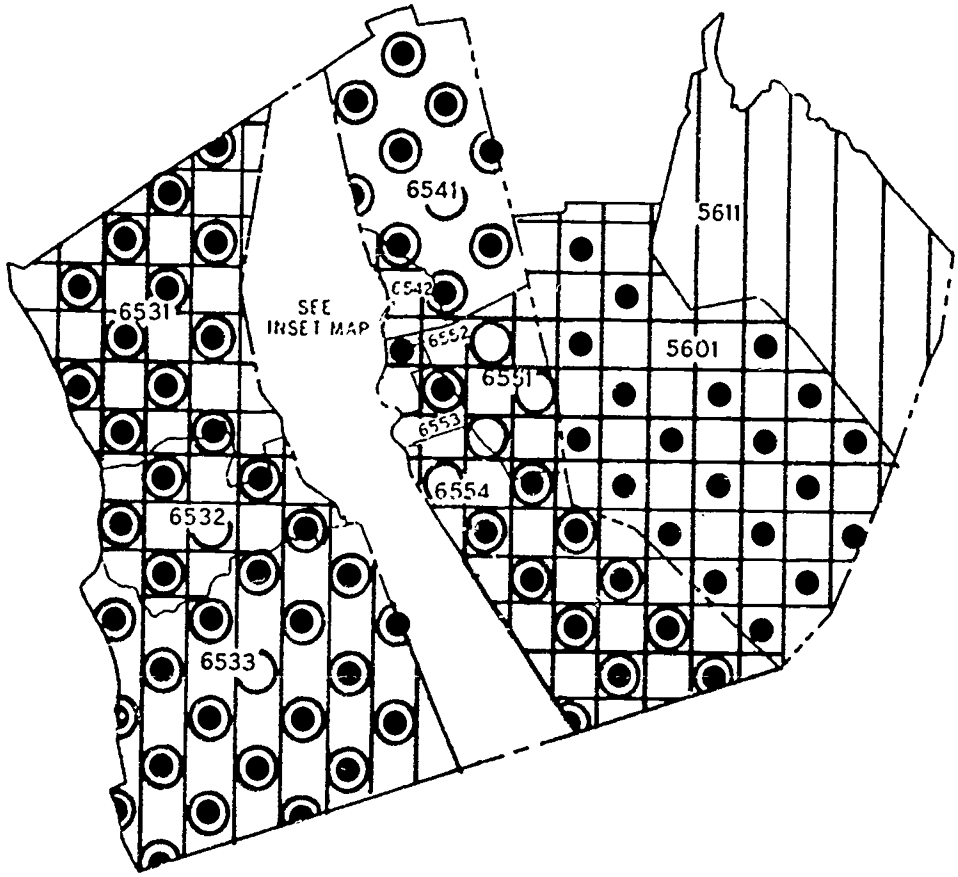
CENSUS TRACTS IN THE LOWELL, MASS. SMSA

Figure C2-7



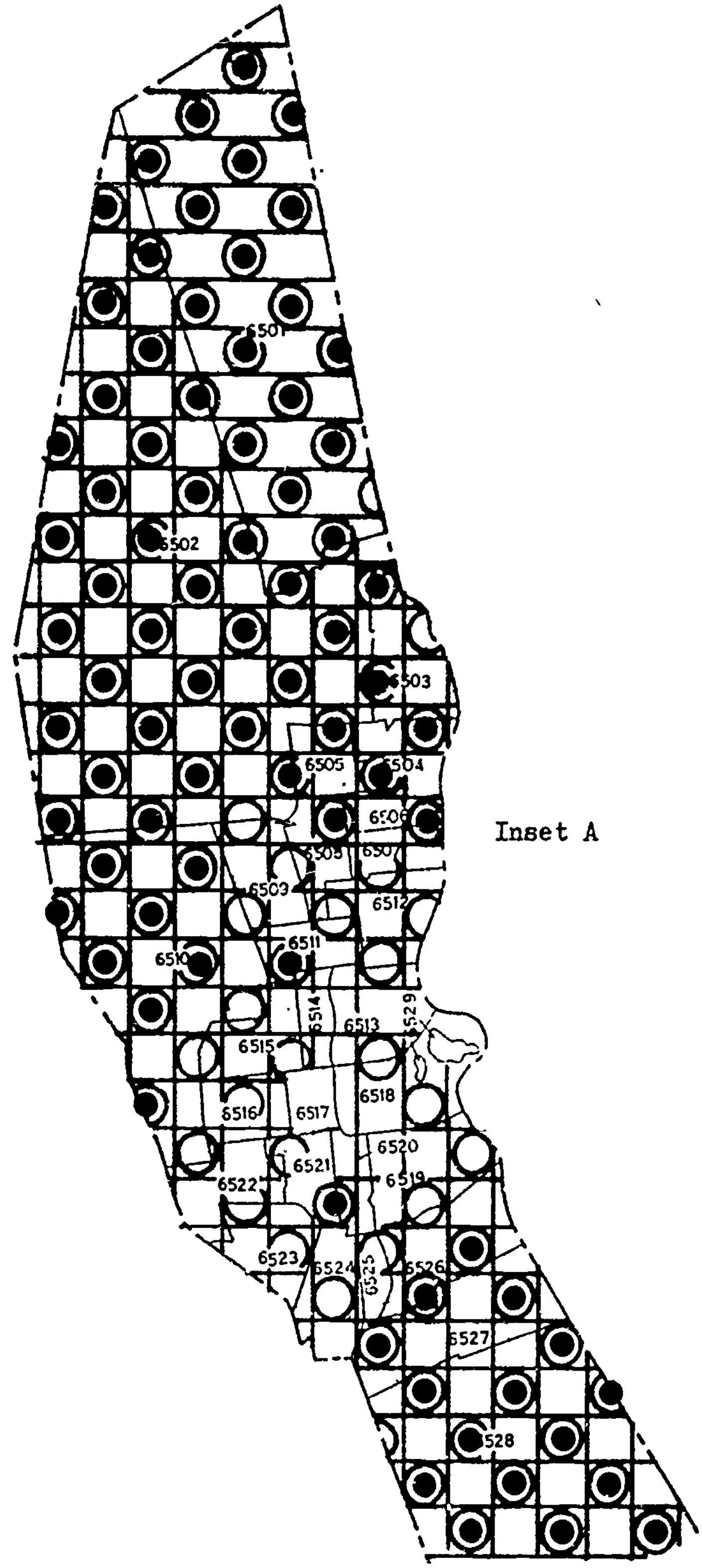
CENSUS TRACTS IN THE LOWELL, MASS. SMSA

Figure C2-7A



CENSUS TRACTS IN THE NEW BEDFORD, MASS. SMSA

Figure C2-8



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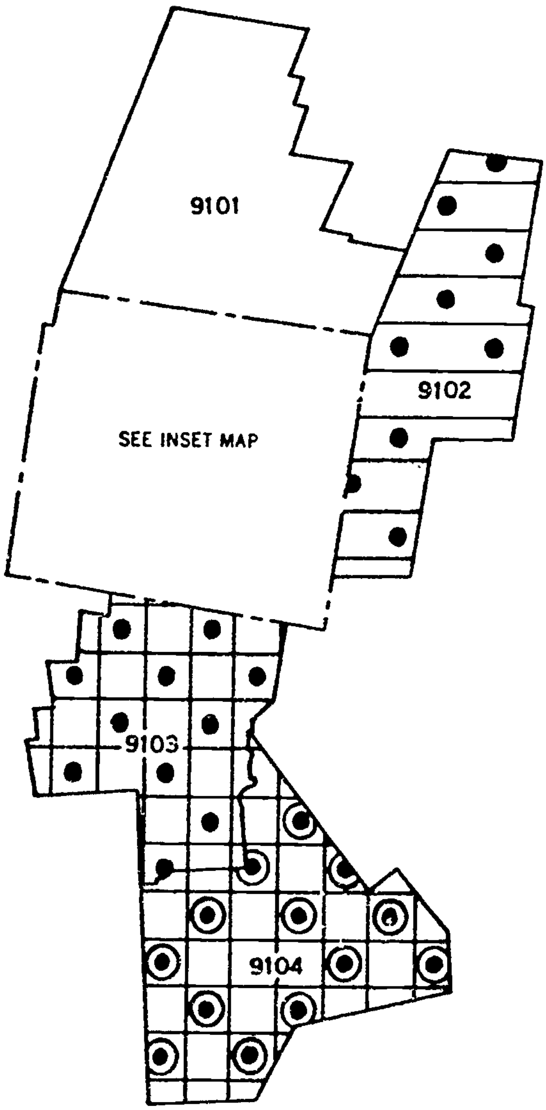
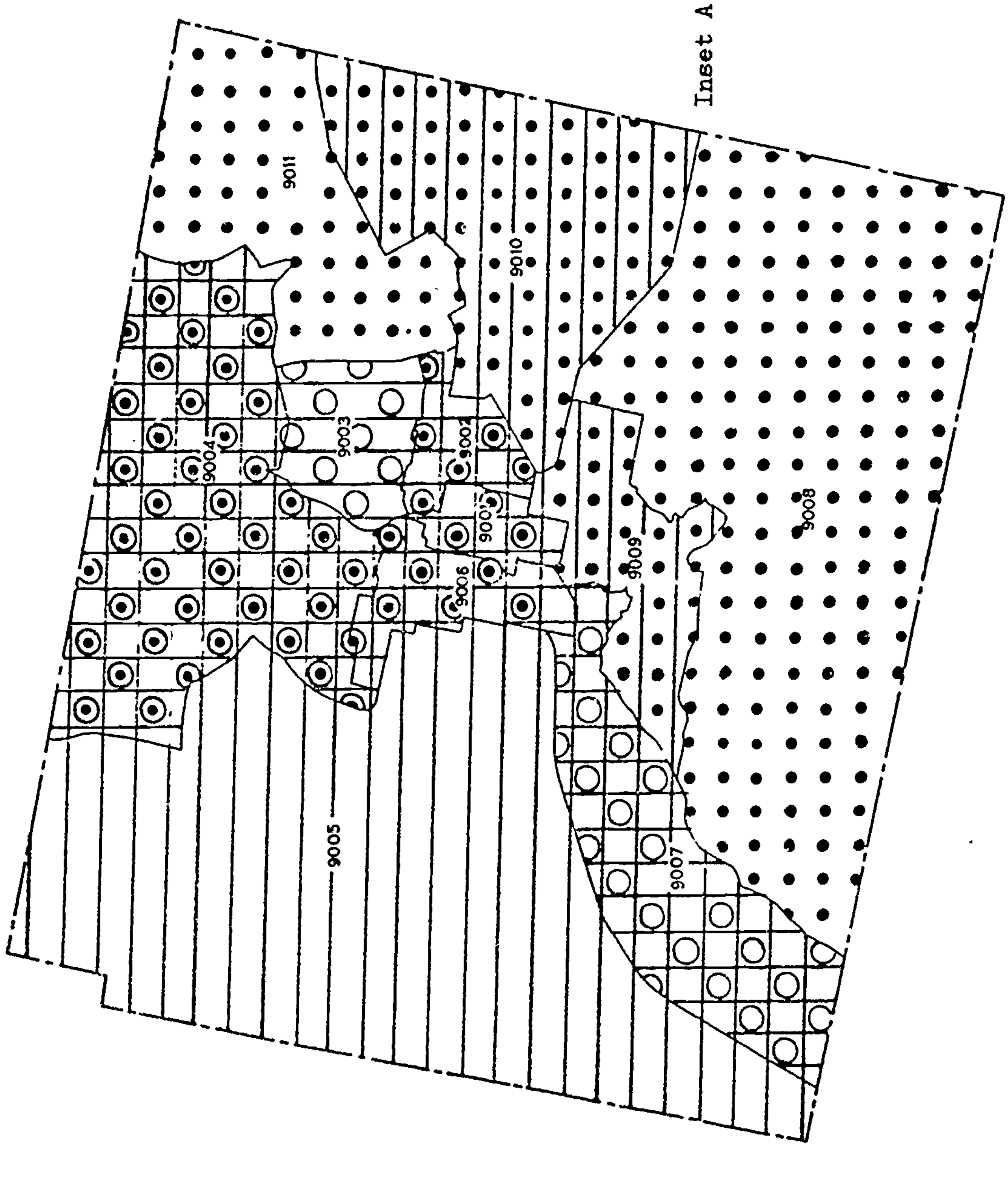
CENSUS TRACTS IN THE NEW BEDFORD, MASS. SMSA

Figure C2-8A



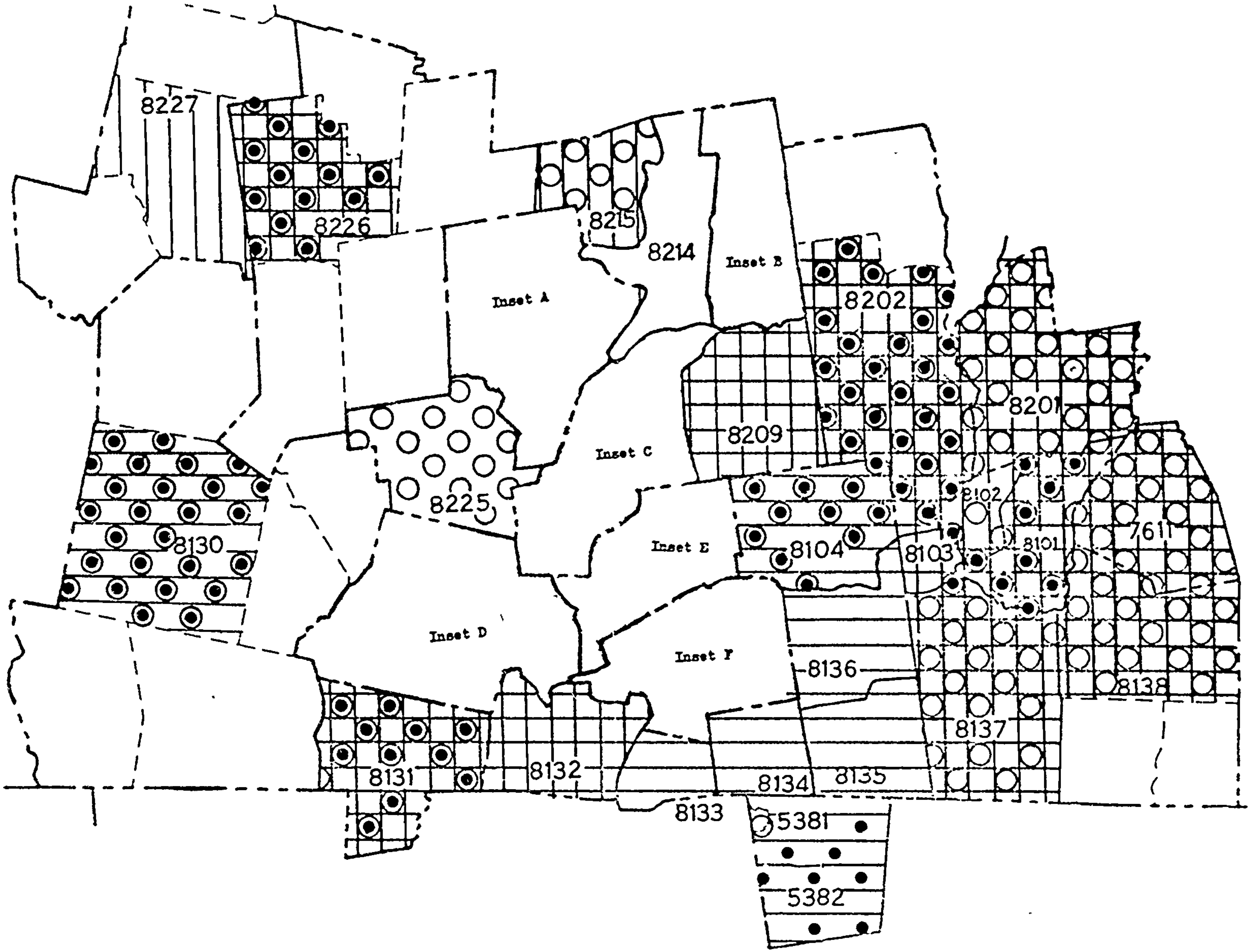
CENSUS TRACTS IN THE PITTSFIELD, MASS. SMSA

Figure C2-9



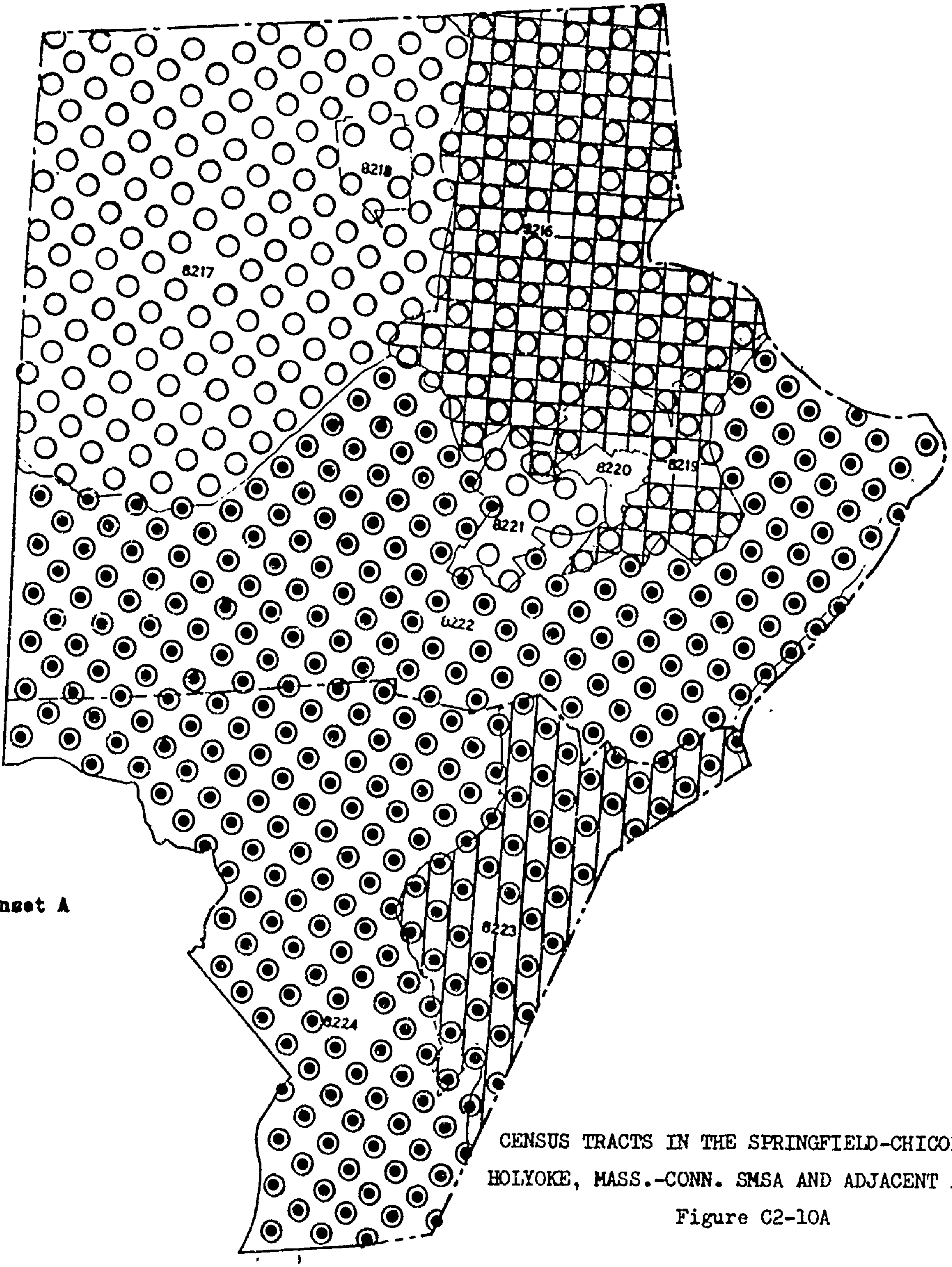
CENSUS TRACTS IN THE PITTSFIELD, MASS. SMSA

Figure C2-9A



CENSUS TRACTS IN THE SPRINGFIELD-CHICOPEE-HOLYOKE, MASS. CONN. SMSA AND ADJACENT AREA

Figure C2-10



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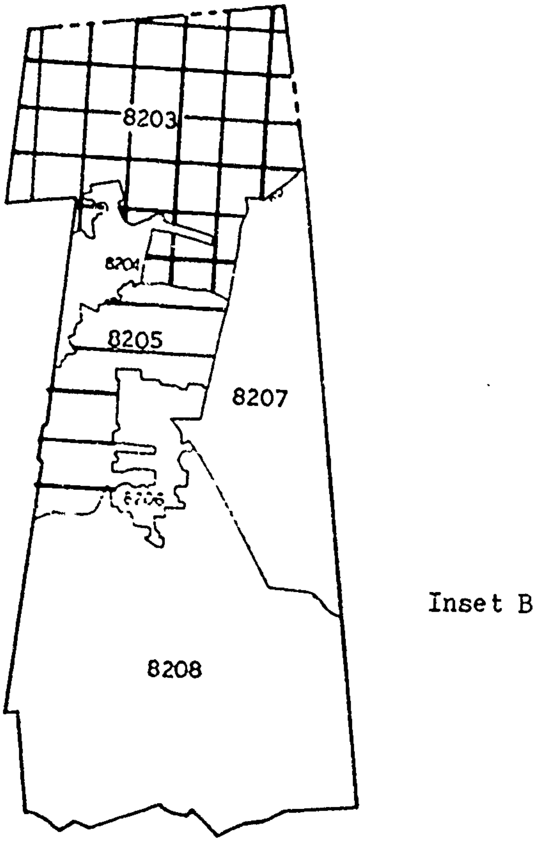
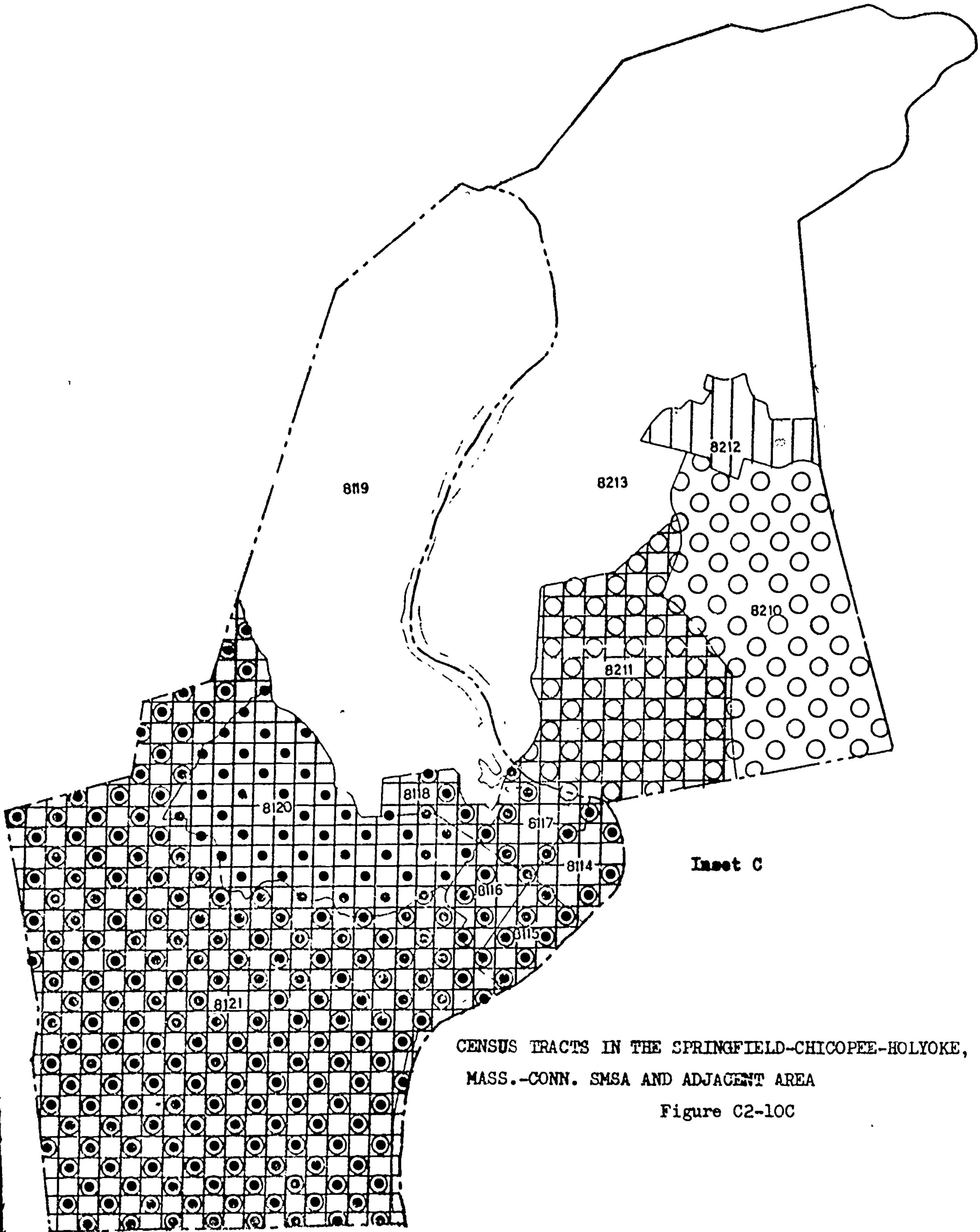
CENSUS TRACTS IN THE SPRINGFIELD-CHICOPEE-HOLYOKE, MASS.-CONN. SMSA AND ADJACENT AREA

Figure C2-10A



CENSUS TRACTS IN THE SPRINGFIELD-CHICOPEE-HOLYOKE, MASS.-CONN. SMSA AND ADJACENT AREA

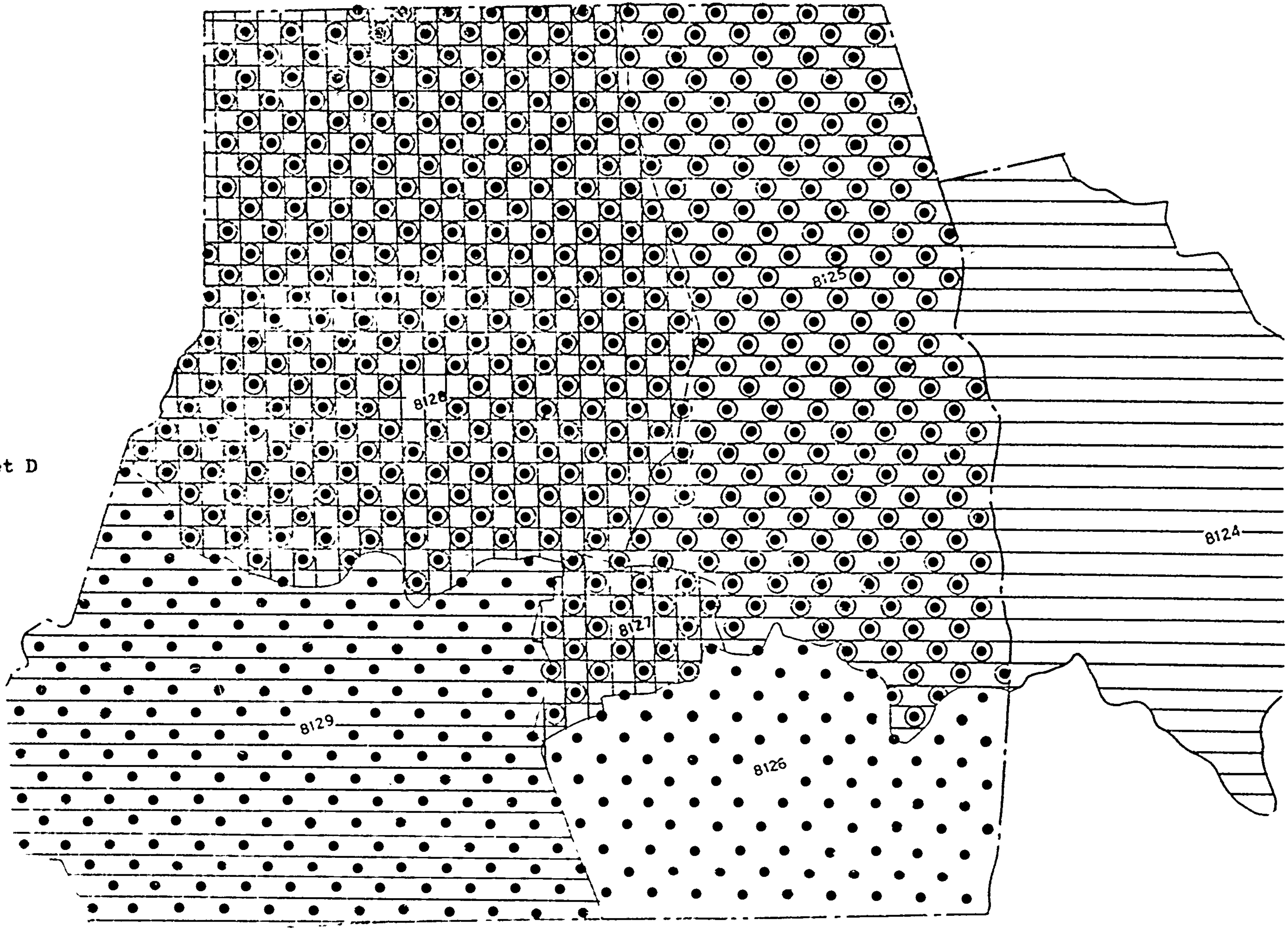
Figure C2-10B



CENSUS TRACTS IN THE SPRINGFIELD-CHICOPEE-HOLYOKE, MASS.-CONN. SMSA AND ADJACENT AREA

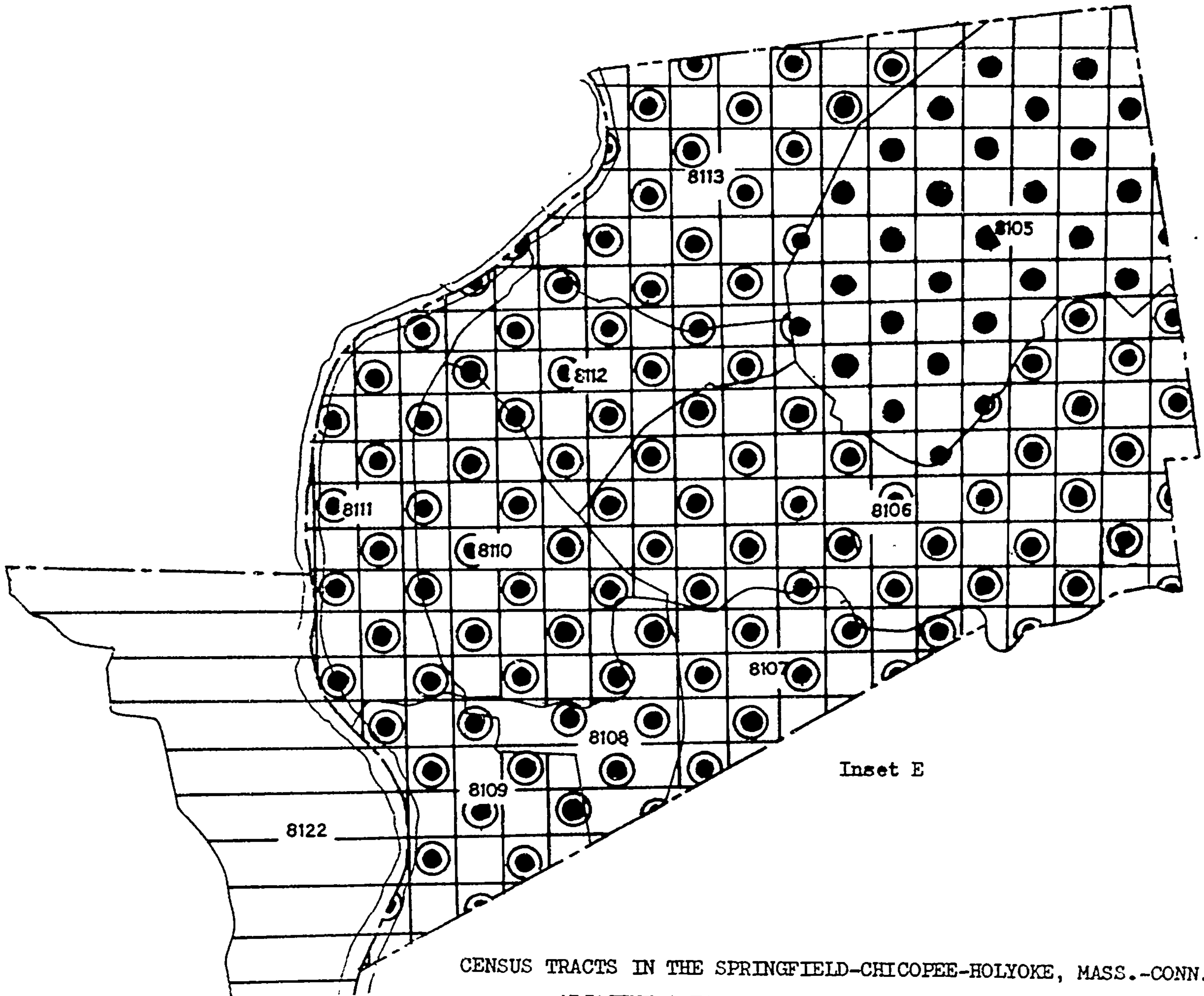
Figure C2-10C

Inset D



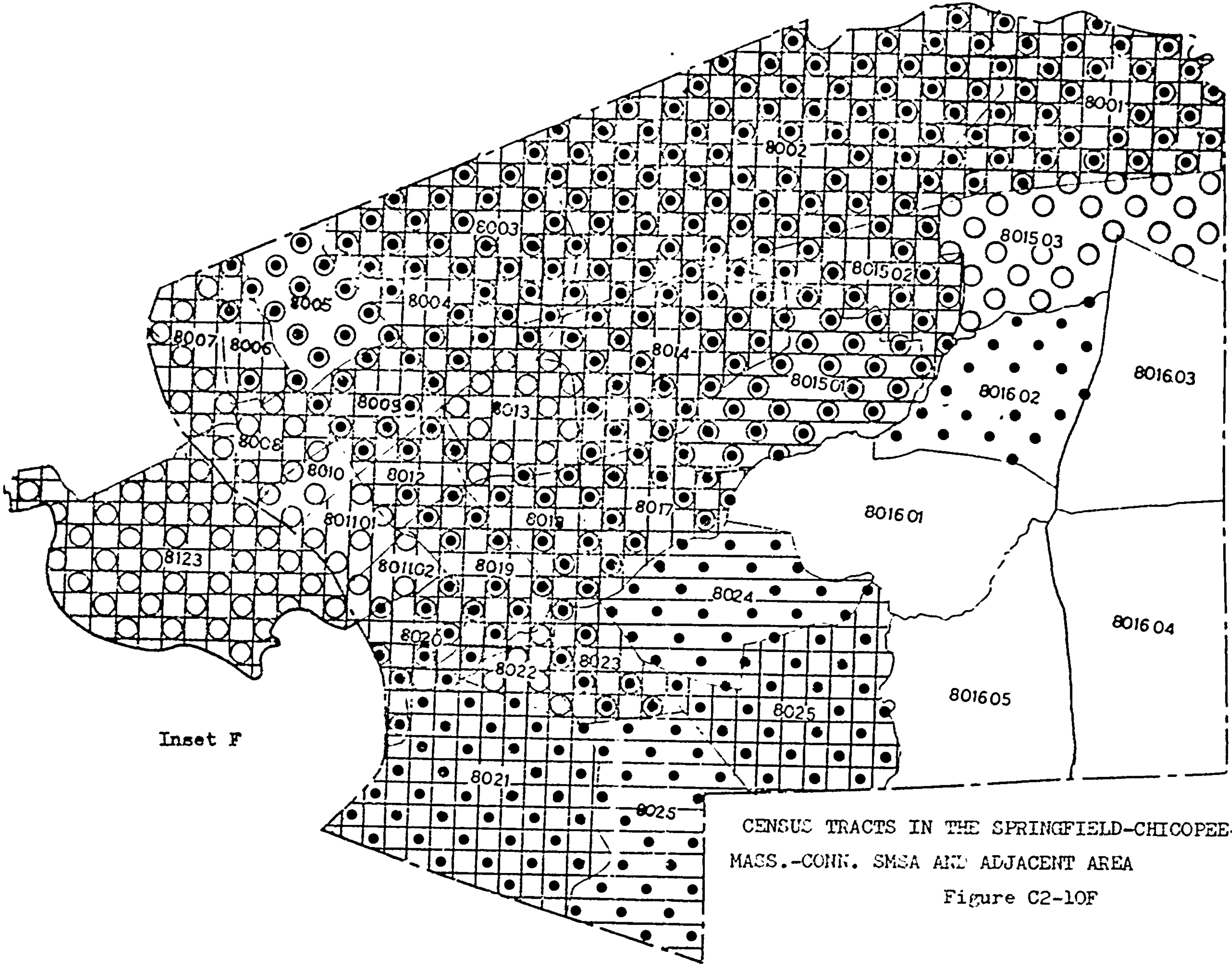
CENSUS TRACTS IN THE SPRINGFIELD-CHICOPEE-HOLYOKE, MASS.-CONN. SMSA AND ADJACENT AREA

Figure C2-10D



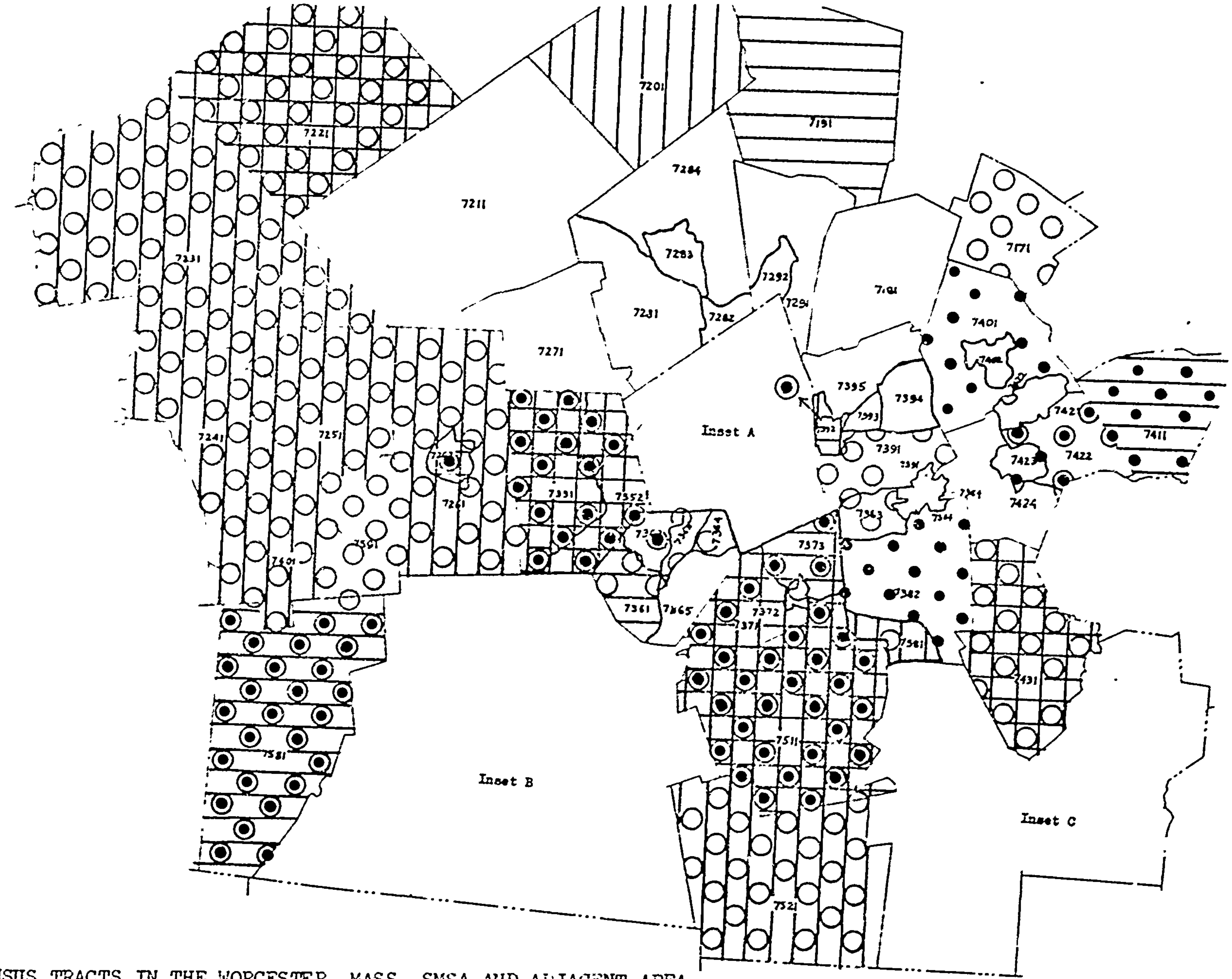
CENSUS TRACTS IN THE SPRINGFIELD-CHICOPEE-HOLYOKE, MASS.-CONN. SMSA AND ADJACENT AREA

Figure C2-10E



CENSUS TRACTS IN THE SPRINGFIELD-CHICOPEE-HOLYOKE,
MASS.-CONN. SMSA AND ADJACENT AREA

Figure C2-10F



CENSUS TRACTS IN THE WORCESTER, MASS. SMSA AND ADJACENT AREA

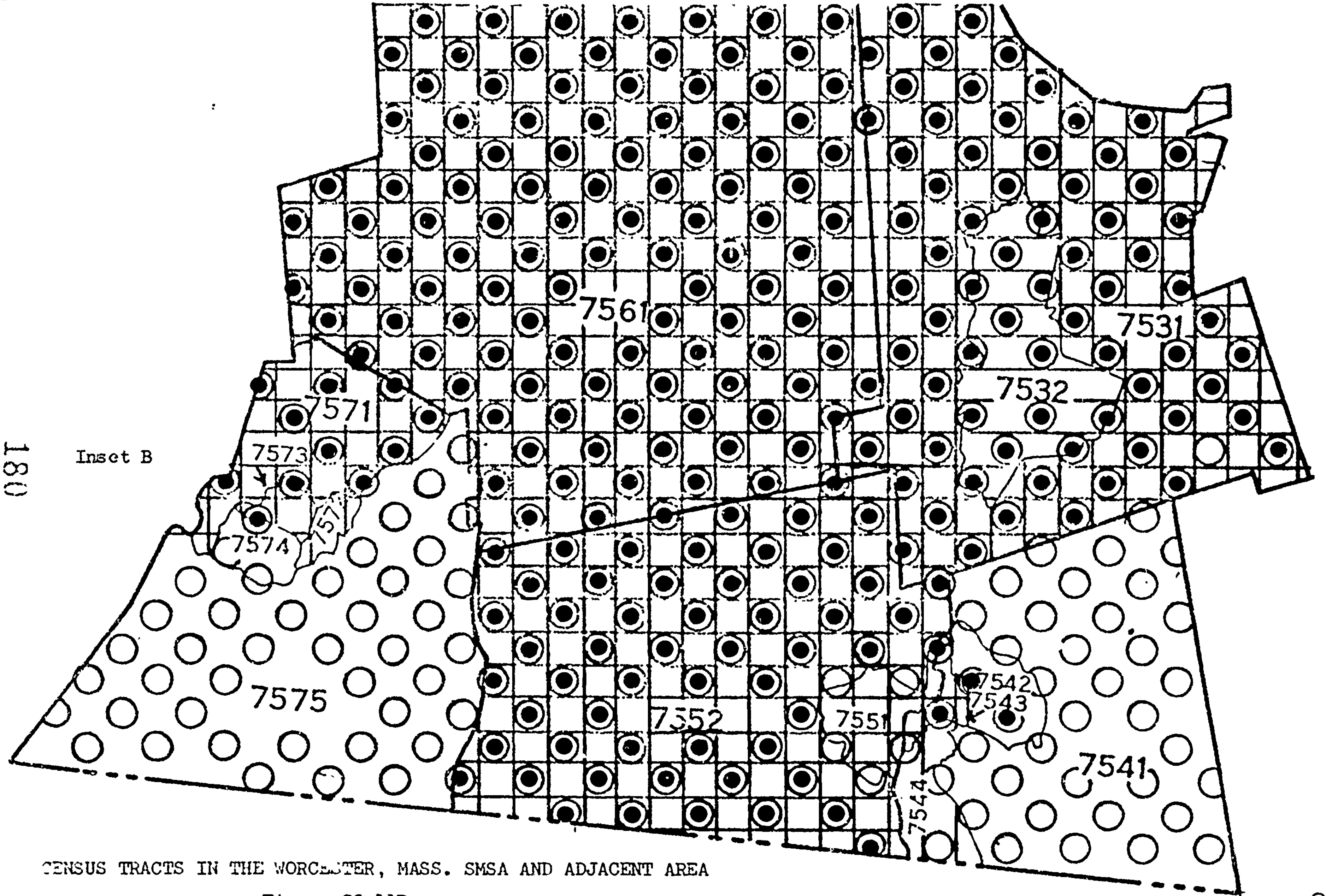
Figure C2-11

Inset A

CENSUS TRACTS IN THE WORCESTER, MASS. SMSA AND ADJACENT AREA

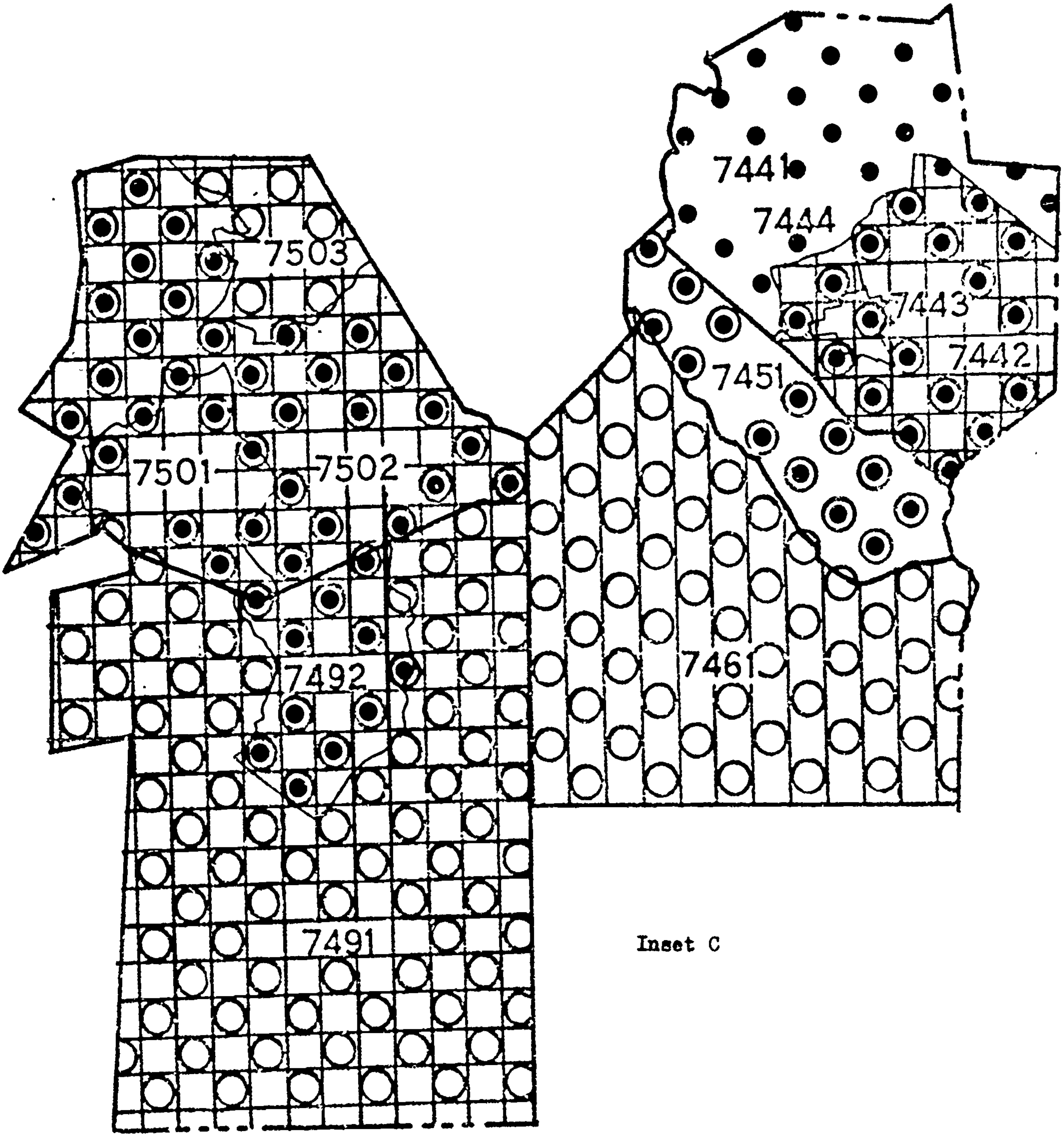
Figure C2-11A

Inset B



CENSUS TRACTS IN THE WORCESTER, MASS. SMSA AND ADJACENT AREA

Figure C2-11B



CENSUS TRACTS IN THE WORCESTER, MASS. SMSA AND ADJACENT AREA

Figure C2-11C

Appendix C-3

MEDIA

A REPORT

For

Telecommunications Project
321 Arnold House
University of Massachusetts
Amherst, Mass. 01002

by
Robert S. Donnelly
and
William L. Gibson
September 20, 1974

MEDIA

In the last fifty years Western man has experienced enormous technological development which has had an overwhelming effect on all aspects of his civilization and culture. Among the most dramatic developments has been the extraordinary increase in the number of ways which man has created to communicate with his fellow man.

The rate of invention has been geometric: before about four thousand B.C. there were no written records at all; more than 2,000 years after that, man arrived at his first alphabet; another 3,500 years elapsed before the first printing came into being; yet in the last hundred years the creation of extra-natural communications has been explosive - telephone, phono recording, audio tape, radio, television, film and computers have all come into being.

The implications for man are obvious. His awareness and understanding of himself and his fellow man and of his environment have become more acute. Communications devices have enabled him to transmit thought, ideas and images at a rate here-to-fore unimaginable. Because the development of these devices has been a relatively recent phenomenon, it is difficult, if not impossible, to ascertain at this time their full potential. However, by any measure - number of hours used for a particular intent, capital investment, etc. - more than half of these devices are designed for entertainment: commercial film, television and phono records. The next largest application is simple factual information transferal; our use for business and pleasure of the telephone, telegraph and the like. The use of communications devices for learning is at least 30 years behind commercial applications. Whether or not the revolution is coming to the classroom; it has come to the broader society.

What does this lagging mean for education? The most immediate observation is that the educational institutions of our society are not taking the fullest possible advantage of the technological revolution. Education has not felt the "industrial revolution" and may be persisting in methods or a structure which could be vastly changed for the better.

This is the reason for the emphaiss on "media" in this report. The purpose of the media appendix, then, is to provide a theoretical and technical background for understanding the nature of media with specific concern for its application to education. Furthermore, like the other appendices, this paper is intended to be the resource material which will act as the groundwork upon which the assertions and conclusions of the main body of the project report will be founded.

What are the questions which this paper will attempt to answer? The first is to determine a general working definition of media: What media are and how they function? Second, we will detail the role of media in instructional systems. The third part will analyze the general characteristics of media as they relate to media selection. Those discussions will act as a basis for the fourth section: a cursory overview of each of the major media forms--their operation and limitations. Finally, the selection of media for the target population of this study will be considered.

Definition - The term media as it is used in education almost defies definition. The difficulty seems to arise because educators think of media as a means "by which instruction may be presented"[1] which immediately is taken to include "TV, motion pictures, teaching machines, programmed booklets, slides, filmstrips, and sound tapes." and "...conventional media (books, workbooks, laboratory materials)..." It seems apparent that "TV" and "workbooks" have few similarities. On the other hand, "books" and "workbooks" are difficult to distinguish from one another. In addition, no distinction is made between software (the program material) and the hardware itself.

The dictionary definition of a medium, in the sense in which it is used in education - is "a channel of communications" or "a means of effecting or conveying something."[2] Compare that with Bretz' statement where he relates the normal usage of the term in education -

> The entire system of equipment, processes, people, and materials that are necessary for the presentation of information and direction of learner activity. It often includes software as well as hardware; program planning, production, recording and/or transmitting; and program reception. It may also include response methods and/or devices, and feedback to the learner.[3]

In order to come to a meaning which will be useful, it is necessary to consider some of the components involved in Bretz' definition. Silber[4], a systems analyst, segments the conglomeration into activities (management and development) and Instructional System Components. The activities which relate to the generation of the Components and the administration of the system can be set aside. The Components which include all the devices, objects, equipments, etc. that Silber identified as "media" in education fall into six categories - message, man, material, device, technique and setting. In his scheme the message (subject matter) is embodied in some material (film, records, books) which are used by man (teacher, speaker) who operates a device (projector, radio, computer) to transmit the message in some setting (building, laboratory) as part of a technique of teaching. He finds that some materials are also devices (books, posters, chalkboards, etc.) and that the setting includes environmental conditions (heat, light, etc.), but otherwise he is able to differentiate his Instructional System Components from one another.

We can work from Silber's model to derive a usable definition of "media." Silber's distinction between materials and devices appears artificial. A book displays words on paper. It makes little or no difference, from a functional standpoint, whether the book displays words on paper, sheepskin or papyrus - the book is a display device for words. Similarly a videotape may be one-half, three-quarters or one inch in width without significance for the information stored on it, or a picture shown on television basically differs very little from a photograph (assuming no action is involved). Combining those two categories - material and device - eliminates the difficulty Silber has in categorizing man, posters, chalkboards and some other similar items in either one or the other.

Secondly, the technique of teaching used and the setting in which it occurs impact on the learner, but their impact is totally distinct from that of the learning materials and display devices. One may not be able to read if he/she is very cold, but that inability has nothing to do with the book or the words in it. Lastly, man has unique abilities for interaction with other men, but man is a display device when he/she lectures or otherwise dispenses information. When a teacher uses a chalkboard, the situation is analogous to the combination of projector and screen - a two element display. Thus, Silber's categories of man, technique and setting can be disregarded for present purposes.

Except when the display device is itself the object about which information is sought, the information is "coded" in some symbollic form - pictures, text, sounds, etc. - which are not the object of interest, but which represent it. The symbollic form is termed a "sign vehicle" or "stimulus object." (The sign is the internal reaction one has to the "sign vehicle" - the response to the stimulus.)

The crux of the confusion about what media is comes down to the issue of whether it is the sign vehicle, the display device, the combination of the two or some further combination with yet other elements relating to the instructional process. For present purposes, the term media will be restricted to the means of communication, the sign vehicle. Because the display device used can essentially modify a sign vehicle (a word can be displayed by being spoken or printed), the display devices will also be described and analyzed.

Having settled on what media means here, its (or their) position in the instructional process will be reviewed next.

Media in Instruction

The process of instruction is intended to achieve, or possibly enable, learning on the part of a student or learner. Learning is not presently well defined by educators. Travers lists fourteen definitions of learning as being "representati..."[5] All of those definitions explain learning as something which occurs in an individual which causes him/her to change his/her subsequent behavior. The "something" which occurs is neither defined, nor explained, but a number of the definitions relate the change to interaction with the environment and some exclude changes due to natural maturation and growth or to artificial stimulation as from fatigue or drugs. Thus, learning seems to have at least two components, interaction with the environment and some internal processing of the information acquired. Once "learning" has occurred, it is, or can be, manifested by a change in behavior.

Because it involves interaction with the environment, learning is an information transfer process - a communications process. One acquires information from his/her environment, organizes it and may use it to modify his/her behavior. Formal education or instruction is intended to enable learning and as such, it, too, is a communications process - communications designed to promote learning.

One can interact with his/her environment and derive information from it by observing or manipulating objects. As an artificial process, education attempts to embody information in objects or store it in retrievable form in order that it will be available at the appropriate time for use (learning) by the learner(s). Information would be "stored" in the form of pictures, print, sounds, etc. recorded on paper, records, film, etc. The objects manipulated or in which the information is stored, then, are media; the means used to access the information are the display devices.

Figure C3-1 - A Media System depicts this concept of media in block diagram form. It illustrates that knowledge becomes information in the communications process and information becomes the message to be transmitted to the learner. The message is embodied in a medium which is displayed by some device enabling the learner to perceive the medium and, hopefully to extract the message from it.

The centrality of media and their associated display devices in the instructional process is obvious. Whether the media is words and the display device is a teacher, or the media is a nut and bolt which is handled, the transfer of information to the learner takes place through the media.

When an educator undertakes the design of a learning activity or experience, his choice of the medium or media to be used is critical. There are

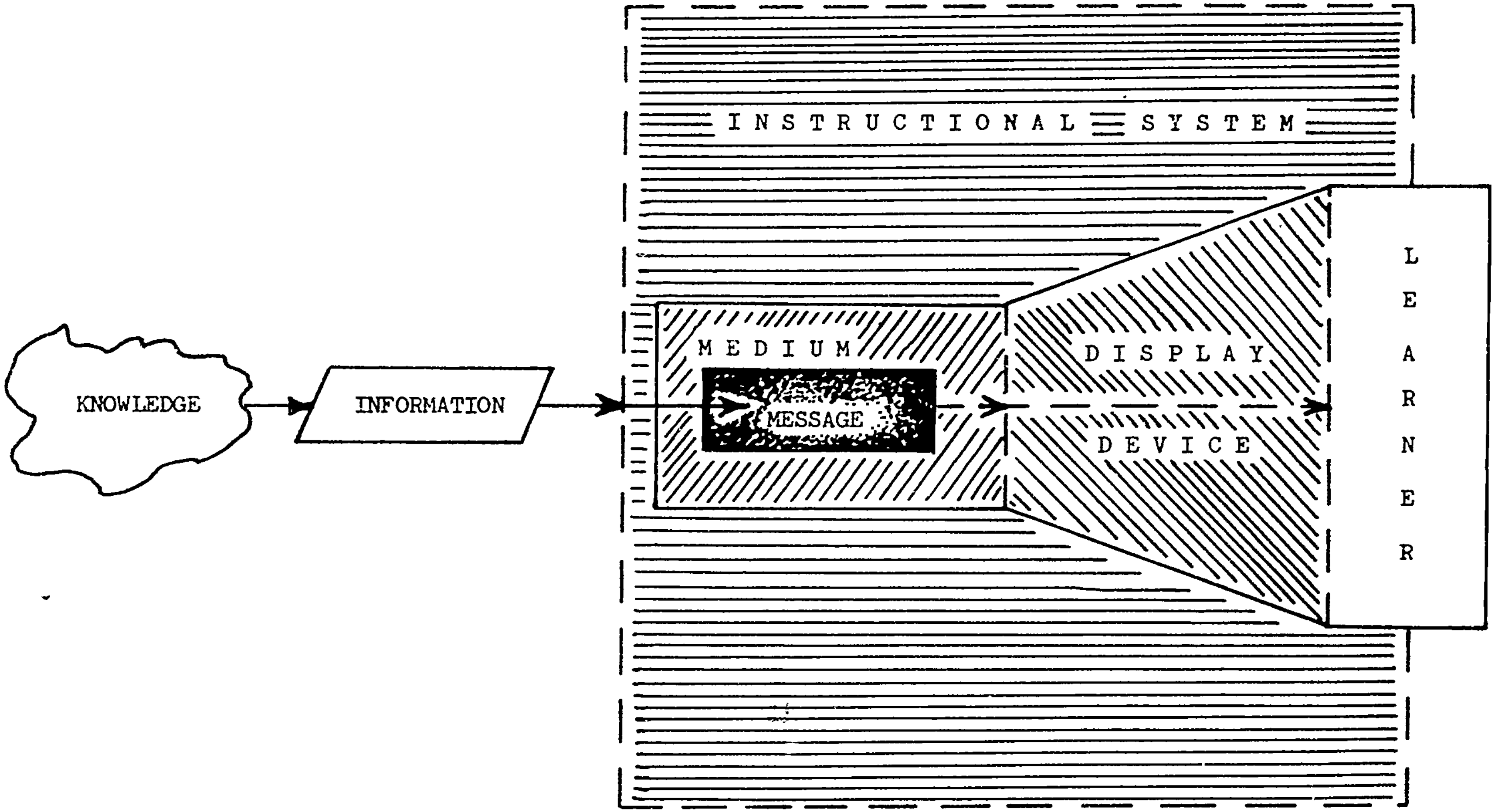


Figure C3-1 A MEDIA SYSTEM

many schemes for classifying media for purposes of selection - some consider the size of the group to be taught,[6] some the characteristics of the device used,[7] and some the learning objectives being met.[8] The confusion seems to stem from the lack of clarity about what a medium really is and the present lack of a very usable definition of learning. Those two factors enable experts in the field to say that at present most media can be used to meet most learning objectives and vice versa.[9] Such a situation makes media "selection" a waste of effort and gives the use of media in education no real impetus at all. Here an attempt will be made to provide a basis for media selection in a more meaningful way.

Characteristics of Media

Except when testing one's own feelings and thoughts, learning occurs through communication with others, observation, or interaction with one's environment. Learning is based on stimuli acting on our senses. Thus, an educational medium functions as a communications device through the stimulation of the learner's senses. Its primary attribute is the sense or senses it stimulates--sight, hearing, taste, touch or smell. It has been shown that some individuals learn more readily through visual than aural material and others the reverse.[10] Efforts have been made to compare the relative efficiency of various sensory channels to receive and process stimuli (one effort is known as Aptitude-Treatment Interaction Research), but no meaningful differences have been isolated. It has been determined that the optimum rate for aural and visual presentations of verbal information is the same--300 words per minute.[11] The limiting factor seems to lie in the information processing done by the brain.[12] Comparable data for other sensory modes has not been developed. As a result the selection of a "best" media for a given learner cannot be established based on alternative sensory channel stimulation.

We know that most deliberate learning presently is done through seeing and listening, but whether those are the most efficient methods is really not known. The conscious preference of the learner is often as good a basis for choosing as any other.

The amount and kind of information included in the medium is another of its major attributes. If the learning relates to a concrete object and the object itself is used as the medium for learning, the information is real and total - although it may not be observable if the object is complex. If a model, picture or description (a representation) of the object is used, the information about it is encoded in a sign vehicle. The more realistic the model or picture is, the more sure one can be that it includes all the information about the object. At the same time, the more realistic it is the more apt it is to include superfluous information. As superfluous information is deleted, the less realism remains and the more thoroughly encoded or symbollized is the specific information intended for use. Thus, while a stick figure may clearly illustrate a point about posture, one must understand stick figures for the point to be perceived. Coding also occurs if black and white tones are used rather than color, or if still pictures are used to depict motion. The "coding" which results from the use of still pictures or black and white rather than color does not seem to be critical. Bretz states that still - television may convey from 80 to 95% as much as full television.[13] And while colored pictures were found to be more dynamic than black and white,[14] there were no consistent differences found in learning from colored as compared to black and white movies.[15] Finally, no advantage was found for 3-D as compared to 2-D films.[16] It may well be, however, that the criticality of such characteristics is a function of the audience tested--that some audiences would find the lack of color more disconcerting than others.

The lack of ability to "decode" writing - to read - is known and accepted. The same problems exist, however, with decoding other symbols, such as pictures. Travers notes that speech has culturally specific basic structures and suggests the same may be true of pictorial components as well.[17] One research study reported in the Second Handbook of Research on Teaching showed that communication with illiterate adults suffered in the same way if pictures of unfamiliar objects were used as if an unsuitable vocabulary had been used.[18] The problem of "visual literacy" is accentuated when a significant cultural gap exists as is reported by Selden based on his experiences in Africa.[19] To derive information from a medium, one must know the code used. To enable learning through the use of a medium, one must be sure the learner can understand the symbollism used. The "best" medium for a given learner is the one which permits a code or level of coding which is appropriate to the learner.

Sensual stimulation and coding are the only important attributes of media as we have defined them. Another group of attributes of import in education, however, are those of the display device which relate to the way the medium is displayed to the learner.

A picture shown in a television broadcast is different from the same picture on a poster in some important respects. The medium--the picture--is the same and will be perceived much the same by the learner, but its serviceability as an instructional tool will be different. One difference is its referability. The poster is permanent and can be referred to again and again if necessary, whereas the television picture is viewed and then lost. Since different learners learn at different rates and in different ways, a transitory display may be unusable by some learners. Especially if the picture included much information (was "dense") all of the desired information might not be perceived in one viewing, or the viewer may concentrate on non-essential elements of the picture. Even where learning does occur initially, being able to refer back to learned material is helpful in reviewing what was learned.

Another important characteristic of the display used is the accessibility it provides the learner. A book, as a display for words, can be reproduced inexpensively and, through reproduction and distribution, can become readily accessible. A television program becomes accessible if it is broadcast because receivers are so available. Accessibility can also be achieved if the medium (and/or its display device as used here) are portable and can therefore be moved to the location where the learner is. Selection must, of course, consider whether the learner can gain access to the medium.

The ability of the learner to control the pace and density of the presentation of the material is also an attribute of importance. Pacing reflects the rapidity with which material is presented and is affected by the transitoriness or permanance of the display as noted above. Density relates to the amount of information included in a given sign vehicle. Especially in the case of pictorial displays, much information can be included, and, if it is, the learner may need cues and time or repeated exposure to derive all the information that is expected from the medium. (Obviously, the ability of the learner to decipher the code used is also important here.) A motion picture, if the projector is controlled by the learner, or a video-tape playback deck are preferable to broadcast television or a motion picture in a studio because the learner can influence the display of information, and even replay the material if necessary. Control of the display also can enable the learner to skip ahead has been noted as a major problem with some programmed materials.)

The appropriateness of the density and pace of presentation to any given learner, then, is important and one means of adjustment is through learner control of the display device, another is through tailoring of material. To limit the tailoring of materials to an economically acceptable level, it will probably be necessary to provide for learner control of the display devices.

True interaction between the learner and a display device can really occur only when the device is a human. Programmed material and computers can be structured to provide "branching" but not actual interactivity. Branching enables a learner to progress along a limited number of alternative paths depending on his/her responses. Branching thus provides some of the benefits of interaction, but without the total sensitivity of a human being--the only wholly unique advantage of a human teacher. Some computer programs are growing very complex in their branching capabilities but they are very expensive as yet. There is disagreement about the value to the learners of interaction. Teachers maintain interaction is necessary, but the research to date does not bear out that contention. For instance, Dubin and Hedley in The Medium May Be Related to the Message conclude "...one-way television is as good as other college instructional media."[20]

The attributes of media and their associated display devices which are important in respect to the learner, then, are:

Media -	Display -
Senses stimulated	Referability
Coding--type and degree used	Accessibility
	Pacing and Density
	Interactivity

The attributes of a medium have a somewhat simpler relationship to the material to be presented than to the learner. Learning material can basically be segmented into the presentation of concrete or abstract information. Some art and music illustrate the second category as do a wide array of conceptual or philosophical precepts and ideas. Unless an abstraction can be portrayed in art or music, it is normally expressed verbally, in words. Verbiage is communicated aurally or through print.

Concrete ideas lend themselves to a number of presentations, but all essentially require some verbal explanations either aural or in print. Even the object itself, unless the learner is very knowledgable and adventurous, cannot impart all the possible information about itself without verbal accompaniment. The need for inspection of the interior of a real object or its cost may require that some symbollic representation either pictorial or verbal, be used. As the realism of the medium declines, (as it grows more symbollic) - through the use of models or pictures - the need for clarifying verbiage grows, until the medium becomes text - words. Thus some form of verbal information transfer can be expected to be required as a part of the media display.

To fully reflect the information to be transmitted, the medium may need to portray color or motion. Full color and full, fluid motion may not be either necessary or desirable, because of the cost and the pacing (which tends to be rapid when full motion is used) of such material. (And because its contribution to understanding is marginal as was noted above.) Rather than simply using color or motion, a careful analysis should be made to determine the least usable degree of each and that should govern the presentation.

Most learning takes place through the use of the s nses of sight and hearing. Since formal education is heavily concerned with abstract concepts, words are a major learning medium, and print is heavily used. Sound is substituted for print although it is normally received at half the speed of print. (150 words a minute is the normal rate of speech whereas 300 words a minute is normal adult reading speed.[21] A means of compressing speech to 300 wpm has been devised, but is not yet in widespread use.) Taste, touch and smell are less frequently used in education, except in certain limited areas such as chemistry or cooking, and generally suggest the use of the object of learning itself rather than some symbollic representation.

From the material standpoint, then, the media must be chosen to portray those characteristics which are important and must portray them clearly enough to be understood by the learner at a suitable pace of presentation. In general, those requirements suggest a medium which can sufficiently dissect the object of interest to enable the needed information to be accessible and which can provide appropriate sensory stimulation.

To summarize - the sense or senses to be stimulated are the primary means of differentiating media from the learners' viewpoint, but the relative efficiency of the alternative channels is not yet known. The critical characteristic of a medium is the degree and kind of coding used. If a learner cannot readily decode the information transmitted through the medium, learning is effectively blocked. The display device used impacts on the learner in a number of ways - it enables or inhibits reference, it is accessible or distant, it presents material at appropriate or inappropriate speed and density, and it is or is not interactive. Of those characteristics, available research indicates interactivity may not be important based on present educational material and methods of evaluation.

The analysis of media selection can be condensed, then, to two basic considerations. The medium is intended to communicate information to a learner. As such, the medium chosen for a given instructional task must provide the information in a form and manner which is understandable and usable by the learner in question.

It will be understood if it stimulates the appropriate senses of the learner in a comprehensible fashion (if he/she knows the code).

It will be usable if the learner can gain access to it - if it is available to him/her; if he/she can control the speed and/or density of presentation by controlling the display device used, and if the learner can use it again and again a he/she needs and wishes to do so. The usability of any medium and its display device range over a continuum. At some point, if the learner cannot gain access at all, the medium is totally unusable. As access becomes more ready, the medium becomes more and more usable until, when the learner owns the book or tape cassette, it is fully accessible and thus wholly usable on that scale. The same scaling is true of the other two primary characteristics. There is a wide range of usability, a portion of which is acceptable to any given learner. How large the acceptable range is depends on "motivation" - the strength of the drive the learner feels to gain that information at that time.

Given the descriptive material above, explicitly how would a medium and display device be selected? The suggested decisional order would be -

1. Abstract or concrete?

2. If abstract, much or little affective content?
   - 2a. If much affective content -
     depict through art and/or music in addition to verbally.
   - 2b. If little affective content -
     depict verbally, through print if tolerable to learner, aurally if not.

3. If concrete -
   - 3a. Which senses needed?

Sight?	Smell?	Taste?
Hearing?	Touch?	

3b. Feasible to use object with verbal cuing? If so, cue through print if tolerable to learner, aurally if not.

3c. If not feasible to use object, what level of representation is necessary?

Operative 3-D model?

Non-operative 3-D model?

Color, motion picture?

Black & white, motion picture?

Color, still picture?

Black & white, still picture?

Sketch?

Line drawing?

Verbal description, spoken?

Verbal description, printed?

3d. Representation with verbal cuing (coding) tolerable to learner? If not, tailor to learner.

Disabilities?

- Blind?
- Deaf?

Educational level?

- Vocabulary?
- Degree of symbollism?

Cultural background?

- Print or Aural cuing
    - Language?
    - Vocabulary or dialect?
- Pictorials
    - Variety?
    - Hierarchy?
    - Evolutionary series?

At that point, the medium should have been chosen and the potential display devices limited by the medium and its characteristics. The specific display device, ideally, would be chosen by determining which best met the needs and desires of the particular learner for -

Accessibility -

Individual use?

Location?

Referability -

Transitory or permanent?

Repeatable?

Pacing and Density -

Controllable?

Suitable?

Interactivity -

Branching?

Human?

In reality, in an operating educational system, the ultimate selection will come down to what is available and usable in the space provided. The sorts of considerations outlined here are of value in the design of the system. Nibeck suggests that in design, three decisional levels are needed - one at the system level, the second for departments working with course design and the third, a practical one concerned with availability, costs, user sophistication and other such pragmatic considerations.[22] Earlier in that paper, he also suggests that "...the learner may be the best instrument for ultimate media selection and future educational systems should provide some degree of redundancy in the form of varying delivery formats to allow for these options,"[23] which, given all the variables involved, is probably the most practical, even if not the most valiant, approach.

As we have defined media they do not comprise a very long list - Pictures (line, sepia, photograph, etc.), words, sounds, objects, smells, touches, postures, feelings, sights, etc. There seems no way to adequately illustrate these various stimuli, although someone has undoubtedly developed a taxonomy someplace. Rather, it appears more meaningful to deal here with the various display devices currently being used in education and discuss how they function in the communications/education process.

Any listing of display devices can become complex and lengthy as the precision of distinguishing one device from another is increased. There are differences between projectible transparencies and 35 mm slides, or between television and video tape replays. This listing is intended to be complete but is not necessarily exhaustive. The degree of completeness will vary with the expected familiarity of the reader with the device described - the more "usual" the device the less exhaustive will be any subdivisions and description. In each case, the degree of description thought appropriate will be given, and a brief discussion of the device as a means of enabling communication will be provided. Generally, the sequence followed will be from realistic to the symbollic which tends to be from multisensory devices to audio-visual, audio and finally to visual.

As each device, group of devices or category is reviewed a number of specific characteristics will be considered -

- the expected familiarity of the learner with the device
- senses involved
- potential interactivity and branching
- availability (time, access), portability
- pacing and density of presentation
- repeatability (referability)
- realism of normal display
- degree of learner control

3-D Models - Realistic multi-sensory devices include three dimensional models of the concept or device about which learning is to take place. (For these purposes a "Model" could be the device itself, if it is something which can be so used - sometimes the actual device is too complex or too indistinct for instructional use.) Most of the characteristics to be considered will vary with the model(s) used. Since they are models, however, they would not usually be available other than where instruction takes place. They may be manipulative so the learner can vary the amount of information gained (pacing) and will normally be repeatably usable. They can offer a high degree of realism, and, if given time, access and resources from which to gain added data, the learner can feel and be in control of learning as he experiences it.

Other Multi-sensory display devices - would include experiments which might require the use of taste or smell for identification or evaluation - such as in chemistry or cooking. The characteristics would depend on the particular model, device or experience. As a general rule, realism is enhanced by the use of multi-sensory devices or activities.

Television - We are all familiar with the electronic transmission of audio-visual information. Its unit cost can be low because there are no limits to the number of users of broadcast shows. In education, the transmissions are often classroom lectures broadcast "live" - while the lecture is actually occurring. Commercial broadcasts, other than news events, are usually delayed and edited through the use of film or video-tape. The "broadcast" can be over closed-circuit (such as cable or special radio equipment) or broadcast (the usual television seen in homes) equipment. While not three dimensional, the ability to display color and full-motion make television the most versatile and realistic electronics media. When broadcast, it is available wherever a receiver is. Television is an expensive medium because it requires expensive equipment to transmit and lengthy careful programming if its versatility is to be used. The pacing and density of the information presented are usually high although they can be varied. Very few applications provide for two-way operation, but a number of closed-circuit systems provide one-way video and two-way audio. In general, the student is a passive recipient of television without the ability to influence or control the material or its presentation.

Two forms of television which are just coming into use deserve mention - slow-scan and time-shared. Slow-scan television presents a picture about every ten seconds and thus cannot provide full fluid motion, but it does enable much less costly transmission. Because of the slow speed of presentation, a slow-scan television picture can be transmitted over a normal telephone circuit. Its characteristics are essentially those of a filmstrip or slide presentation which are discussed below.

The other novel television form is time-shared. It is a slower-scan form than normal, but not so slow as true slow-scan. It enables a number of television pictures to be sent over the same transmission equipment at one time rather than using all the equipment capacity for one picture. The result is a picture which does not have full fluid-motion, but can provide very slow or step motion, or a lower quality picture. Another result is again, much lower unit cost. As a display device it also is like a filmstrip.

<u>Videotape</u> - Uses television cameras but records the information rather than transmitting it instantaneously. The technique is one of magnetic recording and is inexpensive as normally applied. It differs from motion

pictures in the manner the information is recorded and, usually, in the amount of editing prior to replay. Most commercial television is recorded on videotape and edited before being broadcast. The technology of videotaping is advancing rapidly with smaller and lighter cameras, more flexible playback units and reductions in tape size without loss of quality. A variety of tape-to-tape reproduction processes exist some of which enable the electronic enhancement of certain aspects of the recorded information. Storage is accomplished on reels or cassettes with cassettes being more usable by the layman.

Because videotape is inexpensive to record and playback, it is finding increasing uses. It provides audio-visual material that is shown just as would be a motion picture or television show and thus is a familiar presentation. It has flexibility television does not have because many copies can be made and it can be stored in accessible locations to be used at the desire of the user. It also can be repeated, by simply reversing the playback unit and rerunning it. Thus the learner has a degree of control unattainable with any broadcast or remote, one-way media.

Motion Pictures - Again, this is a media form with which we are all familiar. It has the same characteristics and attributes as videotape. Motion pictures are relatively expensive to produce and reproduce. There are two sizes of motion picture film which are most used for educational purposes--16 mm and 8 mm. While the larger film size provides better quality when it is shown on a screen, the film is expensive and the larger the size, the more expensive it is. 8 mm is growing rapidly in use because of its lower cost. A larger picture version - Super 8 - gives adequate results when projected and excellent results when small screen viewers are used. The recent advent of sound with 8 mm motion pictures will further enhance their attractiveness. There are also 8 mm film loops which are like cassettes and provide short viewing time in a "package" which is especially convenient to handle. The lower cost and less complex 8 mm film enables its wider use and its use for individual rather than group viewing. Such individual use provides the learner with much more control of the learning process than can be achieved in a group situation.

One special form of 8 mm film deserves individual mention. There currently is a special type of film equipment which is variable in speed. Two such units are presently on the market Programmed Individual Presentation (PIP) of North American Philip's Corporation (Norelco) and Cue-See of Charles Beseler Co. These units separate the sound track from the film putting each on its own cassette. The projector advances the film when triggered by a sub-sonic signal recorded on the audio cassette. The signals can be given at any desired time interval so that the viewer sees a picture which can vary in speed from one frame at a time to full motion. The end result is a film display using 8 mm motion picture film that can operate as a slide projector, step or slow motion projector or motion picture depending on the demands of the presentation being made at any moment. Economy is gained in reproduction of the program by the use of two systems which are synchronized by specific signals. Economy also is realized because the flexibility of the unit eliminates the need for a number of different types of equipment. The present cost of the system is relatively high, $620 for a recorder - projector system versus $150 for a standard 8 mm projector. The system may not be thoroughly tested in use since it has only recently come on the market, and at the present, program material is limited.

<u>Filmstrips</u> - A series of still or step-motion pictures provided on a

strip of film. Normally used with an audio-tape to provide descriptive narration. It is shown either by projection on a screen like a motion picture, or on a small personal viewing screen for use by one person or a small group. Filmstrips are generally susceptible to damage through handling since they are simply coils of film (usually 35 mm film). Late model projectors with automatic film advance, reduce handling damage somewhat Filmstrips are much less expensive than motion pictures since they are basically a series of still pictures. They also provide a slower paced presentation because there is no motion. Normally the learner has a greater sense of control with a filmstrip than a motion picture because the pictures advance one by one. This is not as familiar a medium as motion pictures but is frequently found in schools. The balance of its characteristics are essentially the same as motion pictures or television.

Slides - Projectable still pictures are basically the same, as a display, as a filmstrip, except they are in discrete pieces and thus have the handling problems of 25 or 30 separate items. To overcome the handling problem, slides are usually stored and used in trays or racks which insert into the projector. The projector automatically switches from slide to slide. Slides are normally used in conjunction with an audiotape and the projector often has an automatically triggered advance. The characteristics of slides are the same as film strip, the advantage is that the order of presentation can be varied and an individual slide replaced.

Other visual display devices - There are a host of other visual display devices such as wall charts, photographs, various kinds of projectable transparencies, the proverbial blackboard, etc. All offer the advantage of being visual stimuli. None offer meaningful motion and have the limitations of static presentation. They are often used as descriptive aids by lecturers.

One device, which would be classified as an "other visual" deserves special mention because of its unique combination with telecommunications - the electronic blackboard. (The details of its operation are explained in Appendix D-1). As a display it is just like any other blackboard - a visual display. It is unique in being usable remotely over telephone connections. In combination with a telephone, it can provide most of the audiovisual stimulation of the normal classroom lecture over unlimited distances. It operates one-way, from the lecturer to the students. There are a number of such units on the market, each of which has slight variations from this general operating description. Aside from its novelty and its ability to operate remotely, it has the same attributes and limitations as the other static visual media.

<u>Telephone</u> - Leaving the visual media, one of the most familiar audio media is the telephone. It offers two-way (interactive) audio connection at low cost and has great accessibility because of its pervasiveness. Telephone connections are not often used as the primary media for a course of instruction apparently because the lack of visual contact is felt to be frustrating. Telephones are often used in conjunction with a television course or a correspondence course, and have been used in conjunction with prepared textual or audio-visual materials. They can be effective. Since telephones are so readily available, they are essentially portable. They are lacking in realism, since no visual material can be presented, but offer some sense of control since the teacher can be responsive to reactions or questions of the student.

<u>Radio</u> - is another familiar medium, which offers the potential of connecting an unlimited number of learners to a source of information inexpensively. It is a one-way device with all the psychological problems inherent in that

limitation in addition to the lack of visual contact. Two-way contact by radio often is established where it functions as the primary means of communication - where telephones are not available. When used two-way, it is essentially like the telephone, except that talk flows one-way at a time and there is a slight delay before a response can be made. Radio used this way does enable any number to converse since there is no limit on the interconnections possible. It can be an effective learning tool as shown by its use in less developed areas, where two-way operation is frequent. Normally radio is used in conjunction with prepared written or audiovisual materials as was the case with the telephone. Because there is no visual stimulation, little realism can be imparted. The famous Orson Welles, "Men from Mars" radio show illustrates, however, that realism can be achieved, if this or any other device is used creatively.

Audiotape or Phonograph - Both are prerecorded audio devices. The phonograph requires a more expensive storage process, and a more complex one and so despite its longevity, is not as widely used as audiotape. The two devices are essentially identical for educational applications. They do not provide visual information and thus are frequently used with textual or other visual materials. They enable the storage of audio information inexpensively and in easily recoverable form. Since they are stored forms, they are accessible, provide repeatability and a sense of control on the part of the learner. They do not enable interaction. The pacing and density of presentation can be controlled somewhat by controlling the speed of the speech.

Programmed Texts - are essentially a form of book, but a form structured carefully to accomplish a specific task - teach. Programmed texts normally break down the material presented into small increments each of which quieries the learner and calls for a response. A correct response leads to the next question or block of material, an erroneous response leads to a "branch" (a segment of material repeating in modified form what had just been presented intended to review earlier material which was not understood). Programmed material is basically visual and primarily textual rather than pictorial in content. It is often presented through the use of a computer in a form of Computer Assisted Instruction which will be discussed below. As display devices, programmed texts are like any other book, except that they attempt to enhance learning by the way in which the material is presented. To use a programmed text effectively, a learner must be able to read and comprehend what he/she has read. It is a one-way presentation, and, when in book form, is fully portable. As a book it is totally available and repeatable. The pacing and density are controlled to a degree by the learner. Some learners find programmed texts unsatisfactory because of the small increments of material presented--they find it frustrating not to be able to move at a faster pace. As opposed to most other media, as was mentioned, it can provide branching and normally does so.

Computer Assisted Instruction - The final media form to be discussed is CAI. The ability of a computer to store a great deal of information in small increments, be programmed to assemble the stored information (data) in a variety of ways and permit many users to access the data at a time, makes it a potent learning tool. The very advantages of a computer are also some of its major disadvantages, however. To develop the means of using the computer (to program it) can be very expensive because extremely detailed instructions covering every possible use and every eventuality must be provided. Once adequately programmed, a computer can do wonders. Most often the input and output to and from a computer are from a typewriter-like keyboard, but visual and audio inputs and displays are available. Usually the audio and visual operation require expensive equipment and elaborate programs. Because the computer can store and manipulate large amounts of information, it can provide great flexibility in operation, as a rule, however, the more flexibility is used,the more extensive the programming necessary and the higher the cost.

Given adequate programming, a computer, while not very familiar to most of us as yet, can seemingly enable two-way, interactive operation. It can provide visual and audio as well as textual displays and thus can be multisensory. Its visual displays are normally static, so full fluid motion is not provided, although it could be through the use of videotape or movies controlled by the computer. The computer can provide for programmed instruction with its advantages over normal text and can also provide straight textual data if desired. The density and pacing of presentation can be controlled, like all else, by the programming used and if repeatability is provided the learner. The computer can always be available and can be operated, with proper associated equipment, over telephone circuits from remote locations. It has infinite patience and will repeat itself as many times as the learner desires. Once a program is fully tested, the computer is reliable; it will always correctly present the specified material in the specified way or ways. It cannot offer great realism, (other than in operating a computer), but can do some amazing tricks. It can be programmed to use the user's (learner's) name and the vernacular. It can be programmed to enable an inquiry method of instruction where the learner is presented with a problem and required to specify what information he/she needs to answer the problem. The computer responds to his/her questions enabling the student to devise his/her own strategy for solving the problem. The computer evaluates the learner's questions indicating whether they fit the problem or not.

The inquiry mode is usually found to be much more stimulating than is a drill-type teaching approach. The major deterrant to widespread use of the computer is the availability of sufficiently skilled technicians (programmers) and its cost. If standardized materials (courses) were accepted so the use rate could increase, computers would come into their own as a teaching tool.

Two experimental computer systems deserve special mention--TICCIT and PLATO. TICCIT (time-shared, interactive, computer-controlled, informational television) is a system enabling subscribers connected to a coaxial cable (presently usually a cable television network) to interact with a computer and receive video responses. The system is designed so that a 20 channel cable system could service 12,000 subscribers providing a response from the computer within 10 seconds after interrogation by the subscriber. Being able to access a computer and obtain a visual response directly from one's home, suggests a wide array of uses in education, marketing, etc. - in communications generally. TICCIT has been demonstrated in Reston, Virginia and the National Science Foundation is supporting its further development by the MITRE Corporation.[24] At the present TICCIT is experimental and is too expensive for wide-spread use.

PLATO uses a keyboard, a "plasma" visual display panel and audio responses to provide audio-visual responses to remotely located users from a large central computer. The nature of the display enables the interaction with the computer to take place over a teletype circuit so that 1,000 PLATO terminals can be services over a communications link which has the capacity for a single television channel. The PLATO terminal uses internally stored microform cards as well as computer information to provide video displays and the computer also controls lights, motion picture cameras and an array of other devices. The plasma panel provides for "interaction" by being sensitized to the touch of the learner. PLATO enables full random access from each terminal and the present system can service up to 4,000 terminals from the central computer. It is expected that the costs of using PLATO will soon be competitive with classroom teaching. PLATO was developed by the University of Illinois and the National Science Foudnation is supporting a five year demonstration of its operation.[25]

Costs - Throughout this discussion of various display devices costs have been mentioned as a factor promoting or inhibiting the development or use of one or another device. Few specific figures have been quoted because the cost of any device relates to the manner in which it is used. A classroom lecture can be taped for television broadcast at a very nominal cost. A half-hour of Sesame Street costs tens or even hundreds of thousands of dollars. If the classroom lecture is shown only to a single student and Sesame Street attracts millions of viewers, however, the cost per student hour may ultimately be less for Sesame Street. Storing material so it can be replayed, inherently reduces its unit cost, if it is, in fact, replayed. Reducing the redundancy ofprogram preparation by increasing the dissemination of a given program also reduces cost. The point is that unit cost is a function of use more than anything else so statements about the costs of given display devices presuppose the manner in which they will be used.

A second major factor in cost is the quality of the material provided. A tutorial (drill-type) computer program is much easier, as a rule, to develop than is one which uses the inquiry method. It also does not usually stimulate the users. If stimulation is a necessity, the more costly approach may be much better. The same comment of course, can be made using the earlier comparison of Sesame Street and a televised lecture. From the viewers' standpoint, the lecture may be something to "get through" while Sesame Street may be highly enjoyable. Education can often trade on the motivation of its learners to learn despite boring or poorly presented material, and in that way realize cost savings. The question would be how large the hidden costs of drop-outs, minimal learning, loss of support for education as an institution, etc., were.

Thus, while general categories of cost were noted, with the exception of PIP, specifics will not be provided here. Where broadly applicable comments relative to cost could be made, they were made. Specifics must wait for the definition of applications.

Conclusion

From all of this, what conclusions can be reached of direct value to this report? Without being able to forecast the nature of the material which might be involved, no assumptions can be made in that area. Information is available, however, about the group of learners of primary concern - the urban disadvantaged. Their educational skill level, while varying, is generally low so their vocabularies are limited and they are not facile with symbollic manipulation. This limitation suggests the use of audio-visual rather than textual material. Those characteristics suggest restrictions on verbalization and preference for realistic pictorial presentations, but with a need for a slowly paced, loose (as opposed to dense) presentation. That need suggests the use of slide/tape or other still or step motion media rather than film or videotape. Many of the target population are minority group members and have a cultural background which must be considered in the coding of the instructional material. The material should be tailored to their background to ensure its usefulness to them.

Cohen points out that -

> The use of audiovisual techniques and materials, including charts, recordings, radio and television programs, pictures and programmed materials can enable an illiterate or semi-literate youth or adult to master considerable sophistication in skills, information and concept...This use of audiovisual instruction is important. It indicates the possibility of working toward major personal goals... without sacrificing academic instruction, until sufficient success has been achieved to enable the student to succeed with normal academic techniques and materials based upon the ability to read.[26]

With all the concern here for the means of transmitting a message, we must still not forget that "...a major component in learning is the learner's expectation of later use. If he expects to have a need for the information later, he will be able to 'store' it in his memory much more readily than if it is not apparently relevant."[27] Perfection in a medium and its display device will not compensate for learning material which has no real meaning to the learner.

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Media

Footnotes

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[6] Jerrold E. Kemp, "White Medium", Audiovisual Instruction, December, 1971.

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[14] Travers, Man's Information System, pg. 142.

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Footnotes (Cont'd.)

[20]Robert Dubin and R. Alan Hedley, The Medium May Be Related to the Message, Eugene, Ore.: Univ. of Oregon, 1969, pg. 2.

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[22]Richard G. Nibech, "Selecting Media for More Effective Learning", Conference Proceedings: the first annual National Conference on Open Learning in Higher Education, Lincoln, Nebraska: Univ. of Nebraska, 1974, pp. 85-86.

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[24]James W. Amsey and Normal C. Dahl, An Inquiry Into the Uses of Instructional Technology, New York: The Ford Foundation, 1973, pp. 32-33.

[25]Ibid., pp. 64-65.

[26]Samuel Cohen, "Helping the Child Who Doesn't Make the Grade", Audiovisual Instruction, January, 1965, pg. 17.

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Appendix C-4

TELECOMMUNICATIONS

A REPORT

For

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July 19, 1974

TELECOMMUNICATIONS

The purpose of this appendix is to make the reader acquainted with the field of telecommunications as it might apply to public higher education in the Commonwealth of Massachusetts. Given that orientation, some of the descriptions may be oversimplified, but they should provide the understanding of the technology needed to evaluate the positions taken and recommendations made in the report proper.

This appendix provides first an explanation of communications and telecommunications. (Tabular descriptions of alternative systems and components and the associated costs are included.) Secondly it posits some communications problems and alternative possible solutions. Some possible systems for Massachusetts are described and comments are made about the costs and value of each. Finally, some of the initial areas of concern in reviewing possible systems are suggested.

Communications Systems

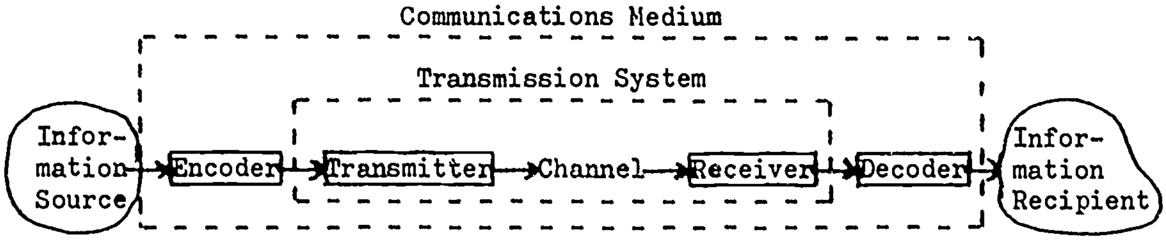
A communications system is an arrangement of devices, human, mechanical or electrical, which permits the transmission of information from one person or persons to some other. Two human beings talking to one another form a communications system. A painting or a poem can be a communications medium, since they involve the artist or poet transmitting a message and the viewer or reader receiving it. (The "system" would include the artist or poet and the viewer or reader.) The information to be transmitted can be factual or aesthetic.

A telecommunications system is a class of communications system which operates over long distances ("tele" meaning far). As a general case, telecommunications implies communication between two locations by electronic means, usually in "real time"--that is, instantaneously. Since smoke signals or the use of semaphore flags would be unusual in our present society, we will use the more limited definition here.

In education, a telecommunications system is used to connect a source of information--a teacher, a library or a specially prepared program--to a learner or a group of learners. Generally, the system functions to expand the range of the educational activity beyond the group of learners in the immediate vicinity of the teacher or library. There are a variety of systems currently being used, all of which have certain basic components.

At its simplest, a communications system consists of an information source, a means of communications (a communications medium) and an information recipient.

The communications medium can be broken down into an encoder/decoder and a transmission system, the latter normally including a transmitter, a transmission channel and a receiver.



Each component of the communications medium may consist of a variety of devices. The encoder/decoder may be a television camera and receiver, a microphone and an earphone or loud-speaker, a pair of teletypewriters, etc. The transmission system may be a point-to-point (microwave) radio system, a broadcast radio or television system, a cable system, or some combination of two or more of them. Finally, the channel used by the transmission system may consist of radio waves, coaxial cable, wires, or a satellite in combination with radio waves. The components interact with one another so that a certain channel will influence the type of transmitter and receiver required, as will the encoder/decoder which is used. If a particular type of transmission system must be used, it may limit the possible alternative encoder/decoders. Since the purpose of a system is to enable information to be communicated from a source to a recipient, the decision process should start with those three factors - the source, the information and the recipient, and work through the system step by step. Table 1 - Shows some of the various alternatives.

Table 1

Alternative Components

Encoder/Decoder	Transmission System	Channel
Television	microwave radio	radio waves (Satellite)
Radio	broadcast radio or tv	cable
Telephone	coaxial cable	wire
Facsimile	ITFS (Instructional Television Fixed Service)	(In future--light waves, wave guides)
Teletype (telegraph)		
Electronic Blackboard		

The following illustrations show how the alternatives can be applied.

Some Communications Problems

A group of people in Springfield want to see a stage play in Boston. How might they go about it? An initial solution would be for them to decide that since the show is in Boston, they will forgo seeing it, in which case no communication will take place. Alternatively, the group could go to Boston to see the show or have the show brought to Springfield, or they could have a theatre group based in Springfield perform the show. As an admittedly poor substitute, they could go to their public library and read a copy of the play. They would then have resolved their communication problem by transportation or substitution. While these first alternatives are not within the realm of telecommunications, they illustrate some of the questions that need to be asked and answered at the outset in considering the establishment of a communications system. Is there, in fact, a need for communications and can it be resolved by transportation or substitution?

The group of Springfield theatre enthusiasts must decide next whether they need to see the play live or can (and will) accept some reproduction of it. Should they choose reproduction, the following options are available to them.

The most complex possibility is an audio-visual reproduction that is as life-like as possible, such as color television, broadcast "live." The television camera (an encoder) would be set up in Boston and each of the Springfield group would turn on the receiver (a decoder) in his home. If there were a powerful enough transmitter (a transmission system) and if each of the Springfield group had a home on a hill and if there were a television channel available for their private use, it would be possible to transmit the play from Boston to Springfield. It would be expensive, however, and a lot of people who wouldn't share in paying the bill could also tune in, but it would do the job. Another possibility would be to put in a radio-relay system (another type of transmission system) which would "pipe" the picture and sound directly from the theatre to Springfield. In Springfield, however, the group would have to gather together, since the radio relay is point-to-point, rather than broadcast. Otherwise, it would be necessary to add another link which would broadcast out of Springfield. An ITFS (Instructional Television, Fixed Service) system connected to the microwave system would allow transmission to a number of locations in or around Springfield, but not to each theatre goer's home. (Such a system is also restricted to use by educational organizations). Since they are interested only in this one show at the moment, such a private radio system would be very costly. A better alternative would be to rent or lease the needed transmission system from the telephone company. Thus, while it might be costly, color TV could be used, and a number of ways exist to provide it if it is desired.

If the Springfield group could accept less realism, and perhaps a more polished presentation because of editing, a videotape or movie could be used. The information could then be sent by messenger or mail and played over a broadcast station or shown in one or more locations in Springfield.

The end product might be better and would be much less costly, with some small sacrifice in realism. The major change would be that the transmission would not be done on a "real-time" basis. Since very little television is broadcast live at this time, and no movies are made without editing, this seems a likely choice for the group. Once information is stored, such as on video tape, it can be modified (edited); it is available when desired, and it can be replayed again and again. Unless there is a need for real-time transmission, such as an event where the knowledge of "live" viewing greatly heightens the impact (a coronation, a funeral, etc.), replayed material is preferable.

Some additional choices exist if the theatre goers can accept yet less realistic reproduction. A picture without sound offers little savings, since the bulk of the cost of transmitting, or storing and replaying, audio-visual information is in the visual aspects. The loss of information in a soundless program would not be worth the difference in price. If our audience could accept still rather than motion pictures of the play, again the cost would go down and some new options for transmission would arise. Television or movies could be used, but that would be a waste--"overkill." Slow-scan TV or facsimile, however, are two other possibilities. Slow-scan TV sends one picture approximately every 10 seconds rather than thirty each second. That change in speed permits some motion, like step-motion, but enables the transmission equipment to operate over a telephone line rather than a special radio system or a cable. The cost reduction is significant (about 1/1,000). Facsimile involves the transmission of a picture over a telephone circuit through a still slower reproduction process. It takes some minutes to transmit a picture this way and the result is not an exceptionally crisp copy, but the end product is the printing of a separate copy. (A printed page could also be transmitted this way.) Because of the delay in transmission, facsimile, of itself, cannot provide any motion effects.

If the audience could forgo all visual contact--not a very likely possibility in this case--still other transmission systems could be used. Strictly audio information could be sent by a radio broadcast, a telephone call, or a tape recording. The first - broadcast radio--could reach this group and would be available to anyone else who cared to listen, but would be relatively costly and would use radio "space" in an uneconomical way. A telephone call could be made over a special system or the telephone company's equipment. As with the video signal, unless there were a continuing need, or, if only audio is to be transmitted, the need for a number of circuits, renting or leasing would be better. A tape-recording, although not directly related to telecommunications, is at least a low cost approach and should not be overlooked. Once more, the consideration would be whether there is a need to hear the play at the time it was being given. If not, the tape would be as good a method as any and it would be available to play over again and/or to play whenever the owner wished to listen.

Finally, if the audience could settle for print, there are some further options. Reading the play in the library is one, as is facsimile. In addition, telegraph or teletype could be used. Telegraph uses a key and code to transmit and normally is accomplished by Western Union telegram. Teletype uses the same transmission system but operates from one typewriter-like keyboard to another. (Actually, Western Union has been using automatic equipment for a long time now.) Teletype connections can be permanent or temporary and can be dialed like a telephone. They provide printed (hard) copy and transmit print at a rate of up to 100 words per minute. A teletype system operates over only part of a voice circuit, so more than one (16 to be exact) can operate over one telephone line--potentially the most economic means yet considered, aside from the library. Finally, there are a number of systems now available which permit hand-written or drawn material to be reproduced in some other location(s). One form of such a system is an "electronic blackboard." That system acts to reproduce, in a remote location, marks made on a paper pad or a special blackboard. While this last approach has some obvious advantages for classroom use, it would not help the theatre-goers particularly, unless the actors wrote out their lines rather than spoke them. The electronic blackboard can operate over a telephone linc, so it is also a relatively low cost approach--unless a transmission system is installed to carry the telephone circuit.

All in all, the theatre-goers have a number of options--generally those in Table 1 including various combinations--each having advantages and disadvantages when compared to the others. A summary of the characteristics of each alternative is given in Tables 2,3 and 4.

Table 5 gives a rough comparison of costs for alternative transmission channels and systems. The location and number of receiving and transmitting locations affect cost as does the required capability--television, voice only, facsimile, etc.

The initial illustration used here for discussing alternative communications systems was one requiring high sophistication in the system because the subject matter (information) to be transmitted was complex. It had a large aesthetic component, involved both visual and auditory material, suggesting a need for color presentation and requiring visual motion. Following, in less detail, is a simpler requirement with possible alternatives.

In this case a young woman in Worcester would like to learn about plane geometry, is aware of a teacher in Holyoke who could teach her, and wishes to find out how she might get in contact with that teacher. Once it is established that it is indeed plane geometry that she needs to learn, it is necessary to inquire whether she has a book about it that she could study or whether there is available a tape-slide or video tape presentation she could use. If those alternatives are not feasible and if there is no suitable teacher in Worcester, she might then have to contact Holyoke. If the Holyoke teacher could supply a workbook, then a telephone call from time to time, used in conjunction with the workbook, should be sufficient. No special circuit or private system would be warranted. One problem might be whether the student

Table 2

Alternative Communications Channels

	Characteristics		Comments
Radio Waves	Free-no capital or operation cost.	Strict gov't regulation.	Limit on numbers because of frequency allocations by gov't.
	Fully accessible to all locations.	Varies in quality due to natural phenomena.	
	Little limitation on capacity.	Requires costly transmitter/ receiver.	
	Few or no repeating stations required.	Limit on number of stations.	
	Full range of frequencies available.		
Cable (coaxial)	Wide frequency range (capacity)	Costly to install.	Largest capacity due to unlimited reproduceability and wide bandwidth.
	Low transmission power required.	Some gov't regulation.	
	Consistent quality over length and time.	Requires numerous repeating points.	
	No limit on number possible.	Limited accessibility.	
		Moderate operating cost.	
Wire	Low transmission power required.	Narrow frequency range.	Not normally suitable for TV.
	Little gov't regulation	Modest installation cost.	
	Consistent quality over length and time.	Limited accessibility.	
	No limit on number possible.	Some repeater points.	
		Low operating cost.	

Table 2 (Cont'd).

	Characteristics		Comments
Satellites	Essentially a radio repeater.	Very costly to install.	Cannot originate material acts only as a repeater.
	Reaches broader area than normal radio wave.	No operating cost, but limited life.	
	Quality deterioration rare.	Limited accessibility due to receiver cost.	
	No real limit on designed capacity.	Same gov't regulations as radio.	
	No other repeating stations required.		
	Unlimited number possible.		

Table 3

Alternative Transmission Systems

	Characteristics		Comments
Microwave radio	Usually point-to-point private system. Best suited for longitudinal (bi-directional) system. No limit to range (with repeaters). Multiple video channels possible. Unlimited number of systems possible.	Expensive to install and operate. Permits multi-use (audio, video, teletype). Gov't regulated. No limit to number of locations. 30 miles between repeaters. No competing programs on system.	Can connect with cable, ITFS and broadcast for complex system.
ITFS (Instructional Television Fixed Service)	Point-to-point with capability for omni-directional transmitter and multiple receivers. Best suited for radio system. Private system. Short-range--normally 20 miles. Almost unlimited number of systems possible.	Low cost to install and maintain. Up to 4 video channels possible. Gov't regulated. No limit to number of receiving locations. Normally only one transmitting location. No competing programs on system.	Simple, inexpensive system for special service.

Table 3 (Cont'd.)

	Characteristics		Comments
Broadcast Radio or TV	Accessible to public--most citizens have receivers. Variable range, depending on location, power and operating frequency. Number limited by frequency band limitations. No limit to receiving locations.	Costly to install and operate. Heavily used for commercial purposes. Competing programming. Gov't regulated. Adapted to radial system. Normally one audio or audio-video channel per system.	Must compete for listener/viewer attention.
Cable	Very inaccessible except to those "on" it. Non-radiating. Variable range with repeaters. Unlimited number possible. No limit to receiving locations "on" cable. Can be private or commercial.	Costly to install, inexpensive to operate. If commercial, will have competing programs. Some gov't regulation. Best for longitudinal system. Can have multiple transmitting locations.	Strictly a "pipeline" but offers high quality.
Leased System	Can be any or all of above. No initial cost but ongoing expense.	Potentially well maintained. Leasing only increment of total can offer favorable cost/quality ratio. Not "locked-in" by owning equipment.	Can offer quality and flexibility at a price.

Table 4

Alternative Encoders/Decoders

	Characteristics		Comments
Television	Very familiar. Provides visual motion and sound. Requires broadband tranmission system (costly). Cost limits two-way potential.	Can provide life-like reproductions. Can be expensive to program. Relatively low cost receiver. Normally taped for delayed transmission.	Most sophisticated of present devices.
Radio and Telephone	Very familiar. Audio only. Narrow band, inexpensive to transmit. Two-way operation feasible to normal.	Can be used with texts, workbooks to gain some visual content. Moderate to low cost for programming. Can be taped for delayed transmission.	Good for limited purposes. Not often used for education.
Slow-scan Television	Not familiar. Provides semi-motion visual and audio. Inexpensive to transmit. Can provide 85-90% of information of full motion.	Varying cost for programming. Can be taped for delayed transmission. Could operate two-way.	Not presently "normal" but holds promise for future.

able 4

	Characteristics		Comments
Teletype	Not familiar. Text only. Very inexpensive to transmit. Readily used with computer.	Non-standard typewriter keyboard. Varying cost to program. Normally "real-time" transmission.	Currently used only for computer input-output.
Facsimile	Not familiar. Text and still pictures. Relatively inexpensive to transmit.	Use quickly learned. No cost to program. Transmits preprinted material. Slow (3-10 mins.) transmission.	Not often used at present.
Electronic Blackboard	Not familiar. Text only. Inexpensive to transmit. Transmits hand-writing in "real-time."	Use easily learned. No cost to program. No time delay in transmission. Could readily be combined with audio link.	Has some potential, not much in use as yet.

Table 5

Transmission System Costs

Channels	Installation	Operation	Cost per Usage Unit
Radio waves	None	None	None
Satellite[1]	$10-50,000,000 plus ground stations at $2,000,000 each.	10-15% of capital cost.	Fully variable up to 8760 hours per year.
Coaxial cable[2]	Urban (buried) up to $100,000/ mile. Non-Urban $4-15,000/mile.	Typically $300-500/mile plus $1-3.00/subscriber.	Fully variable up to 8760 hours per year.
Wire	60-90% of cable.	Same as cable.	Same as cable.
Transmitter/Receivers	**Installation**	**Operation**	**Cost per Usage Unit**
Broadcast Television[3]	Average $940,000	$200-800,000 (Average $500,000)	Fully variable up to 8760 hours per year. (Current Ave. $160/hour)
Broadcast Radio[3]	Average $150,000	Average $100,000	Variable as TV (Current Ave. $18.80/hour)
Microwave Radio[4]	$1-10,000 per mile per channel	30% of capital cost	Same as Broadcast Television (No Current Average)

[1]Source: An Educator's Guide to Communication Satellite Technology, Kenneth A. Polcyn, Washington, D.C.: Academy for Education Development, 1973.

[2]Source: The Here, Now and Tomorrow of Cable Television in Education - A Planning Guide, Toby A. Levine, Boston, Mass.: Massachusetts Advisory Council on Education, 1973.

[3]Source: 1974 NAEB Directory of Educational Telecommunications, Washington, D.C.: Nat'l Ass'n. Educ. Broadcasters, 1974.

[4]"Inclusion of Time-Factor in Comparing Costs of Terrestial Telecommunications Transmission Systems," Robert D. Swensen and Kitty A. Montie. IEEE Transactions on Communications Technology, Vol. Com. 19, No. 5.

Table 5 (Cont'd.)

Transmitter/Receivers	Installation	Operation	Cost per Usage Unit
ITFS[4,5]	$100-500,000	25% of capital	Same as Broadcast Television ($10-30/channel/hour)
Coaxial Cable	See under channels		
Leased Systems[5]	None (Telephone Company has a termination charge.)	Varies based on service required. ($35-100/month/mile/channel for one-way video.)	Same as Broadcast Television (No Current Average)

[5] Source: "Technical and Economic Factors in University Instructional Television Systems," Charles A. Martin-Vegue, Jr. et.al., Proceedings of the IEEE, Vol. 59, No. 6, July, 1971.

and teacher could establish a mutually convenient schedule. If the contact were made so that the student in Worcester participated by phone while the teacher carried on a normal lecture and discussion with a class in their classroom in Holyoke, then the student would have to be prepared and available when the class convened. If the lessons were to be private, more convenient times might be arranged. Since the visual material would not involve motion nor be complex, the workbook approach might be fully satisfactory. If it were not, a facsimile circuit operated over the same or a second telephone circuit should suffice. Certainly, unless the student had some psychological difficulty in not seeing her teacher, there should be no need for any video connection. It is likely that well prepared tapes sent by mail and used in conjunction with a text or workbook would also provide the help the student needed. Thus, in this case, a relatively inexpensive telecommunications scheme would seem appropriate. In fact, an arrangement which does not provide a "real time" flow of information (such as tapes) should work satisfactorily, eliminating the need for telecommunications altogether.

The considerations of a small group wanting to see a play and a single student seeking to learn plane geometry have shown two rather different communications needs. One further illustration suggests a far more vast problem. Consider the case of a large, dispersed audience, such as all the college freshmen in the U.S., needing some information in order to complete a requirement for their college course of study, such as English 101, to get their degrees. If all the colleges they attended would accept a certificate of completion from some source (quite a large "if" at the present), or if the colleges would coordinate the correction of papers, giving exams and such with some central agency, lectures could be provided from a single location. The present medium for such an approach would be either radio or television. There does not presently exist a satellite relay which would allow every student to receive the material on his or her home television receiver, but there are satellites which would permit a single source to feed all the public and/or educational television stations in the U.S. which could then rebroadcast the material for reception at home. If one considers a less global audience, freshmen in Massachusetts, for instance, broadcast radio or television could certainly accomplish the task. While the cost to install and maintain the facilities is considerable, if the audience is large enough, the cost per student becomes small. When the target population is well motivated and when a small proportionate involvement is acceptable, broadcast works very well. There are a number of factors that prevent wider use of broadcast, such as lack of faculty acceptance and inter-institutional protectionism; but for the freshmen in Mass. who are somewhat motivated because English 101 is a required course, who are dispersed over a large area and who are large in number, broadcast telecommunications would be a cost-effective approach.

Those, then, are some of the possible alternative applications of telecommunications and some of the considerations in ascertaining what kind of system would be most appropriate to a particular situation. The technology exists to do almost anything necessary, but careful, rigorous analysis of the real need to be met is required to minimize cost.

Alternatives for Massachusetts

Some current applications of telecommunications in higher education are presented in Appendix D-1. As is apparent, there are a variety of approaches, from the ITFS system of Stanford to the S-U-N broadcast network to the elaborate system in Indiana. Suggesting some alternatives for the Commonwealth of Massachusetts, however, poses a problem unless goals for the system are established, decisions are made about the form and quantity of information to be carried, and terminal points to be connected are determined. For purposes of this appendix, here are three alternatives with the implications and approximate costs of each.

1. Use of the public or educational broadcast stations.
2. A "trunk line" system connecting Springfield and Amherst with Worcester and Boston.
3. An "Indiana-style" system connecting all the institutions of higher education in the state together and including possible ITFS and Broadcast stations as well. (A system similar to the Indiana Higher Education Telecommunications System, IHETS).

Public Broadcast

There are public broadcast stations in Boston (WGBH and WGBX), and Springfield (WGBY) which can reach about 95% of the state's population. These stations are existing, licensed and operating. (WGBH and WGBY are structured to enable simulcasts--duplicate telecasting.) The problem in their use would be in securing the desired time slots (prime evening time from 7-11)[1] and funding the cost of the programs offered.

The most successful use of broadcast for educational purposes is Chicago's TV College, which has been operating since 1956 and has evolved a system which permits four courses to be broadcast each semester. Each course has two segments a week and is broadcast once in the morning and once in the evening. In 1973 the College introduced rebroadcasts on Sunday morning between 7 AM and 1:30 PM. The Sunday broadcasts cover both course segments for the week, so someone missing during the week can catch up, or someone able to watch only on Sunday can do the whole week's viewing at one time. Each course segment runs either 30 or 45 minutes, so four courses repeated three times during the week occupy 12 to 18 hours viewing time. Each course carries three hours credit.[2]

Chicago has been able to attract 275-300 credit students per course[3] from a total potential audience not much larger than that in the Commonwealth (6 million to 5,689,000). They also have about 8,000 "casual" (chance) viewers for each program[4] and as many as 2,600 non-credit students in a course. The latter group, however, shows continually declining numbers. They have had over 160,000 students in the past 18 years, 400 of whom received their Associate in Arts degree for study entirely by TV.

Significantly, another 2,200 TV students have gone on to become resident students at the City Colleges of Chicago. Of the group of 160,000 students, 75% have been women and the total group has performed better (received better grades) than on-campus students taking the same courses.[6]

What about costs? Chicago constrains them by mixing newly produced courses with previously shown ones. (They have found that a course shown for credit can be repeated 3 or 4 times over a 5 to 6 year period with slight updating.) According to their estimate, it costs about $70,000 to develop and televise a course, $60,000 of which is spent in development.[7] Once the courses are developed, they are put on file at the Great Plains National Instructional Television Library at the University of Nebraska and rented to other schools for $1,000 per semester per course. In addition to the televised material, study guides and occasional face-to-face conferences are normal ingredients of study by television, as are tests administered in local educational institutions. In all, there is administrative effort required which, if two broadcasting locations were used, would be somewhat complex. Based on Chicago's experience, to rent and televise the program three times a week over two stations, as would be necessary in Massachusetts, would involve costs of approximately $30,000 per course.

The costs per credit hour would depend on the number of students attracted. Surveys done for the University of Nebraska reflect that between 1.6 and 2.7% of all adults are interested in taking courses for credit even if it costs $50 per credit. (Chicago estimates that it costs them approximately that much per credit student hour.[8]) The potential audience in Massachusetts would thus be 90-150,000 people,[9] though the registration may not even approach that number. Chicagoans pay no tuition for their courses,[10] yet only ¼ of 1% of their "interested audience" actually signs up for credit. (2% of 6 million is 120,000 and 300 sign up - .25% of 120,000). On the other hand, the British Open University, which uses television and radio in part, (25 minutes of an estimated 10 hours study per week) has managed to attract as many students as they could accept--presently 42,000. Their costs are 25-33% of resident study.[11] Their course materials can also be leased or purchased.

It seems very probable that arrangements could be made, at reasonable cost levels, to broadcast college level courses in Massachusetts. Such an approach, if designed to reach the general adult population of the Commonwealth, would be sound from a communications standpoint. It would be the least-cost method of communicating with that audience as a composite group. The audience would self-select the relative few who would respond to the opportunity, and that few typically would be middle-class people who already have some college, or even a degree, behind them.

Trunk Line

A "trunk line" communications system from Boston to Amherst/Springfield via Worcester could function as the first phase of a larger, more complex system (see the next section of this appendix) and would serve to interconnect the areas of the Commonwealth in which about 70% of the population is located. (The heavily populated areas which would not be included are Lowell-Lawrence-Haverhill and Fall River). The system would also interconnect public institutions of higher education which serve the same percentage of post-secondary students.

Those institutions which almost certainly could be connected would include:

On the trunk line proper -

Boston State College
Univ. of Mass., Boston
Worcester State College
Univ. of Mass., Amherst
Springfield Tech. Comm. College
Framingham State College *

By ITFS -

Salem State College
North Shore Comm. College
Mass. College of Art
Roxbury Comm. College
Mass. Bay Comm. College
Bunker Hill Comm. College
Quincy Junior College
Massasoit Comm. College
Newton Junior College
Middlesex Comm. College
Quinsigamond Comm. College
Univ. of Mass., Worcester
Holyoke Comm. College
Westfield State College
Greenfield Comm. College

Institutions which could potentially be connected, depending on the location of the Boston antenna and the antennas at the other locations are the following:

Lowell Technological Institute
Lowell State College
Bridgewater State College

It is unlikely that the following could be connected without North-South microwave links or ITFS repeaters:

Bristol Comm. College
Southeastern Mass. Univ.
Mass. Maritime Academy

---

*Depending on need for a repeater in the area, otherwise by ITFS.

C4-20 Cape Cod Comm. College
Northern Essex Comm. College
North Adams State College
Berkshire Comm. College

With provision for the origination of transmissions at Salem State College, Boston State College, Univ. of Mass./Boston, Worcester State College, Springfield Technical Comm. College and Univ. of Mass./Amherst, this system would cost in the range of $1.5-2 million. The total cost would depend on such things as the terminal facilities at each terminus, and the switching arrangements provided. Incorporation of studio facilities, classroom facilities, talkback features and so forth could expand the costs greatly. A map showing this configuration is given as Figure C4-1.

There is a microwave system connecting WGBH (Channel 2) in Boston with WGBY (Channel 27) in Springfield. Potentially, additional channels could be added to that system at less cost than establishing a completely new system. Such an arrangement would need early, careful, detailed consideration.

Probably, the trunk line could be leased from the telephone company There would be substantial termination charges should the system be discontinued within the first 5 or 10 years.

The real concerns should be the audience to whom the system is directed and the purpose of the system. Unless broadcast or further connection arrangements were made at one or more of the terminal points, the audience would be the students at the schools involved, new students attracted by the communications system, or those people who would in some way be connected to the system. The potential would exist for interchanging programs--courses--between the schools on the network. Whether a need for such an interchange exists, is another question. Whether the interchange requires real-time transmission is yet a larger question. If a real need existed, it could presently be serviced, at least in part, by simply interchanging video-tapes. Thus while the "trunk-line" poses no technical problems and need not be unreasonably costly, it would not seem to have any justification.

"Indiana Style" System

The "trunk line" system could readily be expanded and elaborated on to make it a system similar to that operating in Indiana. To interconnect all the public institutions of higher education in the Commonwealth would require microwave links extending from Boston (or Framingham) to Lowell, from Boston to Bridgewater, Southeastern Mass. Univ. and Mass. Maritime, from Worcester to Fitchburg and from University of Massachusetts to Pittsfield. Added ITFS links would be needed out of Berkshire Comm. College, Fitchburg State College, either Lowell Tech or Lowell State, Mass. Maritime, and Southeastern Mass. Univ. The added cost would be in the range of 1.0-1.5 million. A voice circuit dialing

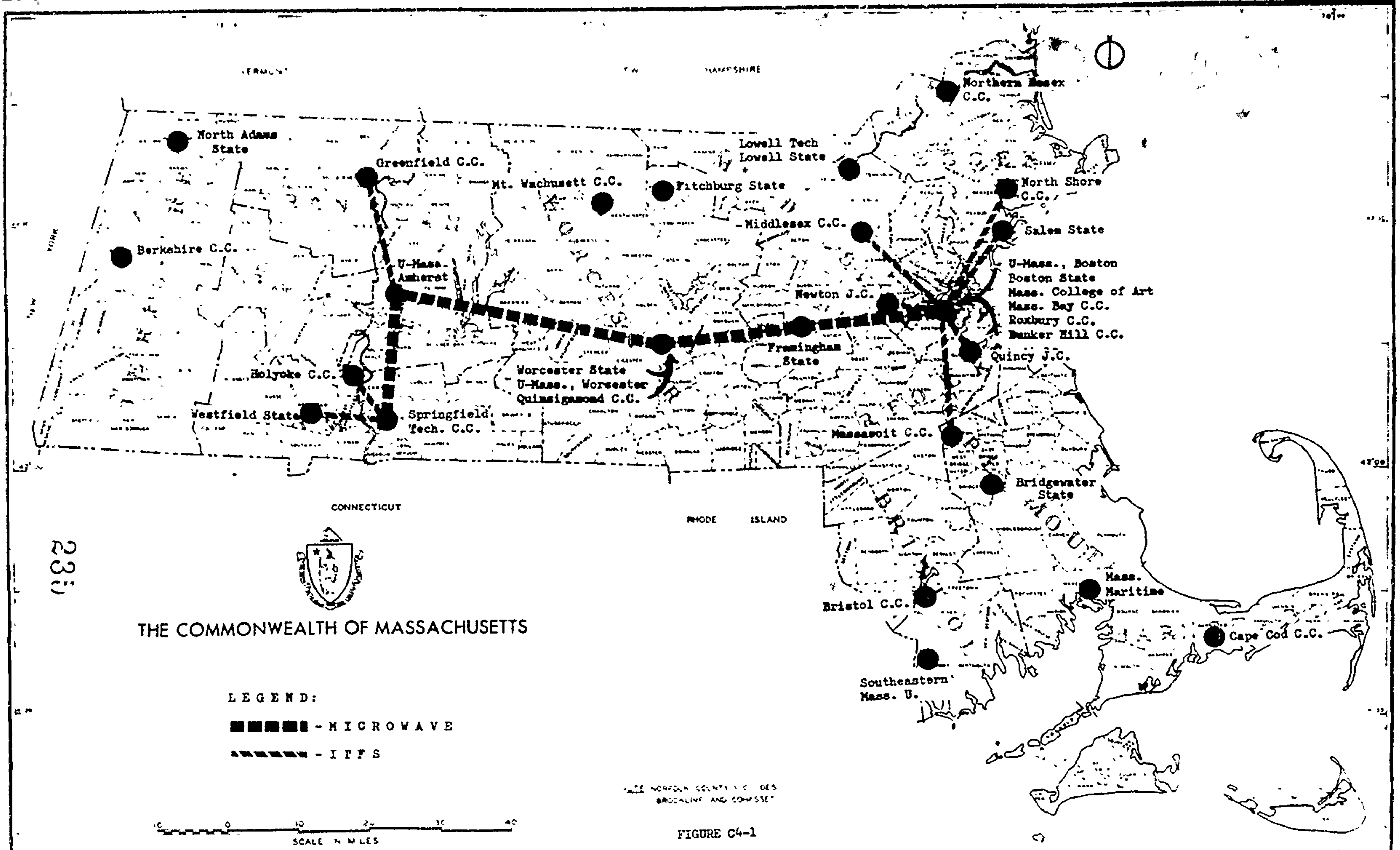

VERMONT
NEW HAMPSHIRE
North Adams State
Greenfield C.C.
Mt. Wachusett C.C.
Fitchburg State
Lowell Tech
Lowell State
Northern Essex C.C.
North Shore C.C.
Salem State
Middlesex C.C.
Berkshire C.C.
U-Mass. Amherst
Newton J.C.
U-Mass., Boston
Boston State
Mass. College of Art
Mass. Bay C.C.
Roxbury C.C.
Bunker Hill C.C.
Framingham State
Quincy J.C.
Worcester State
U-Mass., Worcester
Quinsigamond C.C.
Holyoke C.C.
Westfield State
Springfield Tech. C.C.
Massasoit C.C.
Bridgewater State
CONNECTICUT
RHODE ISLAND
Mass. Maritime
Bristol C.C.
Cape Cod C.C.
Southeastern Mass. U.
THE COMMONWEALTH OF MASSACHUSETTS
LEGEND:
- MICROWAVE
- ITFS
SCALE IN MILES
0
10
20
30
40

FIGURE C4-1

system and other embellishments of the Indiana system would add yet more cost to the overall system, so that a fully expanded system could readily total $3-5,000,000. A map showing this configuration is given as Figure C4-2.

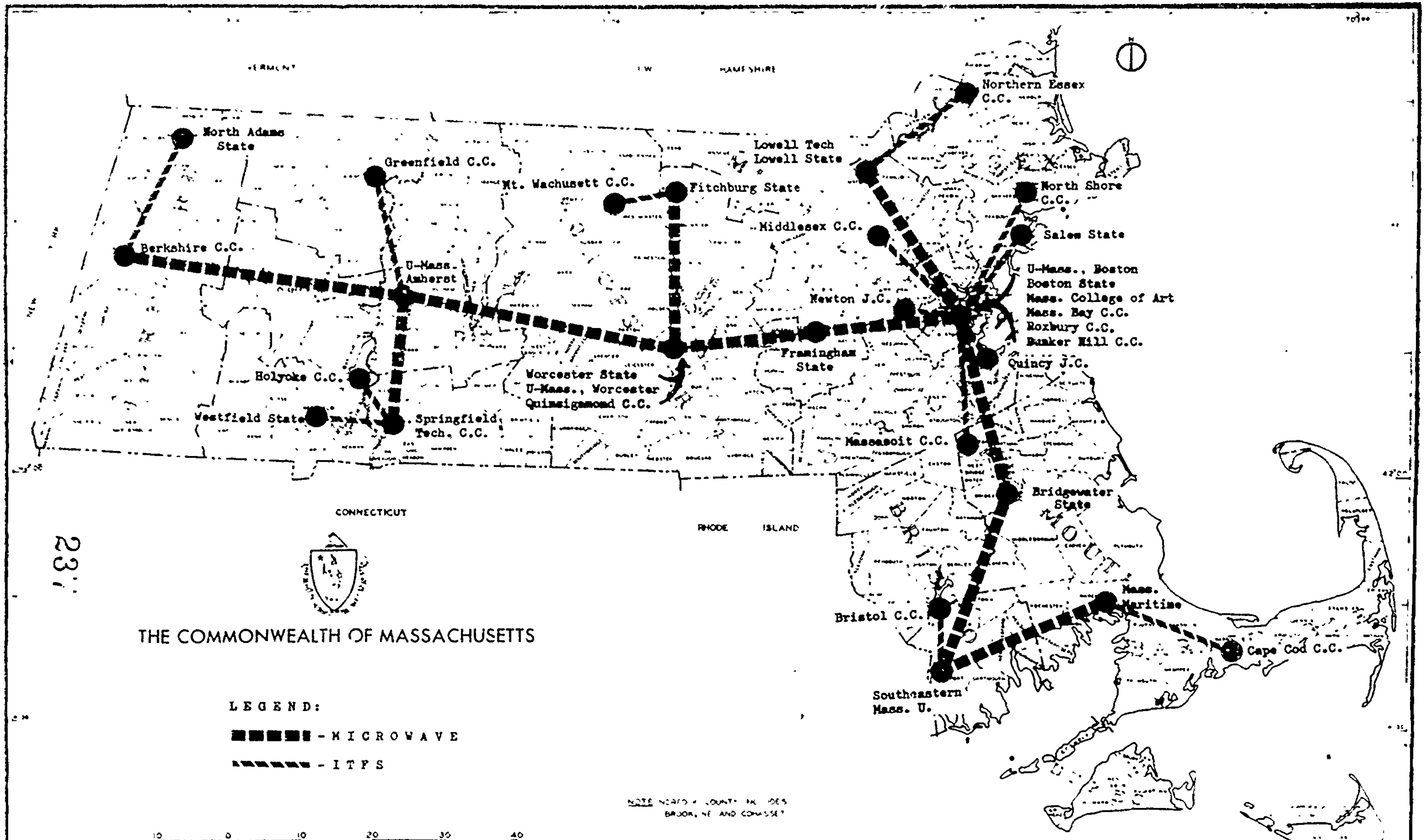
While the more elaborate system would obviously enable more sophisticated usage, the same questions exist that existed for the "trunk-line." To what end?

Other configurations for a telecommunications system could be suggested. The "Indiana-style" system could be extended beyond the institutions of higher education at modest additional cost to connect other schools or other learning facilities. Heavier use of ITFS links could be made, depending on the level of quality acceptable and the possible alternative antenna locations. Different combinations of leased lines, microwave and ITFS could be tried to obtain the optimum quality at reasonable cost. In any case, however, the intended uses of the system, the ability and willingness of the institutions to use the system, and the clientele to be served, must be weighed in deciding the best configuration at a given time.

What has been established to this point, then, is that a telecommunications system need not be overwhelming conceptually. It is simply a medium of communications. Most people are familiar with a number of such systems in their daily lives and the concept of applying them to a specific communications problem is not difficult to understand. At the same time, proposing systems is very easy. When there are no constraints in terms of cost, uses and clientele to be served, the technology will support almost anything conceivable. But if any system will suffice, so will none. To design a system, there is an array of questions which have to be asked and answered, before real system parameters and meaningful system costs can be established. Some of those questions are -

1. Who is the system to serve and what are their needs?
2. Must those needs be met and, if so, what alternative methods are available to meet them?
3. Where are the users located and in what numbers?
4. In meeting the needs of the established users, what sorts of information must be transmitted?
5. Must information be transmitted one or more ways?
6. Are there absolute information flow or cost limitations?
7. Are there artificial constraints on the technology to be used or can cost/effectiveness be applied freely?
8. Must the need be met immediately, or should a phased program be considered?

The body of this report will undertake to answer the first five of those questions for a particular target population and for other populations as extrapolations of the first. From those answers some determinations will be made about the kind of telecommunications system, if any, which should be suggested at this time for higher education in the Commonwealth of Massachusetts.


VERMONT
NEW HAMPSHIRE
North Adams State
Greenfield C.C.
Mt. Wachusett C.C.
Fitchburg State
Lowell Tech
Lowell State
Northern Essex C.C.
North Shore C.C.
Salem State
Middlesex C.C.
Berkshire C.C.
U-Mass. Amherst
U-Mass., Boston
Boston State
Mass. College of Art
Mass. Bay C.C.
Roxbury C.C.
Bunker Hill C.C.
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Massasoit C.C.
Bridgewater State
CONNECTICUT
RHODE ISLAND
Bristol C.C.
Mass. Maritime
Cape Cod C.C.
Southeastern Mass. U.
THE COMMONWEALTH OF MASSACHUSETTS
LEGEND:
- MICROWAVE
- ITFS
SCALE IN MILES
10 0 10 20 30 40

FIGURE C4-2

Telecommunications

Footnotes

[1] From an address by John Witherspoon, Corporate Vice President, Community Television for Southern California at the National Conference on Opening Higher Education, University of Nebraska, Lincoln, January 16-18, 1974.

[2] Zigerell, James J., Chicago's TV College, A Fifth Report, (Chicago: City Colleges of Chicago, 1974), pg. 15.

[3] Zigerell, A Fifth Report, pg. 25.

[4] Ibid., pg. 11.

[5] Ibid., Pp. 35-40.

[6] Ibid., pg. 22.

[7] Ibid., Pp. 25-26.

[8] Wall, Milan, "Taking Education to the People, The S-U-N Project," Education and Industrial Television, October, 1974, pg. 15.

[9] U. S. Census - 1970.

[10] Ibid., pg. 13.

[11] From an address by Prof. Michael Neil, Open University of the United Kingdom at The National Conference on Open Learning in Higher Education, University of Nebraska, January 16-18, 1974.

Appendix D-1

THE USE OF TELECOMMUNICATIONS IN HIGHER EDUCATION

A SURVEY AND OVERVIEW
PREPARED BY
GENESYS SYSTEMS, INC.

JUNE, 1974

SUMMARY

The use of telecommunication in higher education is reviewed. By far the greatest use is made of television, both live and by video tape (cassette), with major innovative video tape systems offering world-wide service coming on line. The extension of the university through cable television is still in its infancy but offers great promise. As yet, no impact of any significance has been made on higher education by the use of satellites or the Picturephone.

Blackboard-by-wire has received considerable use in higher education. It has been demonstrated to be educationally effective and its cost is significantly less than that of television. However, where the financing of a television system is available, television is usually preferred because of its greater long term acceptability - both for the students and for the faculty.

The application of CAI in higher education is still in the experimental stage. No real evidence yet exists that it will improve the higher education learning process or that it will save on faculty costs.

Telecommunications is useful in extending the university to reach students where they work or where they live. Extensive evidence exists that its use need in no way result in a lower level of education, academic standards or prestige. A number of systems already service students at rates significantly lower than on-campus teaching costs. One major system accrues a surplus of income.

The technical approach to the use of telecommunications varies widely. The economic results can be expected to vary just as widely. However, educationally, the results are probably indistinguishable. For this reason, cost, cost-recovery, cost-effectiveness, acceptability to the faculty and acceptability to students are the major determining factors in the educational system design.

Using the Stanford ITV system as an example, the remarkable impact on energy conservation, the environment, safety and dollars of using telecommunications as a substitute for automobile transportation is clearly demonstrated.

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I - INTRODUCTION

The purpose of this report is to summarize current uses of telecommunications in higher education. It is being prepared for the Telecommunications Project Office of the University of Massachusetts, Amherst. The report is intended to be descriptive and to compile information representative of the different types of systems without attempting to discuss all systems. By request, the report will avoid interpretation of data and no recommendations will be made. Where deemed appropriate, questions will be raised which are pertinent to the data.

Included in the uses of telecommunications will be systems utilizing VHF or UHF broadcast television (TV), Instructional Television Fixed Service (ITFS), microwave TV, TV systems utilizing video tape or cassettes, cable TV, satellite TV, picturephone, blackboard-by-wire and computer aided instruction (CAI).

Wherever possible, the report will discuss the amount of utilization, the type of material transmitted, the clientele serviced, the system capital, operating and teaching costs and will attempt to arrive at the cost per student-contact-hour. Cost-effectiveness, as measured by an instruction cost index, will be a major focus of the report.

Cost-effectiveness is normally defined as the benefit/cost ratio. However, in this report, the cost/benefit ratio will be used as a measure of comparison between TV systems and between TV and on-campus costs. This cost/benefit factor can be directly related to Terman's (1) "instruction cost index,*" which he uses as a measure of faculty productivity. While some disagree with the way this measure has been applied, a direct relationship between it and equivalent TV costs for a given institution is quite valid. In addition, it was decided to define benefit only in terms of the "incremental" number of students (actually student-contact-hours) served by the TV system, with no attempt to measure the effectiveness of the learning process (hundreds of studies already attest to the conclusion that students learn just as well (or better) by TV than in a live face-face environment). This "incremental" number of students includes students of <u>all</u> kinds: graduate and undergraduate as well as credit and non-credit. There appears to be a growing tendency to share on-campus courses by ITV with other than students taking them for credit. A number of ITV systems include an auditor category and a category of students who are tested and graded but not-for-credit. Further, there is a growing tendency to use these systems for business administration, management, the social sciences, the humanities, languages, education and special non-credit courses.

* the ratio of total teaching payroll including faculty, lecturer, acting faculty, visitors, adjunct professors, teaching and laboratory assistants to student-credit-hours or student-contact-hours.

The report avoids considering as "part of benefit" incremental income or "released time" to participating faculty. In some cases, such incremental income is already being derived but as yet it is insignificant. While it may be significant in the future, its inclusion at this time is not warranted. There are other "benefits" to both the institution and the faculty relating to participation in TV which were deliberately not included because, while real, they are intangible. Included in such benefits are "greater service to the community," and "better relations between the institution and the users of its product."

Cost is defined as the incremental cost to the university incurred due to the use of television, including amortized capital costs, annual operating costs and added instructional costs (if any). Clearly, the closer a TV system comes to recovering such costs or if it accrues a surplus, the more successful the operation will be.

The report covers primarily systems utilizing television technology. Very little use is made of the radio spectrum for higher education purposes, so radio systems are not included. Telephone systems (blackboard by wire and picturephone) are included for completeness. Special systems such as PLATO and TICCIT are included primarily because of future potential rather than current utilization in higher education.

Special mention is made of the British Open University because of its impact in Great Britain, even though its use of telecommunications is not large.

II - OVERVIEW OF UNIVERSITY ITV SYSTEMS FOR ENGINEERING AND BUSINESS SCHOOLS

Based on the best information now available to the authors, Table 1 lists all operating University ITV systems for Engineering and Business Schools. Included is a brief description of each system. The information is broken down by State and alphabetically within each State. Figure 1 shows the number of such systems implemented each year since the first system in 1962. In 1974, U.C., Davis supplemented its system with a microwave link to Chico and ITFS to Sacramento. Also, U.C., Berkeley initiated construction of a 1 channel ITFS system.

A. University Responses

Table 2 tabulated responses received from some of the universities listed in Table I. The following summarizes those responses:

1. 12 out of 13 utilize TV classrooms.
2. 3 out of 13 utilize TV studios.
3. 10 out of 13 have students on-campus in all televised courses.
4. 3 out of 13 are developing special non-credit courses for television.
5. 13 out of 13 make faculty participation voluntary.

6a 0 out of 13 compensate the faculty in dollars for TV teaching.

6b 3 out of 13 compensate the faculty in released time for TV teaching.
6c 3 out of 13 utilize residual benefits for non-credit off-campus use of televised courses.
7. 0 out of 13 utilized televised courses provided by others.
8. 2 out of 13 re-use video taped courses on-campus.
9. 5 out of 13 use video tapes of courses to derive off-campus income.
10. 3 out of 13 derive income from leasing TV facilities to others.
11. 4 out of 13 participate in consortia with other institutions.
12. 2 out of 13 are interacting with cable TV systems.
13. 6 out of 13 utilize TV system during summer academic period(s).
14. 5 out of 13 utilize TV system during non-academic periods.
15. 9 out of 13 would recommend ITV involvement to others, 4 out of 13 did not respond, 0 out of 13 responded negatively.
16. 5 out of 13 utilize TV surcharges.
17. 7 out of 13 apply tuition income in justifying television involvement.
18. 1 out of 13 is accruing income in excess of incremental cost.

B. Industry Responses

Table 3 tabulated responses received from industry questionnaires relative to ITV. These responses may be summarized as follows:

1. Attitudes - Very positive on the part of top management, supervisors and participating employees.
2. Participation Factors - Very positive in recommending participation to others. Very positive as to ITV being vehicle for greater student participation and reaching senior people. Fifty-fifty in helping in recruitment and employee retention.
3. Work Commitments - Almost unanimous in allowing time off during day to participate. Very positive towards video tape for make-up and review of missed classes.
4. Course Selection Privileges - Very positive towards wanting them. Most claim they use them.
5. Talkback - Utilization highly variable from minimal to very much. Most think it important but almost 40% do not. Over half would still participate without it.
6. Credit, Degrees, Certificates - Preponderance in favor of some kind of "recognition." Heavily in favor of credit and degrees. Very favorable towards "certificates of completion."

III - COLORADO STATE UNIVERSITY (SURGE*) ITV SYSTEM

The CSU SURGE system is the largest, longest operating example of serving off-campus fully employed engineering students by video tape on essentially a state-wide basis. It can be used as a standard of comparison for other existing or proposed video tape delivery systems.

* Colorado State University Resources for Graduate Education.

A. Background Information**

Colorado has a concentration of technology based industries and government facilities situated along the eastern slope of the Rocky Mountains in a narrow, 160-mile strip extending from Fort Collins to Pueblo. To provide continuing education opportunities and graduate level course work for the professional employees of these organizations, the College of Engineering of CSU initiated Project Colorado SURGE in 1967. Complete MS degree programs are provided. An expanded program under SURGE leading to an MBA was initiated in 1972-73.

Course work is delivered in the form of video-taped classes with the same supporting materials as provided on campus. Every video tape is of a regular on campus course attended by on-campus students. The classes are held in regular classrooms equipped for TV (2,3,4). The lectures and student questions and discussion are recorded on the video tape. The tapes are packaged with class materials, assignments and examinations and delivered commercially to each user location. The off-campus classes usually view the tapes two days following the on-campus class. Over 80 percent of these viewings are during regular working hours. Tapes may be retained so that any person missing a class may see the tape at some later time. After being viewed, the tapes are returned to the campus, erased, then reused to record other classes.

SURGE students complete the same assignments, reports and examinations as on-campus students. Where laboratory or computer work is required, SURGE students use facilities of their employer. The inconvenience of limited library facilities is overcome by sending a single copy of reference articles to each location.

Faculty members teaching on SURGE are encouraged to make at least two visits per quarter to each industrial location for direct contact with students. Additional live interaction between faculty and students occurs in occasional telephone calls and more rarely by student visits to campus.

During the first six years of the SURGE program, 50 engineers of participating companies have been awarded MS degrees completely through the video tape program. Over 16,000 quarter hours of credit have been earned by other professionals without leaving their place of employment.

B. SURGE Participation

Table 4 is a summary of SURGE participation from inception of the system in the Fall, 1967 through the Summer, 1973. Included are the number of courses, the number of students and the number of participating organizations (remote locations). These data are plotted on Figure 2.

** Information contained in this report was derived from (2). Further information is contained in (3) and (4).

C. SURGE Capital Cost*

The following summarizes the capital cost of the TV related facilities devoted to the SURGE system:

1.	Studio Classrooms and Operator Consoles (3 total) Table 5 shows a breakdown of these costs.	$ 90,000.
2.	Interconnect Between Classrooms and Master Control	3,500.
3.	Master Recording Area (Master Control) They include 38 VTR's (no video tape), cabling, racks and audio and video switching. A breakdown of these costs is also shown in Table 5.	58,255.
	Total Capital Cost	$151,755.

4. Investment Cost in Video Tape

While video tape is amortized as an operating cost, it still requires a significant "front-end" investment. For example, if an average of 4.5 copies of 26 courses were made, it would required 117 tapes for each course hour. At 3 hours per week per course and assuming a 4 week supply of tape (before erasure and reuse of returned tapes) an investment in tape inventory might be required of:

Dollar in tape inventory = $20/tape x 26 courses x 3 hours/week/course x 4.5 copies/hour x 4 weeks = $ 28,080.

D. SURGE Operating Costs

Operating costs of a video tape system are split between "dollars per recording hour" and "dollars per delivered tape." The cost factors for the academic year 1972-1973 are used for the analysis. The following information is pertinent:

Total courses = 110
Total course-hours = 30 x 110 = 3,300
Total Section ** = 315
Total off-campus student-course-registrations = 1,277

1. Dollars Per Recording Hour

These costs are independent of the number of tapes made and include base operating costs and amortization of pertinent capital costs. Costs relating to VTR's and tape will be treated on a per tape basis. Space costs are not included because space used is usually not an incremental cost.

a. Table 6 lists base operating costs. From this Table we get:

* Do not treat these costs as current or necessarily representative of 1974 prices and requirements.

** A Section is a group of off-campus students meeting at a location and requiring a tape.

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Base Operating Cost = $\frac{\$60,900}{3,300 \text{ course-hours}}$ = \$18.45 per course-hour

b. The equipment to be amortized has a 10 year useful life and includes the sum of items in paragraphs C.1 and C.2. Assuming interest at 6% per year (\$0.13587/dollar/year):

Capital Amortization Cost = $\frac{\$93,500 \times \$0.13587/\text{year}}{3300 \text{ course-hours/year}}$ = \$3.85/course-hour

c. Total Operating Cost/course-hour = \$18.45 + 3.85 = \$22.30/course-hour

2. Dollars per Delivered Tape

"Dollars per delivered tape" is comprised of the sum of tape amortization cost, VTR amortization cost, (3 year useful life) tape handling cost, tape delivery cost, instructional support cost and certain overhead costs. These are outlined below:

a. Tape Cost/Delivered Tape = $\frac{\$20/\text{hour (purchase price)}}{100 \text{ uses}}$ = \$0.20/delivered tape

b. VTR Cost/Delivered Tape = $\frac{\$36,845 \times \$0.37411}{315 \text{ section} \times 30 \text{ tapes/section}}$ = \$1.46/delivered tape
From Table 5 (6%/3 years)

c. Other Recording Facilities Cost/Delivered Tape =

$\frac{\$21,410 \times 0.13587}{315 \text{ section} \times 30 \text{ tapes/section}}$ = \$0.31/delivered tape
From Table 5 (6%/10 years)

d. Tape Handling Cost = \$0.50/delivered tape (estimated by CSU)

e. Tape Delivery Cost = \$1.00/delivered tape (estimated by CSU)

f. Faculty Travel Allowance - \$1.25/delivered tape (estimated by CSU) to visit students

g. Secretarial/supplies/phone = \$0.30/delivered tape (estimated by CSU)

h. Instructional Support = \$1.00 x $\frac{1,277}{315 \text{ sections}}$ = \$4.05/delivered tape (estimated at \$1/off-campus student/section)

i. Total Dollars/delivered tape = (sum of a thru h) = \$9.07

E. SURGE Cost-Effectiveness (Instruction Cost Index)

1. From the previous analysis of costs, the total costs for 1972-1973 are as follows:

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Total Operating Cost = \$22.30/hour x 3,300 hours = \$ 73,590.
Total Cost for Delivered Tape = \$9.07/delivered tape x 315 sections x 30 tapes/section = 85,712.

Total 1972 - 1973 cost = \$159,302.

2. So, cost/quarter-credit-hour = $\frac{\$159,302.}{3 \times 1277 \text{ quarter-credit-hours}}$ = \$41.58

   and cost/student-contact-hour = $\frac{\$41.58}{10}$ = \$4.16 = instruction cost index)

3. From (2), related on-campus costs at CSU for 1972-1973 are:

   Instruction cost/student-contact-hour (graduate engineering) = instruction cost index = \$ 6.50

   This instruction cost index can be derived from (1) by assuming an escalation rate of costs of 5%/year for 7 years. Table 7 shows these indices for different classes of institutions. CSU is assumed to fall in the Group II H category.

4. The economic viability of the TV system relates to the sharing of on-campus instruction with off-campus students, thereby minimizing incremental instructional costs. If one assumes that the on-campus instruction is already paid for and that off-campus students would not participate without TV, then it is possible to compare the cost of educating the TV students via the TV system with the cost of teaching equivalent students on-campus.

   From the above it can be concluded that the CSU SURGE program serves off-campus graduate degree seeking students in Colorado at:

   $\frac{4.16}{6.50}$ = 64% of the cost of serving on-campus graduate students

   Therefore, the TV system is an economically viable alternative to on-campus instruction, even with zero cost recovery. The situation is really better than this because along with the off-campus students comes <u>incremental</u> tuition income of: (CSU makes no surcharges)

   1277 students x 3 credit-hours/student x \$23/credit-hour = \$88,113.

   If we subtract this from the annual cost of SURGE, we obtain for <u>net</u> SURGE cost:

   159,302 - 88,113 = \$71,189

   This leads to a net off-campus cost/contact-hour of:

   $\frac{71,189}{3 \times 1277 \times 10}$ = \$1.86

   and this leads to a comparative cost relative to doing the same job on-campus of:

$$\frac{1.86}{6.50} = 29\%$$

The alternatives to the TV system are either to create new schools and faculties, or to service the need by transporting existing faculty or to do nothing at all. The first two alternatives have proven to be economically untenable. The third alternative may be socially unacceptable.

It can, therefore, be concluded that if the state sees its obligation as providing educational services to all eligible students in the state, then the cost of accomplishing part of this objective by television can be significantly lower than equivalent education on campus, even if none of these costs are offset by income.

F. Cost of Facilities at Participating Organizations

The cost of off-campus facilities were not included in the previous cost calculations as they are paid by the organizations participating in the CSU SURGE system. Nevertheless, such cost information is pertinent and is presented in Table 8. It is easy to conclude from this that in a "video tape delivery" system, off-campus facilities costs are linearly related to the number of classrooms (for simultaneous viewing), independent of the number of geographic locations of the organizations.

IV - STANFORD UNIVERSITY ITV SYSTEM

The Stanford University ITV system has been operational for five (5) years. It is the first to be funded entirely by participating organizations whose students utilize the "product" of the system. It offers a diversified curriculum responsive to the educational needs of the surrounding industrial community. Among all operating ITV systems, Stanford offers the greatest diversity and number of courses that relate to the full spectrum of industrial interests, covering the range of engineering, science, business, management, supervision and training such as rapid reading, effective listening and secretarial skills. Several other institutions utilize the TV facilities of Stanford to reach the same participating organizations. Stanford incorporates a video tape mode to supplement its live interactive mode and its instructors are already deriving income from off-campus non-credit use of recorded materials. Stanford is a mature system which is expanding and is now accruing a surplus of income over incremental costs. In the early years it operated at a deficit. Stanford represents what can be done in matching the interests and needs of a university to the interests and needs of the industrial/governmental community. A detailed description of the Stanford ITV system is available (5).

A. Background Information

Stanford University is surrounded by a large number of technology based industries located throughout the San Francisco Bay Area. Starting in 1953, the School of Engineering initiated an "Honors Cooperative Program" (HCP) wherein it opened its on-campus classes during the regular academic day to fully-employed part-time matriculated students. Organizations desiring to have students participate in the HCP are required to pay matching fees, approximately equal to tuition in order to cover the full costs of instruction. This HCP on-campus program has been very popular and is highly successful. The TV system was initiated to overcome the geographical limitations of the on-campus program, to broaden participation in regular Stanford courses to allow for auditor and non-matriculated student participation, to allow for serving a broader spectrum of industry educational needs, while, at the same time, providing economic benefit to the university.

B. Instructional TV in Operation

Stanford concentrates on courses at the master's degree level. By utilizing only Stanford's regular teaching hours (no evening program) of 8 A.M. to noon and 1-5 P.M., it is possible to televise 180 three-quarter-unit courses during a calendar year. This represents more than 5000 hours of instruction per year. Since the typical master's degree program in engineering requires only about 15 courses, the four-channel system capacity allows a diverse course representation from all graduate engineering departments as well as from related sciences.

Network member organizations are permitted to make "off the air" video tapes of Stanford lectures for make up of missed classes or for course review.

It was realized that the television facility could provide additional educational benefits beyond the part-time degree-oriented program for matriculated students. One addition was a "non-registered option," (nro) which permits non-matriculated industry graduate students to take televised courses. Such students are tested and graded to the same standards as regular students. Auditors are permitted in the remote TV classrooms at reduced fees. They receive no testing or grading. Selected seminars of interest to the network members are televised and are available without fees.

The system is available at noon and in the early mornings and evenings when Stanford courses are not being held. This affords an opportunity for additional education of all kinds. A separate non-profit corporation, the Association for Continuing Education (ACE), has been established to provide such programming. Its membership comprises the organizations which participate in the Stanford ITV Network. ACE courses are directly responsive to the needs of its sponsors. It offers non-credit courses ranging widely in interest and it offers an MBA degree program, under the auspices of Golden Gate University; the Foundation Program for the MBA degree, under the auspices of the College of Notre Dame; graduate courses for credit in Cybernetics Systems Engineering, under the auspices of San Jose State University; non-credit courses from the U.C. Extension Division and special courses such as put on by Xerox Learning Systems. The added dimension of ACE is a vital ingredient in the financial viability and acceptance by industry of the Stanford ITV Network.

C. Stanford Network Participation

Table 9 is a summary of Stanford Network participation from inception of the ITV system in the Spring of 1969. Included are the number of courses, the number of students in each student category, and the number of participating organizations. These data are plotted in Figure 3 and clearly show the growth trend in courses, students and industrial participation.

D. Stanford Capital Costs*

The capital costs of the facilities devoted to the Stanford ITV Network are tabulated on Table 10. They approximate $615,000. While Stanford does record a number of its courses on video tape, this activity is an add-on which is not fundamental to the ITV system operation. It is conducted on the basis of recovering all costs plus a surplus. Therefore, capital costs associated with this portion of the system have not been included in the estimates on Table 10.

Table 10 also includes, for the sake of completeness, estimated costs of live ITV systems with fewer channels (6). The cost of the 2 channel system shown correlates closely with that of the University of Minnesota ITV system which was completed in 1971. Great care must be taken in comparing ITV system costs. For example, a great deal more money was spent on classroom facilities at some institutions compared to others for the express purpose of creating an attractive teaching environment for the faculty.

Of the $615,000 in capital costs shown $166,000 is applicable to the RF (radio frequency) portion of the facilities and $215,000 to the on-campus video/audio related facilities. Of the remaining $234,000, probably 70% or $164,000 is also allocable to the RF system. Therefore, the estimated total cost of the RF system is:

1. Total RF system cost = $330,000 and
2. Total Video/Audio system cost = $285,000.

E. Stanford Operating Costs

Operating costs of the Stanford ITV system are also tabulated on Table 10. They total approximately $120,000 annually for approximately 6,000 hours of televised courses. The resultant cost of $20 per hour is typical of what can be expected in an efficiently run live interactive TV system (an approximately equivalent cost is the $18.45/course-hour for CSU from Section III.E.1).

The above cost does not include amortization of capital equipment. This equipment has a 10 year useful life and, when amortized, adds to operating cost as follows:

1. RF system cost $= \frac{\$330,000 \times \$0.13587/\text{year}}{6,000 \text{ TV hours/year}} = \$7.47/\text{hour}$

$= \$44,820/\text{year}$

* Do not treat these costs as current or necessarily representative of 1974 prices and requirements.

2. Video/audio system cost = $\frac{\$285,000 \times \$0.13587/\text{year}}{6,000 \text{ TV hours/year}}$ = \$ 6.45/hour

\$38,700/year

3. So <u>total</u> operating cost is:
\$20.00 + 7.47 + 6.45 = \$33.92/operating hour

F. <u>Stanford Cost-Effectiveness (Instruction Cost Index)</u>

1. From the previous analysis, the total cost for 1972-1973 is:
\$33.92 x 6,000 hours = \$203,520.

2. If we consider Stanford courses only, the cost reduces to:
\$203,520 - (118,643 - 113,280) = \$198,157

Where \$118,643 = total annual operating cost
113,280 = annual operating cost without ACE

3. In 1972-1973, From Table 9, there were 2,029 student course registrations in Stanford courses representing 2,029 x 3 = 6,087 quarter-credit-hours. Therefore, the cost per credit hour for Stanford courses only is:

Cost/quarter-credit-hour = $\frac{\$198,157}{6087}$ = \$32.55 and

Cost/student-contact-hour = \$3.26 = instruction cost index

4. A more realistic appraisal of costs is to consider all costs and all students served. Using these numbers:

Cost/quarter-credit-hour = $\frac{203,520}{4,199 \times 3}$ = \$16.16

where 4,199 is the total of all students, from Table 9, not just Stanford students.

5. From Table 7, in 1965-66, the Stanford "instruction cost index" was \$46 per semester credit hour. Updated at an estimated increase per year of 5% and normalizing to contact hours, one obtains:

1972-1973 estimated Stanford ICI = \$6.47/student-contact-hour

Utilizing the result from F-3 above and <u>not</u> including cost recovery, it is clear that Stanford is serving its off-campus TV students at a cost of:

$\frac{3.26}{6.47}$ = 50% of on-campus costs

The same qualifying statements made in Section E of the CSU analysis pertain here.

6. The facts are actually much better than this. The above calculations have ignored cost recovery. In the case of a private institution such as Stanford, cost recovery is essential. The data on cost recovery are shown on Table 11 (Stanford charged tuition of \$60, a matching fee of \$50 and a TV surcharge of \$20, all per quarter-credit-hour). From these data one can conclude

the following:

a. Minimum surplus accrued by Stanford over operating costs is:

$137,720 - 118,643 = $19,077

where $137,720 includes all income except HCP matching fees and HCP tuition and $118,643 is annual operating cost.

b. Reasonable estimate of surplus accrued by Stanford over operating costs would include that portion of HCP matching fee allocable to students who would not participate without TV. This is estimated at:

$$\$19{,}077 + \frac{\$78{,}700 \times 0.45}{0.60} = \$19{,}077 + 59{,}025 = \$78{,}102$$

where $78,700 represents 60% of HCP matching fees received from all HCP students and 45% is the estimated percentage of all HCP students who would not have participated without TV.

c. Maximum estimate of surplus accrued by Stanford over operating costs would also include the tuition income from the students in 6-b above. This is estimated at:

$$\$78{,}102 + \frac{\$94{,}440 \times 0.45}{0.6} = \$78{,}102 + 70{,}830 = \$148{,}932$$

d. One may wonder why capital amortization costs were not included in the above in estimating surpluses. The reason is that Stanford recovers these costs from capital contributions. If these costs were to be considered, the surpluses shown would be reduced by: 6,000 x $13.926/dollars/operating hour/year (from paragraph F) = $83,556/year. Under these conditions, Stanford would clearly need to count all TV related income to justify its ITV activities.

7. One of the pertinent facts worth realizing results from a look at what happens to Stanford's income if they did not have ACE and if they had no special student categories such as NRO's and auditors.

a. From Table 11, the incremental TV income drops to $31,480.

b. From Table 10, TV operating costs remain equal to $113,280. There is then a net loss to Stanford of:

(113,280) + 31,480 = ($82,000)

c. Applying HCP matching income reduces this loss to:

(82,000) + 59,025 = ($14,103)

d. Applying tuition income results in a gain of:

(14,103) + 70,830 = $56,727

e. Many organizations are participating primarily because of the auditor, NRO and ACE related features of the ITV system. If these features did not exist, a significantly different picture would be apparent. For example, of the 4,199 student course registrations in 1972-1973, only 562 or 13% are matriculated Stanford students. One can conclude therefore that the Stanford School of Engineering ITV Network is economically viable as a direct result of the totality of its educational services to industry, not just those related to degree seeking students.

G. Cost of Facilities at Participating Organizations

In a live ITV system such as Stanford's, each geographic location must have "head-end" equipment for receiving the TV transmission and for converting the signal to be viewed by a standard VHF TV receiver. The costs associated with off-campus facilities are shown in Table 12. In this case, costs are not linearly related as the head-end equipment is broad-band and capable of handling at least 4 simultaneous channels of transmission. In comparing these costs with the costs associated with a video tape delivery system (Table 8), it can be seen that costs favor the video tape system for one classroom, are essentially equal for two classrooms and then favor the RF delivery system for three or more classrooms. However, in the case of the RF system, each separate geographic location requires its own head-end equipment so that cost comparisons must take this into account.

V - TAGER ITV SYSTEM (The Association for Graduate Education and Research of North Texas)

The TAGER ITV system has been operational for seven (7) years. It, along with the Genesys system in Florida, was a prototype for the Stanford ITV system. Nine institutions (SMU, TCU, U. of Dallas, U. of Texas-Dallas, Austin College, Bishop College, Texas Wesleyan College, Dallas Baptist College, Southwestern Medical School) and ten (10) industrial organizations are linked into the system. Like Stanford and CSU, it programs both engineering and business courses, primarily at the graduate level. It does not include a non-credit continuing education program such as provided by ACE in the Stanford system. Programming hours are 8 A.M. - 10 P.M. A detailed description of TAGER is available (7).

A. Background Information

TAGER was formed in 1965 as a consortium of universities and colleges "to further the abilities of its participating institutions in meeting regional and national needs for more and better-prepared engineers, scientists and other scholars." The "microwave backbone" of the system was funded by a gift. Institutions funded their own on-campus originating facilities and participating companies and institutions funded receiving classrooms. Some additional funding was provided by NSF. Total system costs as of 1970 approximated 2.5 million dollars. Audio talk-back is available by means of telephone lines. TAGER represents what can be done on a large scale in important aspects of cooperation among institutions of higher education.

B. Cost and Participation Data

Table 13 presents Basic Unit Costs and Unit Factors as received from SMU. All amortization of capital cost data presented assume a 7 year life and 7% annual inflation. In order to be consistent with assumptions made for both CSU and Stanford, the data below will assume a 10 year useful life and interest at 6%/year. Also, since receiving classrooms were not included in the CSU and Stanford analysis, they will not be included here.

1. Total Capital Costs

12 studio-classrooms at $50,000. each =	$ 600,000.
Receiving classrooms (18 at schools/26 industry) =	-
42 microwave chanel hops	1,680,000.
6 ITFS channels	60,000.
Total	$2,340,000.

2. Operating Costs

a. Annual operating costs are:

Studio operations (160 x 300) =	$ 48,000.
System operations (160 x 600) =	96,000.
System maintenance =	32,000.
System overhead =	22,000.
Sub-total	$ 198,000.

or $\frac{198,000}{160 \text{ courses} \times 45 \text{ hours/course}}$ = $27.50/course-hour

(This compares to $20. for Stanford and $18.45 for CSU)

b. Annual amortization costs are:

$2,340,000 x 0.13587/year = $ 317,936.

c. so total annual operating costs are:

$198,000 + $317,936 = $ 515,936.

d. Cost/televised hour/year = $\frac{\$515,936}{160 \text{ courses} \times 45 \text{ hours/course}}$ = $ 71.66

C. SMU Cost-Effectiveness (Instruction Cost Index)

From the above, assuming all courses represent 3 semester-hours (45 contact-hours) we get:

1. Total semester hours/year = 3 x 1,695 student course registrations/year = 5,085.
2. Cost/semester-credit-hour = $\frac{\$515,936}{5,085}$ = $ 101.
3. Cost/student-contact hour = $\frac{\$101}{15 \text{ hours/credit hour}}$ = $6.73
   (Instruction cost index)
4. Income received from off-campus students = $1,695 x $300 = $ 508,500.
   (Tuition is $80/semester-credit-hour and TV surcharge is $20)
5. Net cost = $515,936 - 508,500 = $ 7,436.

D1-

6. so net instruction cost index = $\frac{\$7,436}{5,085 \times 15} = \$0.10$

7. Referring to Table 7, it is difficult to decide which category of institution would describe SMU. Nevertheless, the ICI of $6.73 (from C-3 above) is clearly in the range of typical on-campus costs. With cost recovery, the SMU ITV ICI (C-6 above) is very low, even though TAGER is a very large, complicated and costly system.

D. <u>Cost of Facilities at Participating Organizations</u>

For the ITFS portion of the TAGER system, the cost data shown on Table 12 and the comments in Section IV-G are applicable. However, many organizations in the TAGER system are (were) served directly by 12 GHz microwave and the costs for such receiving equipment is much higher. If we take the present capital cost of 44 TAGER classrooms, which approximates $220,000, we obtain an average cost/classroom of $5,000. This agrees with the numbers given in Table 13. It is this large cost of receiving classrooms (plus line-sight microwave transmission costs) which lead TAGER into incorporating ITFS into their system where wide-area transmission is feasible and to continue to rely on 12 GHz microwave primarily for point-point transmission.

VI - IMPACT ON ENERGY CONSERVATION, THE ENVIRONMENT, SAFETY AND DOLLARS

There has often been expressed a strong visceral feeling that an ITV system has benefits and cost-savings, which are real and measurable, other than those treated in Sections III, IV and V. This Section will treat such benefits and cost savings and use the data on the Stanford ITV system given in Section IV as an example. From the Stanford data for 1972-1973:

A. <u>Facts</u>

1.	Number of student-course registrations =	4,200
2.	Number of student-contact-hours =	120,000

B. <u>Assumptions</u>

1.	Average round trip distance to campus =	12 miles
2.	Average miles/gallon of gas =	12 (IRS tax tables)
3.	Automotive transportation cost =	12¢/mile
4.	Average travel and parking time =	1 1/4 hours
5.	Average salary of students =	$7/hour
6.	Average automotive injuries = (4 lane undivided highway)	2.06/million-vehicle-miles
7.	Average pollutants/mile (8) = (using existing emission standards)	45 grams

8. All students are participating by TV instead of coming to campus.
9. Each student would spend an average of 1 1/2 hours in class if he came to campus.

C. <u>Resultant Savings Per Year</u>

From the above we get: 257

1. Number of round-trips to campus saved = $\frac{120,000}{1.5}$ = 80,000
2. Transportation cost savings - 80,000 trips x 12 miles/trip x \$0.12/mile = \$115,200
3. Mileage saved = 80,000 trips x 12 miles/trip = 960,000
4. Gallons of gasoline saved = $\frac{80,000 \text{ trips} \times 12 \text{ miles/trip}}{12 \text{ miles/gallon}}$ = 80,000
5. Pounds of pollutants saved = $\frac{960,000 \text{ miles} \times 45 \text{ grams/mile}}{454 \text{ grams/pound}}$ = 96,000
6. Injuries saved = 960,000 miles x 2.06 injuries/ million-vehicle-miles = 2
7. Cost of time saved = 80,000 trips x 1 1/4 hours/ trip x \$7/hour = \$700,000

It is apparent that the above numbers are significant, even for a local area system such as Stanford's. Also, it is clear that society as a whole and individuals can, by the use of ITV, benefit significantly in safety, environmental conditions, traffic congestion and dollars, costs not counted in the previous analyses which were restricted to university costs. If one extrapolates these numbers to the approximately 2 million engineers employed in the USA, plus other professionals who do or should participate in continuing education, the results become very large indeed.

The use of telecommunications to overcome geography, transportation costs, time and inconvenience is not new. Consider, for example, what would result if we had no telephone system. What may be new is a realization of how large these numbers can be.

VII - COST COMPARISONS OF LIVE ITV SYSTEMS WITH VIDEO TAPE SYSTEMS

Any institution which is considering reaching students off-campus, either where they work or where they live, must carefully consider all pertinent technical delivery systems (6). In making comparisons, the costs of originating classrooms and associated facilities can be assumed to be the same in all systems. The things which will differ are the cost of "delivery" and the cost of receiving facilities.

Except for 12 GHz receiving facilities, which are seldom used, the cost of one kind of receiving facility is not very different than another and those costs are rarely paid by the university. For this reason, receiving facility costs are usually not pertinent to the decision process.

Talkback costs can also be eliminated in making cost-comparisons. A given type of talkback system, whether by phone or radio, can be associated with either a live system or a video tape system. If talkback is considered essential, it must be considered in either case. Although the research shows little or no evidence that talkback improves the learning process, the question continues as to whether talkback is essential. After four years of experience, Stanford no longer requires talkback as a precedent for participation. It is now optional. However, there are certain non-technical courses where it is used extensively. Many schools, faculties and students will continue to view the existence of a talkback system as a vital ingredient in a complete educational system.

If there is no talkback, why have a live system? There is no way of knowing whether a program is live or taped by watching the TV screen. There will be, however, circumstances in certain geographic/industrial areas where it would be less expensive to broadcast single tapes than to deliver and handle large numbers of tape copies to multiple locations. There are also faculty costs to consider as well as faculty and student attitudes.

Ignoring all criteria but the cost in dollars, is there an optimum delivery system for every institution which wishes to reach off-campus students by TV? The answer to this is yes! However, to configure such a system requires the institution to clearly define what it wants to use the system for; where it wants the system to reach geographically; whether it wants to reach students at home, at work and/or in special gathering places (schools, store fronts, etc.); whether it is willing to accept a financial risk; whether it has faculty, administration, and trustees (and maybe State) support; how it will manage and operate the system; how it will recover its costs; how it will come by "front-end" money to create the system; how it will handle credit, degrees, advising, testing, and grading; to what extent it will share facilities with others; how it will relate to other institutions; and who will "carry the ball" for the institution.

No detailed cost comparison numbers will be presented here. However, it is useful to consider some hypothetical cases which give an insight into some of the factors affecting choice of delivery system:

<u>Case 1</u>. Start with the Stanford ITV "rf delivery system" cost of $44,820/year (Section IV-E). This is the cost of reaching 30 companies with 6,000 hours of programming (1972-73). Now ask the question - using "tape delivery" system costs, what would it have cost Stanford to do the same job by video tape?

a. From Section III.E.2.h, we have: dollars/delivered tape = $9.07.

b. Using CSU numbers for sections and courses and extrapolating to the Stanford situation we get:

$$\frac{315 \text{ sections}}{110 \text{ courses}} = 2.86 \text{ sections/course}$$

c. So total cost for delivered tapes is:

2.86 sections/course x 200 courses/year x 30 tapes/section x $9.07/tape = $155,641.

d. Therefore, for this example we get:

$$\frac{\text{rf delivery cost}}{\text{video tape delivery cost}} = \frac{44,820}{155,641} = 29\%$$

<u>Case 2</u>. This time start with the TAGER ITV system "rf delivery system" cost. From Section V.B.1 this is:

a. $\$1,740,000 \times 0.13587/\text{year} = \$236,414/\text{year}$

b. Again, using CSU section/course data and extrapolating to TAGER we get:

Total cost for delivered tapes = 2.86 x 160 courses/ year x 45 tapes/section x \$9.07/tape = \$186,769

c. Therefore, for this example:

$$\frac{\text{rf delivery cost}}{\text{video tape delivery cost}} = \frac{236,414}{186,769} = 127\%$$

Case 3. Let's go back to the Stanford example and keep everything the same except assume the participating organizations are spread out as in the TAGER system and that the "rf delivery system" cost would therefore approximate TAGER's (1,740,000) instead of the present cost (\$330,000 from Section IV-D). Then we get:

$$\frac{\text{rf delivery cost}}{\text{video tape delivery cost}} = 29\% \times \frac{1,740}{330} = 153\%$$

Clearly, in this case, a change from a relatively tightly bunched group of participants (40 miles radius) to a more geographically dispersed distribution radically changes the choice of which system to use.

Case 4. In this last case, let's again use the Stanford system as an example and see what happens if we reduce the level of programming and the level of participation in the courses, i.e., the equivalent of reaching fewer organizations and fewer students. Let's assume that only 100 courses are programmed, instead of 200 and that, on the average, there is only one section per course. Then we get:

$$\frac{\text{rf delivery cost}}{\text{video tape delivery cost} \times \frac{100}{200} \times \frac{1}{2.86}} = 29\% \times 2 \times 2.86 = 166\%$$

Case 4 is a perfect example of the need for an institution doing a thorough job of planning. If Stanford had guessed wrong at the beginning and had assumed too little participation, it might have chosen a video tape delivery system and Stanford would now be incurring delivery system costs almost four times present costs. On the other hand, if Stanford was overly optimistic and had over-built compared to the need, they might be paying a delivery cost premium of 166%. What in fact Stanford did was to start with two channels and build the second two only after it became clear that the participation pattern warranted expansion.

In summary, the choice between a video tape delivery system and an rf delivery system can be made by comparing only costs of delivery and ignoring on-campus or off-campus classroom costs and talkback. Almost always, where rf delivery is the choice, a supplemental video tape system to handle more remote students is worth considering. If the number of participating organizations is small or if the number is large but is widely dispersed geographically, the choice will tend towards video tape. Conversely, if the number or organizations is large and within potential line of sight of a broadcast system, the choice will tend towards an rf system.

VIII - OTHER UNIVERSITY ITV SYSTEMS

A. Indiana Higher Education Telecommunications System (IHETS)

IHETS is one of several wide area coverage systems utilizing microwave and ITFS. The microwave interconnect and switching for both audio and video is provided by telephone companies. Estimated annual cost for this service is $1,000,000. No information was made available on other operating costs or teaching costs to support the system, although $2.5 million was appropriated initially to establish the network for medical communications.

IHETS is described in some detail in a publication produced by them which is called IHETS (undated). The video and audio networks shown in that document are reproduced as Figures 4 and 5. Information on enrollments is as follows:

	Fall, 1970	Spring, 1971	Fall, 1971
Student credit enrollments	1,681	1,875	3,182
Student non-credit enrollments	607	1,610	2,387
Total student enrollments	2,228	3,785	5,569
Student hours of instruction	54,034	272,006	681,850

It is not possible to develop an instruction cost index because cost information has not been made available.

Programs have reached accountants, attorneys, businessmen, chemists, clergymen, dentists, engineers, farmers, teachers, nurses, administrators, pharmacists, physicians, salesmen, alumni, veterinarians, etc. Most of these have been not-for-credit. Credit programs also have wide subject coverage, for example music appreciation, history, mass communications, agriculture, nursing, science, dental hygiene, economics, engineering, education and business.

IHETS is a major state-wide system. It would be valuable to analyze its "cost-effectiveness" in detail if the necessary cost data could be obtained.

B. State University of Nebraska ITV System (S.U.N.)

The S.U.N. system differs in two major ways from most open learning systems now being planned. It plans to use TV as a major means of delivering courses and it has received major support from the federal government. A recent article (9) describes the status and approach of S.U.N. in some detail.

S.U.N. is presently funded at a level of $1.2 million by the National Institute of Education, for an 18 month period ending in

December, 1974. S.U.N. has initiated discussions with institutions in Missouri, Iowa and Kansas to form a regional system to be called the University of Mid-America. In a survey conducted by S.U.N., some 20,000 adults have indicated they might take S.U.N. courses.

The S.U.N. approach is to "productionize" each course. About $191,000. is budgeted for one course alone (15 programs) and S.U.N. "hopes" for 500 students to register in this course the first time around. Not counting the cost of the "TV delivery system," it would take 191,000 student contact hours in this course to arrive at a cost factor equivalent to that achieved in "shared classroom instruction." As a calibration, in 1972-1973, Stanford broadcast 200 courses (6,000 hours of televised instruction) and its total participation was 120,000 student-contact-hours. The approach of S.U.N. must, therefore, raise the following serious questions:

1. If a prestigious university like Stanford (and many others - both public and private) can offer televised instruction at an incremental operating cost of $20/hour, and if the remote TV students perform as well or better in the TV environment as the students who are in-class on campus, then what incremental benefit in the way of improved learning can be expected by increasing the incremental cost from $20 per hour to $20,000 per hour.
2. Is this thousand fold increase going to increase the learning by 1,000?
3. Are there going to be 1,000 times as many students?
4. Even if there were 1,000 times as many students, is there any measurable difference in what students may be expected to learn from one approach versus the other?
5. If, in fact, the learning difference is negligible, might it not be better to utilize the cost differential in other ways?

In its initial stages, S.U.N. failed to gain support of existing 2 year and 4 year colleges in the State. The existing institutions were concerned with losing students. Also, faculty members were not involved early enough. These problems do not appear to be fundamental, they can be avoided or resolved by better early planning. As yet, it is much too early to draw any conclusions from the S.U.N. experience.

C. <u>University of South Carolina ITV System (APOGEE)</u>

The University of South Carolina offers what amounts to a statewide program by both live ETV and video tape leading to Masters degrees in both engineering and business. The engineering program is called APOGEE, A Program of Graduate Engineering Education. It was initiated in 1969. Cost data are not available. However, in 1973 by ETV, APOGEE reached 103 students in 11 courses, in 16 regional playback centers. In 1973, the College of Engineering offered 6 live 90 minute broadcasts/week and made 14 video tape 60 minute recordings/week. Every third Saturday morning, all students must meet on-campus for direct interaction, examinations, etc. The

University has available a pamphlet which describes APOGEE.

The MBA version of APOGEE started about the same time. A pamphlet on this is also available. During 19 0-71 (10) 129 students enrolled. The following year 89 of the original group plus 90 new students registered. Each MBA student takes courses via the ETV Network twice/week. Each session lasts 3 hours. Five meetings/week on campus are required. Three years is needed to complete the program.

There is little doubt of the desirability and effectiveness of these programs for both the university and the students. However, while data are not available, the cost to the State (per student-contact-hour) to provide a state-wide ETV system for such low utilization must be very high indeed.

D. Chicago TV College

The Chicago TV College is one of the leading examples of the success of a project in televised direct instruction now some 18 years old. A report of its first 3 years of experience (11) is available. This was followed by a fourth report (12) after 8 years of experience. Table 14 presents an excellent summary of enrollments and retention for the period 1956-1964. Figure 7 shows a plot of the relative cost of TV versus conventional instruction. This shows that in 1963-64, the TV cost was about 450/30 = $15/student-credit-hour or $1/student-contact-hour. A "TV Fact Sheet," Enclosure 1, updates the referenced information to 1971. It is included because of its great relevance in terms of experience, numbers of students, faculty acceptance and scope of subject matter.

Based on data made available, Chicago TV College has reached more students over a greater period of time than any other telecommunications system for higher education. Perhaps it would have received greater recognition if it were not a 2 year city college.

E. ITV Network for Oklahoma Higher Education

This system was activated in 1971. Figure 8 shows a microwave map of the area of coverage. Interconnect is by microwave and ITFS is used for area coverage in two locations. Institutions in the system include Tulsa University, Oklahoma State University, The University of Oklahoma and the Oklahoma University Medical Center. ITFS broadcast is from O.U. Medical Center and Tulsa. The system is used primarily to offer courses in engineering, science and business. Initial capital cost was approximately $1.5 million, with $1 million funded by the State and $0.5 million by industry. Televised instruction is offered at $75/semester-credit-hour. The State provided each institution with a completely furnished and equipped studio-classroom and funds on-going operational costs for each institution.

In the Spring of 1972, 72 courses were offered, 33 in engineering, 13 in chemistry and 9 in mathematics and computer science. No information was made available on student participation or operating costs.

F. The University of Arizona - Video Cassette System

The system is unique in that it represents the first system which offers credit for graduate engineering courses by video cassette on a world-wide basis. As yet, the effort is just starting and no data is available on the impact of the system outside of Arizona. Complete degree programs are not offered. Further, as presently offered, the participation of the remote students is locked stepped to the on-going on-campus class.

G. The Golden Gate University - Video Cassette System

This San Francisco based institution has initiated a joint venture with Genesys Systems, Inc. of Palo Alto, California (a unique arrangement) to offer a Masters Degree in Business Administration by video cassette on a world-wide basis. The program offers 16 MBA level courses (37 hours each) and 8 Foundation level courses. Ten MBA level courses must be completed satisfactorily for a degree. Self-paced instruction is a key part of the plan. Course leaders approved by GGU are required at each geographic location. Interaction is local or back to campus by mail or by audio cassette.

H. The British Open University

The British Open University has received a great deal of world-wide attention. Planning was initiated in 1969 and activation began in January 1971 with 25,000 students admitted. This represented a 35% increase in students registered for higher education in Great Britain, a level of impact which correlates with the relatively restrictive access to higher education in Great Britain prior to advent of the Open University.

A definitive overview of the British Open University (15) was published by its Vice-Chancellor. In 1973, there were some 45,000 students enrolled, most in full-time employment. Most credit courses require between 32-36 weeks of work and about 10-12 hours/week. Completion of six credit courses are required for a degree. The courses consist of correspondence packages, records, audio cassettes, film strips, radio and TV. Local tutors are provided for monthly interaction at one of 300 study centers and one week during the summer "in-residence" is built into each course. Attempts are being made to make greater use of audio cassettes and discs to free the students of the constraints (and cost) of fixed time broadcasts over radio and TV. The Foundation courses are available in arts, social sciences, math, science and technology. Two of these must be completed before entering advanced work.

It is difficult to determine the "cost-effectiveness" of the British Open University. Estimates of the cost of "establishing" the University range from \$10-15 million as compared to \$85 million for a "conventional" campus. Present charge per course is about \$100. Estimated annual costs are \$21 million annually, half for student related costs and half for salaries (16). Other estimates (17) are \$3.9 million annually for BBC services and \$3.7 million for headquarters services. The differences in these numbers are hard to pin down.

Each radio and TV broadcast is about 30 minutes duration. Each is repeated so that there is about 1 hour per week per course of broadcast time on both radio and TV (18). In 1971, there were the equivalent of 5 courses broadcast, each of about 33 weeks duration. This amounts to 165 hours of broadcast time on radio and also on TV. If the cost factors were about the same, then the cost per hour for broadcasting would be $\frac{\$3.9 \text{ million}}{330}$ = approximately \$10,000/hour. If each course had an equal number of registrants, then the cost per student-contact-hour for broadcasting is:

$$\text{Cost/student-contact-hour} = \frac{\$10,000}{5,000} = \$2$$

The above number does not include production costs.

The British have claimed that the total cost of reaching the O.U. students is about 1/3 that of a typical university. This has led universities in the U.S. to experiment with O.U. courses. A summary report (19) gives the results of experiments by the University of Maryland, Rutgers and the University of Houston. From the cost aspect, the report raises questions of how cost-effective the O.U. would be in the U.S. As conducted during the experiment, the O.U. courses were more expensive than conventional courses (even though no production costs or broadcast costs were included in the costing).

IX - CABLE TV AND THE UNIVERSITY

A paper entitled "A Perspective on Cable Television and the University" is included as Enclosure 2. This is an advance copy of a paper scheduled for publication in the Fall issue of EDUCOM. This EDUCOM paper is intended to cover the cable TV-university situation as it exists today. Referred to in the paper is experience at Oregon State University (13). The OSU use of cable TV started in 1964-1965 and went exclusively with cable in 1967-1968. Enrollment data in the OSU system for the years 1957-1970 are included in Table 15. Typically, 7-8 courses per quarter were being taught, covering subjects such as History, Psychology, Science, Economics and Math. Courses are video taped and most are shown at least twice per day. In addition, one or two "recitation" periods per week with the instructor are offered. Some tapes are used for more than one academic period. The average course enrollment was 350 in 1969-1970. It is interesting to note that students preferred the televised offerings and these courses are no longer duplicated on campus. Released time is provided for the TV faculty. It is difficult to relate OSU's cost counting to analyses previously presented since, in effect, in the OSU mode they either didn't reach or didn't count incremental students participations by TV who would not have come to campus. However, they state that the TV system requires only 20 teaching hours per week instead of a probable "normal" 112 hours. This represents a savings of approximately 9 faculty members (or could if OSU were willing to play the game that way).

It is clear that offering university courses for credit (or even not-for-credit) is in its infancy. The potential, however, is so significant that rapid growth is expected. A recent indication of that trend is the agreement between Virginia Polytechnic Institute (14) and the local cable company for VPI to start providing programming as an educational service by the Fall of 1974.

X - THE USE OF SATELLITES IN HIGHER EDUCATION

The information contained in this section was updated as of June 25, 1974 and was primarily derived from two sources: The Domestic Satellite group of COMSAT General Corp. and the Tariff Branch of the FCC. The picture which evolves is as follows:

a. There are presently 3 satellite systems which are approved. These are:

RCA - 2 - 24 transponder satellites to cover the continental US and Alaska. These should be in orbit in 2-3 years.
ATT - 3 - 24 transponder satellites. US coverage. Up in 2 years. No TV allowed for 3 years.
Western Union - 2 - 12 transponder satellites. One up in a few months. US coverage.

b. All of the above systems utilize 6 GHz up-links and 4 GHz down-links. It takes one transponder channel to handle full bandwidth television. All TV is fm-fm modulation.

c. To obtain network quality TV requires 32' diameter antenna receiving ground stations. Such ground stations, in small quantities, might cost $150,000. for the electronics plus a small building. A 16' antenna will degrade quality, (probably acceptable if not too many repeats) and might save $20,000.

d. The incremental added cost for a transmitter up-link to an existing receiving site is about $50,000.

e. As of July 1, 1974, the approved tariff rates for access to a transponder channel are:

- $180,000/month, on a month-month basis, for a protected channel
- $120,000/month, on a month-month basis, for an unprotected channel

A protected channel designates channels and protects the user against failure by reserving replacement channels. An unprotected channel could result in interrupted service. Therefore, a proposed educational system would need protected service. An annual commitment to a channel might result in a lower rate (not sure), perhaps about $900,000/year.

f. It is possible that within 5 years other organizations may put up satellites. If they do, their rates will also be FCC controlled. Among the possible other candidates are:

- Hughes/NSS
- COMSAT/MCI/Lockheed
- American Satellite Corp.

g. The only existing US satellite with plans for use in higher education is NASA's Applications Technology Satellite-F. (Now in geosynchronous orbit, it is known as ATS-6). Two experiments in higher education are planned: The Appalachian Educational Satellite Project and the WAMI Program of the states of Washington, Alaska, Montana and Idaho.

The Appalachia project will involve teaching graduate level education courses to 300 teachers located in 15 centers in New York, Pennsylvania, West Virginia, Maryland, Virginia, North Carolina, Tennessee and Alabama. Courses will be televised over land lines from the University of Kentucky's Lexington campus to NASA's ground station at Rosman, North Carolina up to the ATS-6 satellite and then to the classrooms in the eight states. Talk-back will be via teletype from each of the 15 centers to the University of Kentucky television studio classroom. A total of four, 3 semester hour courses will be televised; two during the summer of 1974, one in fall 1974 and one in spring 1975. Credit will be given by the University of Kentucky and 15 to 20 other colleges and universities in the participating states.

The WAMI Program involves several different parts. The one of primary interest here will be the two-way color telecasts between the University of Washington School of Medicine and its first and second year medical students in Fairbanks, Alaska and Omak, Washington. Beginning in September 1974, twice-weekly 75 minute broadcasts will be conducted. The experiment will be concluded in May, 1975.

A third demonstration using the ATS-6 will be conducted by the Federation of Rocky Mountain States, Inc. It will focus on junior high students in 56 rural communities throughout Colorado, New Mexico, Arizona, Utah, Nevada, Idaho, Montana and Wyoming. Some in service teacher training will also be broadcast over the satellite. Programs will originate in Denver and be transmitted to the satellite from NASA's Denver station.

Approximately one year after launch, the ATS-6 will be moved eastward to be "visible" to the Indian subcontinent. It will be used by the Indian government to conduct the Satellite Instructional Television Experiment for basic education of people in 5,000 villages and cities throughout India. Some villages will receive programs directly from the satellite with a $600 receiving terminal consisting of an antenna, down converter and TV receiver.

No data on these experiments are yet available or expected to be for at least one year. The experiments are primarily directed toward investigation of the technical and educational feasibility for delivering educational programs and information to rural and remote areas. It will be some time before meaningful cost data is available.

The above cost numbers raise serious questions about the economic viability of using satellites for higher education where a small geographic region (i.e., the State of Massachusetts) is involved. The potential number of students per course is relatively small. The number of receiving ground stations would have to be large or, instead, there would have to be extensive microwave interconnects. If extensive microwave interconnects are needed anyway, then why use a satellite? The cost of ground station equipment is closely related to tolerable signal quality and to the frequency of the down-link. The ATS-F satellite utilizes a 2.5 GHz down-link which requires a less expensive ground receiver and allows for "chicken-wire" ground antennas. In the quantities needed in India (thousands) estimates of $600/ground station are given. These estimates are <u>not</u> to be trusted for use in the USA for a proposed high quality, higher education statewide system. It would appear that this situation could change, many years from now, when much higher power satellites are placed in orbit which could directly access every home at very low cost. The time scale applicable here is too long to sensibly impact on higher education systems planned for use in the next 5 years.

There is an excellent comprehensive report (22) which analyzes the cost-trade offs of satellites versus ITFS end microwave ground systems. It is predicated on an "owned" satellite and "leased" microwave ground lines. It concludes:

> "On a least-cost basis, a satellite system has been shown to be clearly superior to terrestrial microwave for the transmission of teleconferencing signals throughout an entire region (several contiguous states). For a smaller area of coverage, terrestrial microwave will become less expensive as the number of cities in the teleconferencing network drops well below 100.
>
> Local distribution will probably be accomplished with cable systems. In any given city, there will in all likelihood be several non-connected cable systems, the headends of which would be fed directly from their own earth station. Where local interconnection of the cable systems is desired, for instance so that local programming could occur, an ITFS system should be considered."

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"A narrowband-return capability increases the annual cost of the (minimum cost) TV-only network by approximately 10%-30% when the return traffic is directed only to the video-origination station. When the N slave stations also serve as distribution centers of a long-haul telephone network, the marginal cost, of course, is a critical function of the internodal voice traffic. Satellites do not appear to offer possible savings for large-volume telephony at the present time. They are attractive for thin routes, particularly when there is also a need to distribute video."

"There are significant economies of scale. When there is one video-origination station and N slave stations which receive the video and return the narrowband information to the video-origination station, the total capital cost per station falls approximately as $\sqrt{N}$."

One thing this report clearly brings into focus - that is the need for detailed analysis of any proposed communications environment, with numbers taken from the real and not the hypothetical world. No general analysis should be relied on for decision making.

XI - PICTUREPHONE

The Picturephone has received little use in higher education. Essentially it is a video telephone with a 5" x 5.5" video display which projects 30 frames per second with 251 horizontal lines displayed. It required a 1 MHz bandwidth for transmission. To date, the Picturephone has yet to live up to its promise (20).

The only existing use of Picturephone in higher education is in Chicago at the Illinois Institute of Technology. Four classes per week are being sent to off campus students at two Illinois Bell locations; one within the same exchange, the other in a separate exchange. Approximately 30 remote students are taking the courses. The two Illinois Bell locations cannot be served simultaneously.

Picturephone costs are basically 15¢/minute ($9.00/hour) plus a charge of $87.25/mo. for each station. Thus, a single semester course to a single location would cost approximately $1,100. or $25/hour. Therefore, the incremental cost of Picturephone service will range from $25/hour down to about $10/hour depending on the hours of useage per day.

There are technical limitations to Picturephone service. IIT reports that the resolution is good enough for most teaching but more bandwidth would be desirable for certain courses. Service to multiple locations will be required on a long range program. There are also strict limitations on the amount and characteristics of equipment used with the system which further reduce its usefulness. The telephone company will closely assess the needs of users for Picturephone service and characteristics to plan better equipment and service for the future. Other existing Picturephone service is currently in operation on a limited basis in Pittsburgh and Washington, D.C.

XII - BLACKBOARD-BY-WIRE

Blackboard-by-wire is the technique of transmitting, over regular telephone lines, both the spoken and the written word. By far the most extensive use is made of the VERB - Victor Electrowriter Remote Blackboard, although Sylvania had (has?) a version of this which presents the information on a storage cathode ray tube and Bell Labs has recently published information on a new technical approach which originates from the equivalent of a regular blackboard.

The transmitter for VERB costs $1,000. The VERB receiver costs $1,270 and one of these, plus an overhead projector and screen, are required at each remote location. Difficulties have been reported in simultaneously serving more than a few remote locations. Dataphone costs are about $8 monthly at each end of the line. To this must be added costs of phone lines, either dial-up or dedicated service.

A summary of information on Blackboard-by-wire as of 1970, is included as Enclosure 3. This includes most of the institutions of higher education using this technology. Subjects covered heavily favor engineering, math, science and business, where equations, symbols, graphs, etc. need to be added to voice communications.

It is interesting to note that two major users of VERB, the University of Tennessee and Colorado State University (CO-TIE) have switched to using video tapes for transmission of the basic course information and the continued very effective use of VERB for talkback interaction.

No specific cost-effectiveness data is available relative to VERB. However, it is clearly less expensive than TV, either live or by video tape. Delivery can be by standard phone lines. There appears to be much evidence that VERB is a highly effective educational tool, with learning essentially equivalent to what takes place on campus. Acceptance by remote students is good where they cannot get to campus or where they have little other choice. Faculty members who participate find it acceptable. Psychologically, it is not a "shared" classroom experience like TV. Given a choice, by far, most students and faculty would prefer the "full video bandwidth" experience.

XIII - COMPUTER AIDED INSTRUCTION (CAI)

Two systems will be discussed under this category, the Plato system of the University of Illinois and the TICCIT system of the Mitre Corp. Before discussing these two systems, it is of interest to note the conclusions reached by the Institute for Public Policy Analysis (22) of Stanford University, conclusions shared by the authors of this report. The following are quotations from (22) which seem pertinent:

"Although the development of evaluated instructional programs has been a major factor in CAI's slow acceptance in schools, it is generally conceded that the real stumbling block to adoption is current CAI's high cost."

"The importance of display costs can best be appreciated by the fact that half of the total per student contact hour costs estimated for the University of Illinois' proposed PLATO IV system (which includes software, instructional programming, CPU, memory and communications) arise from the display terminal. Yet these terminals are projected $1,800 devices, beyond the current state of technology."

"Unfortunately, the area of CAI has proven to be particularly difficult to quantify. Studies referenced above, which attempted to determine CAI costs, all had methodological weaknesses, or used assumptions which do not seem reasonable or desirable. Moreover, many of the costs seem to be "off the top of the head" estimates, of doubtful value. In general, it seems that CAI costs for current systems range between $1 to $10 per hour of student contact. The lower estimate is near the cost of textbooks in college and about double the total cost in elementary and secondary schools. As component prices continue to fall and software becomes available, the economic outlook for CAI should continue to improve. It is doubtful, however, whether educators or private groups will be willing to make major investments until instructionware packages are improved considerably and cost estimates become more reliable."

In addition, many of the advantages claimed of CAI can also be claimed of traditional methods. In his insightful review of CAI, Feldhusen describes a system called BOOK.

All schools at all levels provide for much individualization of instruction. These activities include reading in BOOK (basic organization of knowledge)...

"BOOK" is the best medium for individualized instruction so far devised. The student may enter at various places or levels, proceed at his own rate, branch by his own choice or under teacher direction, be actively engaged if he does the study exercises or problems, receive some feedback if the answers are given in the back of the book, and be reinforced if he performs well."

"In general, it seems fair to say that, even at the multiple choice branching level, CAI can provide time savings and be cost effective for some applications. Its performance at more sophisticated tutorial level can only be conjectured. In addition, most of the measures used to date have been unacceptable from the viewpoint of theorists who favor exclusive or extensive student control of the learning process."

A. PLATO - Programmed Logic for Automatic Teaching Operations

A definitive paper on PLATO was written by Alpert and Bitzer (23) and the information up-dated by the Plato Services Organization on July 2, 1974. As of July, 1974, there are some 50 colleges and universities participating in PLATO IV, including the University of Illinois, Southern Illinois University, Iowa State University, Indiana, Purdue, MIT, Cornell, Stanford, UCLA and U.C., Santa Barbara.

There are 500 terminals in use at the present time, most in the mid-west and at military bases. Users purchase their own terminals at $5,300. each and pay $2,100. per year per terminal for all PLATO services. In addition, they must pay cost of connecting telephone lines. At present, no charge is made for lesson materials. There is a library of some 3,000 - 4,000 lessons in 100 subjects.

Direct instruction by PLATO has been demonstrated to be effective, flexible and well received by students and faculty. PLATO programs have been for credit and not-for-credit, have been at the elementary, secondary, college undergraduate and college graduate levels, and have serviced hundreds of thousand of student-contact-hours. Drill and practice routines such as routines in math and vocabulary are excellent subjects for PLATO. However, many other subjects such as anatomy, psychology, pharmacology, languages and life sciences have been programmed. Students have learned as much with PLATO in 1/3 - 1/2 the time of equivalent students in regular classes and have demonstrated better retention.

In 1970, estimated PLATO costs per student-contact hour ranged between $2-$5. Estimated costs relating to PLATO IV in 1970 (23) are shown in Table 16. These projections showed estimated costs/student-contact-hour of $0.34 - $0.68.

As of July, 1974, the cost/student-contact-hour is said to be well under $1 (no exact figures available). This estimate is interesting because terminal costs are three times higher than the 1970 estimates, annual student console costs are twice as high, and the number of terminals in use is 500 instead of the 4,000 estimated. In addition, no cost is assigned for system software or educational programming, costs which would add a large but unknown factor.

In summary, PLATO remains a highly interesting and significant experiment. It is still an experiment because hard information on real "cost-effectiveness" seems difficult to verify.

B. TICCIT - Time-share, Interactive, Computer-Controlled Information Television

TICCIT is described extensively (21). It has two application areas, one in an institutional setting and one which involves delivery to the home by CATV. Both will be treated here. TICCIT is about six years old. It has been funded by a large MITRE contribution (unknown) and about $6 million in NSF funds.

TICCIT, like PLATO, is a CAI system. In most ways it is similar to PLATO. There are two fundamental differences (as seen by MITRE):

a. PLATO - to obtain low cost - requires a large number of participating terminals tied to a single large computer. It needs teleprocessing capability. TICCIT presumably achieves low cost with a smaller number of students - 128 students simultaneously. It utilizes on-site terminals and needs no teleprocessing.

b. PLATO has a plasma terminal display. It has audio random access add-on capability plus finger pointing plus slide projections. TICCIT uses a color TV display plus use of an alpha-numeric display. It includes slow motion and is supported by a bank of 20 video cassette players. TICCIT has computer controlled switching. It can deliver audio to 20 out of 128 terminals simultaneously.

The TICCIT instructional strategy is to define a role, to present 20-30 examples and to include many practice problems. Tests are given at the end of each lesson. There are 35-40 lessons per course, 6-8 major rules per lesson. Each lesson takes 1 - 1 1/2 hours. A course is with 3 semester hours of credit. At the present time TICCIT has programmed about 70 lessons covering the first several college level math courses and about 70 lessons covering the first several college level English courses.

The MITRE course material is being developed at Brigham Young University. MITRE has installed systems (free) at BYU, Northern Virginia Community College and Phoenix College. A system is scheduled for North Island, a Naval installation.

Course development costs are estimated at $10,000/lesson for new material and $5,000/lesson once the instructional strategy is determined. Estimated system costs (if purchased) is $750,000. over a 5 year period. Projected costs/student-contact-hour are about $1. The number of $1/s-c-h is derived by assuming 2,000 hours/year of operation (50 weeks at 40 hours/week), and 100 terminals in use per hour (average). Therefore, in 5 years there are 5 x 2,000 x 100 = 1 million terminal hours. If one increases the estimated 5 year cost to $1M from $750K, one obtains $1/s-c-h.

This projected cost of $1/s-c-h is an interesting number. Obviously it is very close to the PLATO projections. It is also very close to the cost of conventional instruction. In both cases, it is arrived at by assuming a <u>possible</u> level of utilization and, that <u>possible</u> level, is used to project a cost equal to or less than conventional instruction. Projections of this kind must be utilized with great care.

In the case of MITRE, for the college application, they admit that the TICCIT system will <u>not</u> save instructional costs. Therefore, TICCIT is a direct add-on, and at <u>least</u> represents a doubling of cost. It is easy to conclude, therefore, that TICCIT must either have a throughput double that of conventional instruction or must significantly improve the quality of learning. Neither of these is claimed by MITRE.

However, there is another aspect of TICCIT which utilizes cable TV to reach students where they live. With this approach, TICCIT is not in competition with on-campus costs and - if it can achieve reasonable cost and prove educationally viable - then it might be an important way in the future to reach people who can not or will not come to campus. TICCIT has essentially completed a large scale experiment in Reston, Virginia. It is now hoping to expand this experiment in Stockton, California where Continental Cable Co. has one of the most modern cable systems in the USA. Stockton has a good community cross-section for the experiment relative to Reston. It covers the entire economic spectrum. It has many different minority groups. In the proposed Stockton experiment, 1,000 homes would be involved. Up to 100 people could be served simultaneously on 15 different channels in six different areas. The cost of this experiment might be about $3,000,000. plus $500,000. per year for operations.

The cable application of TICCIT utilizes a mixture of stills plus video tape. The basic concepts are the same as for the on-campus program. Each individual student participates over a cable channel with return capability. MITRE projects a 3 year cost of $4.5M for its Stockton experiment. It calculates a cost/s-c-h of $5 if 1,000 homes are served for 50 minutes/day for 2 1/2 years.

One of the questions this approach raises relates to the cable company. The TICCIT system could simultaneously tie up 100 channels. In Stockton, where they have 60 channels and can separate their system geographically into 6 areas to give the equivalent 360 channels, the cable company may have no problem. But, by far, most cable systems are not that elaborate.

In viewing the application of CAI to higher education from the prospective of mid-1974, it is clear that it is still highly experimental. Cost factors which might make it competitive with on-campus instruction are still largely projections. Whether it will be possible to accrue net savings is conjectural.

XIV - CONCLUSIONS

A. Most universities that are operating ITV systems and most organizations participating in such systems appear to be pleased with their involvement and would recommend it to others, subject to certain qualifications.

B. Only one university is at present fully recovering the incremental costs of its television delivery system. This favorable situation is the result of at least six factors:

1. The university is located in the midst of an unusually large number of high technology companies.
2. The system has been in operation for about five years and has grown considerably since its inception.

3. In addition to engineering courses for credit leading to an MS degree, the ITV system offers an MBA degree program along with the Foundation course program for the MBA.
4. Additional income is derived from regular credit courses by allowing industry employees not seeking degrees to take the same courses at reduced fees.
5. The television system provides a great diversity of non-credit courses outside of engineering that appeal to industry. In some cases, companies have joined the system primarily because of the availability of these non-engineering continuing education courses, some of which are at the level of training.
6. Effective use, with commensurate income, is made of the facilities, with programming on all 4 channels averaging approximately 8 hours per day, 5 days per week during the academic year and a significant summer schedule.

C. It is possible to serve off-campus students by TV at costs lower than those taught on campus in the usual way. For state-supported institutions, even if all incremental TV related costs are not recovered, this fact may be sufficient justification for establishment of a TV network.

D. RF delivery systems, despite their higher capital costs, can be less costly than video tape delivery systems. As the number of participating locations, courses and students grows within a given geographic area reachable by an RF delivery system, the advantage of "RF" over "video tape" grows. Conversely, if the number of participants are few, or as the geography to be covered expands, "video tape" can become less costly than "RF." Cost trade-off studies and risk analysis are essential precursors to embarking on an ITV system involvement.

E. Significant benefits in energy consumption, environmental impact, safety and cost can be achieved by institutions utilizing television to "deliver" education to people instead of using automobiles to deliver people to institutions.

F. TV need not be viewed as an "educational technology." Rather, it can be viewed as a means of overcoming geography; of possibly avoiding the creation, at university or state expense, of costly new buildings, classrooms and faculties.

G. Universities considering establishment of an ITV system should carefully analyze the academic, technological and economic aspects of such an involvement before proceeding. The following considerations are relevant and important.

1. What audience is to be served? In what academic disciplines? Is the objective to better serve part-time students seeking degrees; to expand enrollment of such students; to provide improved continuing education and retraining services; or simply to establish closer cooperation with the community, enabling for example, the sharing of seminar speakers? Is

an additional objective to reach other schools for the exchange of courses? Or is it the intention to develop a combination of such uses?

2. Where are the students located? Are they all local, or are they state-wide, nation-wide or even world-wide?

3. What is the potential contribution of the foregoing applications in producing income to offset the incremental cost associated with the television delivery system? What is the nature of the accounting that will be used? Can, for example, the tuition from students who would not have taken courses had television not been available be credited against operating expenses? Can it be credited to departments or schools or will it revert to the general fund? If additional income is produced by allowing auditors and non-degree or non-registered students, or by collecting tuition surcharges, how will this money be distributed? Where are the incentives for the faculty? If there will be an initial operating deficit, how long is the university prepared to absorb it? Is the anticipated growth of the system realistic in terms of what it can offer potential users? Will there be a television surcharge? How much will the traffic bear?

4. If taking courses for credit over television costs the part-time student or his employer more than if he came to campus, are the university's offerings, as compared to those of competitive schools, in sufficient demand to sustain the additional cost? What are the reimbursement policies of organizations in the area? Will these organizations pay a television surcharge? If not, are the students prepared to pay as an off-set to the costs of driving and the time and effort saved?

5. Are there enough potential participants to produce the level of credit and non-credit enrollments needed to sustain the system? Are the university's programs now servicing employed students mainly during the day or in the evening? (Employers of part-time students who presently participate in day-time classes can better justify television cost savings because of lost work time than can those of evening students.)

6. Has the university accurately determined clients needs for courses over television? What should be the mix of disciplines, levels and of credit versus non-credit continuing education and training courses?

7. What is the nature of the industrial/government environment? -- Are there urban concentrations or extended rural deployment? What kind of system, video-tape or rf delivery, or both, appears better suited to the area? If an rf delivery system is installed, might the interests and needs of companies beyond its range require supplemental video tape delivery?

8. Does it make sense to "go it alone" or attempt to service the need by an ITV consortium of institutions. Will there be exchange of credit allowed? How will costs and income be shared? Who will manage and operate the system?

9. For either a video tape or rf system, what will be the nature of the interaction? Whether it be by traveling advisors, telephone (live or delayed) or rf, what will be its need and acceptability and what will it cost?

10. What is the attitude of the faculty toward television? Will they support it? Will they require additional recompense or reduced teaching loads? (If so, such costs must be factored in). What are policies on taping, replaying of tapes and residuals?

11. What are the prospects for making use of the system on weekends, between academic periods, and during the summer to increase income? What schools are potential users of the system? Where, when and how, will they be accommodated?

12. Will there be any residence requirement, or can students earn a degree entirely by TV?

13. Will television be used as a delivery system of on-campus classes or will there be TV production type costs involved?

14. Will video taping for make-up and review be allowed at remote sites? Under what ground rules?

15. How will the ITV system be financed? What are the risks? Where will the initial investment come from?

The above conclusions will hopefully lead any institution contemplating involvement in ITV to do a very careful job of analysis and planning so that they are fully aware of the potential risks/rewards inherent in such an activity. Enclosure 4 is included as it presents technical and cost information directly relating to such analysis.

Not included in this report is information on a large number of institutions which offer, by broadcast TV, occasional courses for credit. Typical capital and operating costs of broadcast TV stations are included in Enclosure 4. Typifying systems of this type is the NYU "Sunrise" program and the San Francisco Bay Area Community College TV Consortium. Such systems were not included as they offer limited programming, do not offer access to complete degrees, have limited channel availability and have high cost.

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STATE	INSTITUTION	TYPE OF SYSTEM
ARIZONA	University of Arizona Video tape system - 1 classroom/20 courses/9 remote sites/300 total students/35 registered students. (In 1973-74 will have 2 classrooms/22 courses)	Video tape
CALIFORNIA	University of California (Davis) Has 2-way interactive TV (1 channel each way) by microwave with 1 remote location) plus 1 channel ITFS	Microwave/ITFS
	University of Southern California 4 channel live ITFS system - 4 classrooms/1 auditorium/1 master control/ 66 courses/176 students (12 receiving locations in 1973-74)	ITFS
	Stanford University 4 channel live ITFS system - 4 classrooms/1 auditorium/1 master control/ 214 courses/4,199 student course registrations (36 participating organizations in 1973-74)	Microwave/ITFS
COLORADO	Colorado State University Video cassette system - 3 classrooms/ 1 master control/93 courses/1,127 student course registrations/34 participating organizations	Video tape
	University of Colorado Video tape system - 1 classroom - also 1 ITFS channel	Video tape/ITFS
FLORIDA	University of Florida The original GENESYS system linked Gainesville campus (by telephone company microwave) with Daytona Beach, Orlando, Cape Kennedy, West Palm Beach and Boca Raton. Data made available is dated August 1971 and is no longer pertinent. Fall off in student participation and high fixed costs dictated a change in the utilization of Genesys	Microwave (Telephone Company)

NOTE:
1. All data given are for the 1972-73 academic years
2. All systems are primarily black and white, not color
3. Most systems use overhead and rear cameras. Some use third camera to look at students. Some use only one camera.

UNIVERSITY ITV SYSTEMS FOR ENGINEERING AND BUSINESS

TABLE 1

STATE	INSTITUTION	TYPE OF SYSTEM
ILLINOIS	Bradley System primarily serves elementary schools. Has access to 1 UHF-TV channel, 4 ITFS channels, 1 FM station and accesses 1 CATV head-end	UHF/ITFS/Cable/ FM
INDIANA	Indiana Higher Education Television System (IHETS) Services Ball State University, Indiana State University, Indiana University and Purdue University. IHETS is state-wide system with telephone company microwave backbone and several ITFS head-ends in different cities	Microwave (Telephone Company)/ITFS
	Purdue University Part of IHETS. 1 classroom/4 courses/ 38 student course registrations/5 remote participating groups	
IOWA	Iowa State University Video tape system. 3 classrooms/19 remote locations/33 courses/309 student course registrations. Statewide service	Video tape
MICHIGAN	University of Michigan 2 classrooms/2 telephone company microwave channels to Detroit, 2 ITFS channels in Detroit	Microwave (Telephone Company)/ITFS
MINNESOTA	University of Minnesota 2 classrooms/2 ITFS channels/1 master control/relays 90 miles to Rochester/ 57 courses/470 student course registrations/8 remote locations	ITFS
NEW YORK	Cornell University 2 classrooms/3 remote locations/video cassette system	Video tape
	Rochester Institute of Technology Video tape system. Single studio production/5 remote locations/205 student course registrations	Video tape
	State University of New York at Buffalo 1 classroom/1 ITFS channel/ties in with SUNY microwave network	ITFS/Microwave
OHIO	Case Western Reserve 2 classrooms/2 ITFS channels/7 remote sites/17 courses	ITFS

STATE	INSTITUTION	TYPE OF SYSTEM
OHIO	Ohio State University 1 telephone company microwave to 1 location	Microwave (Telephone Company)
OKLAHOMA	Oklahoma Higher Education TV System 2 channels. Links University of Oklahoma, University of Tulsa, Oklahome State University and University of Oklahoma Medical School and industry. 4 remote locations/72 courses/microwave interconnects + ITFS in 3 locations.	Microwave/ITFS
OREGON	Oregon State University Offers a wide variety of courses, including some engineering and business over cable TV in Corvallis. In 1971, approximately 8 courses per period were offered by TV.	Cable TV
PENNSYLVANIA	University of Pennsylvania 2 classrooms/2 ITFS channels/7 remote locations/367 student course registrations/15 courses	ITFS
RHODE ISLAND	University of Rhode Island 1 classroom/1 microwave channel/1 remote location/9 courses/29 student course registrations	Microwave
SOUTH CAROLINA	University of South Carolina Video tape + ETV/15 remote sites/11 courses per semester/103 student course registrations per semester	VHF/Video tape
TENNESSEE	University of Tennessee Video tape system. 1 classroom/6 remote locations/20 courses per quarter	Video tape
TEXAS	TAGER Interconnects 9 institutions: Austin College, Bishop College, Dallas Baptist College, SMU, TCU, Texas Wesleyan College, University of Texas at Dallas, University of Dallas, and Southwestern Medical School with 12 companies. Four studio classrooms at SMU and one each at TCU, TWC, UD, Bishop, DBC, UTD, SWMS and AC. Uses 6 channel microwave backbone with spurs, a total of 42 channel hops. Has 4 ITFS channels in Dallas and 2 in Ft. Worth. Approximately 160 courses per year. 1,695 student course registrations per year.	Microwave/ ITFS

STATE	INSTITUTION	TYPE OF SYSTEM
VIRGINIA	Virginia Polytechnic Institute and State University Will be offering courses over cable TV in the Fall, 1974	Cable TV
WEST VIRGINIA	University of West Virginia Video tape system (Business school) - 2 remote locations	Video tape
WISCONSIN	University of Wisconsin Just starting video tape programming - 1 classroom	Video tape

	Univ of Arizona	USC	Stanford	CSU	Purdue	Iowa State	Minn.	Cornell	RIT	Penn	Rhode Island	South Carolina	TAGER
Do you use TV classrooms?	Y	Y	Y	Y	Y	Y	Y	Y	No	Y	Y	Y	Y
Do you use TV studios?	No	No	No	Y	No	No	Y	No	Y	No	No	Y	No
Do all of your classes have on-campus students in attendance?	Y	Y	No	Y	Y	Y	Y	Y	No	Y	Y	Y	Y
Are you developing special non-credit short courses for television?	No	No	Y	No	No	No	No	No	No	Y	No	No	Y
Is faculty participation voluntary?	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
What about Faculty compensation?													
In dollars	No	No	No	No	No	No	No	No	No	-No	No	No	No
In released time	Y	No	No	Y	No	Y	No	-	No	No	No	No	No
As residuals for off-campus use	-	Y	Y	Y	No	No	No	No	No	No	No	No	No
Do you use video tapes of courses provided by others?	No	No	No	No	No	No	No	No	No	No	No	No	No
Do you reuse video tapes of courses on campus?	No	No	No	Y	No	No	No	No	Y	No	No	No	No
Do you use video tapes of university courses to derive off-campus income?	No	Y	Y	Y	No	No	No	No	Y	No	No	Y	No
Do you derive income from leasing facilities to others?	No	No	Y	Y	No	No	No	No	No	Y	No	No	No
Do you participate in a TV consortium with other institutions?	No	No	Y	Y	Y	No	No	No	No	No	No	No	Y
Are you interacting with cable systems?	No	No	No	No	Y	No	No	No	No	No	No	Y	No
Do you use the system during the summer period?	Y	Y	Y	Y	No	No	No	-	Y	Y	No	No	-
Do you use the system during non-academic periods?	Y	Y	No	Y	No	No	No	No	No	Y	Y	No	-
Would you recommend a similar system to another university?	Y	Y	Y	Y	Y	Y	-	-	Y	-	Y	Y	-
Do you use TV Surcharges?	No	Y	No	No	Y	No	Y	Y	Y	No	No	-	Y
Do you count tuition and fee income in justifying cost?	No	No	No	Y	No	Y	Y	Y	Y	Y	Y	-	-
Are you now accruing a surplus?	No	No	Y	No	No	No	No	No	Even	No	No	-	-

UNIVERSITY RESPONSES TO QUESTIONNAIRE

TABLE 2

	Responses	Yes	No	Uncertain	Enthusiastic	Favorable	Good	Very Much	Somewhat	Minimal
ATTITUDES										
What is the view of top management towards participation in televised instruction?	19			1	5	9	4			
What is the view of the participating employees?	20			2	4	6	8			
What is the view of supervisors of participating employees?	18			1	13	4				
PARTICIPATION FACTORS										
Has participation helped in employee recruiting?	12	5	5	2						
Has participation helped in employee retention?	11	4	5	2						
Has participation helped in reaching senior people?	15	10	3	2						
Did you see television as a vehicle for increasing educational participation?	17	15	2							
Would you recommend participation in similar systems to other divisions of your organization?	12	11	1							
WORK COMMITMENTS										
Did you see television (video taped) as a means for overcoming the problems of missed classes due to work commitments?	12	10	2							
Do you allow students time-off during the work day for participation in educational programs?	20	19	1							
COURSE SELECTION PRIVILEGES										
Do you have or would you like Television course selection privileges?	16	15	1							
If you have such privileges, do you use them?	12	12								
TALKBACK										
How important is talkback?	14							8	2	4
Give some indication as to utilization.	14							3	6	5
Would you participate if it were not available?	17	9	4	2					2	
CREDIT, DEGREES, CERTIFICATES										
How important is credit?	18							12	4	2
How important are degrees as goals?	22							16	3	3
How important are "certificates of completion?"	11							7	2	2

THOUGHTS FROM INDUSTRY

Following are representative thoughts from the industry questionnaires. The conclusions are that instructional television systems are effective in providing quality education in a convenient, cost effective way.

"Instructional television makes continuing education an integral part of the job environment."

"More employees are participating because of ease and convenience and participation would be no where near as high without ITV."

"TV has enabled us to more directly relate continuing education to the job. It is justified on the basis of the need to combat technical obsolescence."

"TV cost is not significant in relation to minimization of 'hassle' in commuting for continuing education. TV reduces employee travel time and saves in man hours and lost productivity."

INDUSTRY RESPONSES TO QUESTIONNAIRE

TABLE 3

1967 - 1973

Quarter	Number of Courses	Number of Locations	Number of Students On-campus	Number of Students Off-campus	Total/Yr. Off-campus
Fall, 1967	4	7	105	189	
Winter, 1967	9	9	132	249	
Spring, 1968	8	9	100	206	644
Fall, 1968	12	13	283	341	
Winter, 1969	15	14	305	320	
Spring, 1969	13	15	314	288	949
Fall, 1969	15	14	209	336	
Winter, 1970	14	14	262	295	
Spring, 1970	14	14	162	165	796
Fall, 1970	17	15	232	403	
Winter, 1971	20	19	289	316	
Spring, 1971	18	16	235	202	
Summer, 1971	6	6	67	51	972
Fall, 1971	22	23	410	351	
Winter, 1972	24	22	353	284	
Spring, 1972	23	20	331	253	
Summer, 1972	7	10	79	93	976
Fall, 1972	32	24	527	426	
Winter, 1973	30	28	750	426	
Spring, 1973	31	29	367	275	
Summer, 1973	17	16	96	150	1,277

CSU SURGE
PARTICIPATION SUMMARY

TABLE 4

3 TV Cameras at $1,000.	$ 3,000.
1 Sync generator	1,000.
1 Pan tilt control unit	1,100.
5 TV monitors at $160.	800.
2 Zoom lenses at $1,100.	2,200.
Instruction desk with control unit, split screen generator, and back pack play back recorder	4,000.
Electronic control, amplifiers, cables special room wiring	2,300.
Master Control panel with TV monitors, switching unit	5,600.
Studio classroom air conditioning and necessary remodeling	5,000.
Related labor	5,000.
Total Cost	$30,000.

STUDIO CLASSROOM AND MASTER CONTROL
CAPITAL COSTS

TABLE 5-A

1" VTR's (11) - $995. each	$10,945.	
1/2" VTR's (17) - $700. each	11,900.	
3/4" VCR's (10) - $1,400. each	14,000.	
Sub-total		$36,845.
Shelves and racks	$ 1,800.	
TV monitors (27) - $180. each	4,860.	
Custom switcher	7,000.	
Cabinets	500.	
Cables and carts	250.	
Labor	7,000.	
Sub-total		21,410.
Total		$58,255.

RECORDING FACILITIES COSTS

TABLE 5-B

CSU SURGE COST DATA

TABLE 5

			1972-1973 Level (110 Courses)	Expanded Level (200 Courses)
Administrator,	$24,000.	1/10 time	$ 2,400.	
		1/10 time		$ 2,400.
Coordinator,	$16,000.	1/2 time	8,000.	
		3/4 time		12,000.
TV Engineer,	$15,000.	1/5 time	3,000.	
		1/5 time		3,000.
TV Technicians	$10,800.	2 full time	21,600.	
		3 full time		32,200.
Secretary,	$ 5,300.	1 full time	5,300.	
		1 1/2 full time		8,000.
Student Labor, at $2/hr.		3300 hrs.	6,600.	
		6000 hrs.		12,000.
Travel and Telephone			3,000.	3,000.
Supplies and Spare Parts			8,000.	11,700.
Printing and Mailing Announcements			3,000.	3,800.
			$60,900.	$88,100.

CSU SURGE

BASE OPERATING COSTS

TABLE 6

Institution		Dir. Inst. Cost Sem Cr Hr	Comments	Quality Rating	1972-1973 Dir. Inst. Cost* Contact-hour
California:					
Univ. Calif. Berkeley		$62		1	$ 8.72
Univ. Calif. Los Angeles		$53		2	7.49
Calif. State Colleges		$25-33	Range of 5 largest St. College Programs	4	4.08
Stanford		$46		1	6.47
Calif. Inst. Technology		$111		1	15.62
Other Institutions:					
Group I	A	$74	Med. size private inst.	1-	10.41
	B	$46	Large midwest State Univ.	1	6.47
	C	$52	Large midwest State Univ.	2	7.32
Group II	D	$41	Midwest private institution	2	5.77
	E	$56	State Univ. of small state	3-	7.88
	F	$33	Med. size private school in east	3	4.64
	G	$31	Eastern specialized institution	2	4.36
	H	$46	State Univ. of med. size state	3+	6.47
	I	$44	State Univ. of med. size state	4	6.19
Group III	J	$34	Med. size tax-supported inst.	4	4.78
	K	$32	Med. size tax-supported city inst.	4+	4.50
	L	$43	Med. size private university	4	6.05
	M	$40	Large tax-supported inst.	4	5.63

Quality rating scale (based on Cartter ratings of graduate programs):

1. In top 10-12 engineering schools.
2. In top 25 engineering schools, but not in top 10-12.
3. In top 40 engineering schools, but not in top 25.
4. Below top 40 engineering schools.

* These costs are estimated by assuming a 5%/year inflation for 7 years and dividing (sem cr hr) by 15 to obtain contact hours. (Factor used is 1.41)

INSTRUCTION COST INDEX DATA
TABLE 7

	Video Tape Delivery System			
	Number of Classrooms			
	1	2	3	4
Video Cassette Player	$1,150.	$2,300.	$3,450.	$4,600.
TV Set	290.	580.	870.	1,160.
Cart	75.	150.	225.	300.
Totals	$1,515.	$3,030.	$4,545.	$6,060.

CSU SURGE PARTICIPATING FACILITIES COSTS

TABLE 8

D1-54

Quarter	Sp. '69	Su. '69	Au. '69	W '70	Sp. '70	Su. '70	Au. '70	W '71	Sp. '71	Su. '71	Au. '71	W '72	Sp. '72	Su. '72	Au. '72	W '73	Sp. '73	Su. '73	Au. '73	W '74
TV STUDENTS																				
Hon. Coop.			226	219	225	92	304	234	240	58	195	166	140	45	172	180	150	60	199	166
Non-Reg. Option			8	11	9	9	50	34	15	6	34	21	7	4	25	25	31	14	61	44
Auditor			13	28	55	6	30	32	18	17	28	314	369	35	405	340	318	309	455	368
Total	127	27	247	258	289	107	384	300	273	81	257	501	516	84	602	545	499	383	715	578
NUMBER OF COURSES	18	9	28	30	37	21	46	42	43	17	41	42	43	17	38	42	41	24	45	41
STUDENTS/COURSE (AVG.)	-	3	8.8	8.6	7.8	5.1	6.4	7.1	6.3	4.8	6.3	11.9	12	4.9	15.8	13	12.2	16	15.9	14.1
ACE (NOT INCLUDING MBA STUDENTS)																				
TV STUDENTS		56	320	645	696	322	556	292	269	409	437	603	388	355	341	624	550	319	550	915
NUMBER OF COURSES		4	11	14	12	6	16	10	9	8	15	15	10	10	13	18	15	12	16	20
STUDENTS/COURSE (AVG.)		14	29	46	58	53.7	34.8	29.2	29.5	51.1	29.1	40.2	38.8	35.5	26	35	37	26.6	34.4	45.8
MBA																				
TV STUDENTS							58	72	72	50	97	102	102	69	95	91	91	60	100	85
NUMBER OF COURSES							2	2	2	2	3	3	3	2	3	3	3	2	3	3
STUDENTS/COURSE (AVG.)							29	36	36	25	32	34	34	34	32	30	30	30	33.3	28.3

NUMBER OF PARTICIPATING ORGANIZATIONS

1968-69	1969-70	1970-71	1971-72	1972-73	1973-74
(18)	(23)	(24)	(26)	(30)	(36)

STANFORD ITV PARTICIPATION SUMMARY 1969-1974

TABLE 9

UNIVERSITY ITV SYSTEM CAPITAL BUDGET

	Number of ITFS Channels 1 (dollars)	2 (dollars)	3 (dollars)	4 (dollars)
Consulting and legal fees	20,000	20,000	20,000	20,000
Program management, design engineering and drawings	35,000	35,000	35,000	35,000
Installation and Test	44,000	57,000	69,000	80,000
Studio classrooms equipment	23,000	46,000	69,000	92,000
Studio control	19,000	37,000	56,000	74,000
Master control	8,000	27,000	46,000	49,000
RF transmission equipment emergency power	75,000	88,000	102,000	116,000
Talkback receiving equipment	26,000	27,000	29,000	30,000
Spare parts	6,000	12,000	18,000	24,000
Test equipment	15,000	15,000	15,000	15,000
Room modifications	20,000	40,000	60,000	80,000
Totals	291,000	404,000	519,000	615,000

Minnesota Cost → (404,000) Stanford Cost → (615,000)

CAPITAL COSTS

TABLE 10A

Staff	$ 60,739
Staff Benefits (0.17)	11,515
Studio operators - 6,000 x 2.75	16,500
Replacement parts	8,000
Office overhead	9,889
Pick-up and delivery	12,000
Total	$118,643

For Stanford Courses Only

118,643 - 1,950 (ACE) x 2.75 = $113,280
where 1,950 x 2.75 represents incremental ACE related operator costs

OPERATING COSTS

TABLE 10B

STANFORD COST DATA
TABLE 10

Source of Funds	Allocation of Funds: To TV Network	To Departments	To University
HCP Tuition (TV only)	-	-	94,440
HCP Matching Fee (TV only)	-	78,700 (2)	-
HCP TV Surcharge	31,480	-	-
NRO TV Fees	5,300	13,250 (1)	-
Auditor TV Fees	25,156	25,169 (1)	-
ACE	37,365	-	-
	99,301 (1)	117,119	94,440 (2)

NOTE:

1. Of the above funds, the following are clearly identifiable as being incremental as the result of the ITV Network:

   99,301 + 13,250 + 25,169 = $137,720

2. The sum of 94,440 + 78,700 = $173,140 is 60% of total HCP income. The estimated portion of total HCP income allocable to students who would not have participated without TV is:

$$\frac{173,140}{0.6} = 0.45 = \$129.855$$

STANFORD COST RECOVERY BREAKDOWN

1972-1973

TABLE 11

	RF Delivery System			
	Number of Classrooms			
	1	2	3	4
TV Set	$ 290	$ 580	$ 870	$1,160
Cart	75	150	225	300
Antenna, mast, down-converter, power supply, cabling, installation, checkout	1,868	2,298	2,728	3,158
Totals	$2,233	$3,028	$3,823	$4,618

STANFORD PARTICIPATING FACILITIES COSTS
(at given geographic location)

TABLE 12

Basic Unit Costs and Unit Factors

(1)	Unit costs, 1 studio classroom where this is remodeling of existing space	$50,000
	(a) Initial outlay	
	(b) Amortized cost per year' assuming 7 year life and 7% annual inflation	10,020
(2)	Unit cost, 1 four channel 2.5 GHz transmitter (no tower)	
	(a) Initial outlay	50,000
	(b) Amortized cost per year; assuming 7 year life and 7% annual inflation	10,020
(3)	Unit cost, one 12 GHz channel hop; a single one-way video, two-way audio channel between two line of sight points	
	(a) Initial outlay	40,000
	(b) Amortized cost per year	8,000
(4)	Unit remodeling cost, 1 average receiving classroom; these may range from 60 seats to as few as 4; costs are $120 per seat, plus monitors ($500 ea), talk-back telephones and wiring, carpeting, drapes and special lighting	
	(a) Initial cost - average classroom	5,000
	(b) Amortized cost per year (10 years)	700
(5)	Instructional cost per course; direct cost of instructor salaries assuming $25,000 (including fringes) for an average salary to each 10 courses over 2 semesters plus summer school	2,500
(6)	Studio Operating cost/course	300
(7)	Network operating and management costs per course (including couriers)	600
(8)	Maximum number of courses per channel; assuming operation from 8:00 AM to 9:30 PM with all classes being 3 semester hours: Total possible (full year) = 58; for maintenance, etc. = -8; Total usable = 50	50
(9)	Maximum practical enrollment per course; past experience indicates that a total course enrollment (in studio and on network) of 100 is about the upper limit if talk-back is to be a feature	100
(10)	<u>Probable</u> maximum average enrollment/course; based upon wide variety of demands and interest (split roughly equally between in studio and on network)	35
(11)	Enrollment will generally split approximately as 55% on campus (in studio) and 45% remote	
(12)	Unit annual costs to maintain receiving equipment:	
	(a) For each 12 GHz channel incoming to user	5,000
	(b) For each 2.5 GHz channel incoming to user	2,500

TAGER COST DATA
TABLE 13

Summary of Retention, 1956-64

(By Semester and Trimester)

(Revised to include TV-in-class and handicapped students)

% of original enrollment completing the semester's or trimester's work

	FALL 1956	SPRING 1957	FALL 1957	SPRING 1958
Enrollment	2773	1619	2902	1957
Retention	1682	1148	1760	1460
Percent retention of original enrollment	61	71	61	75

	FALL 1958	SPRING 1959	FALL 1959	SPRING 1960
Enrollment	2743	1950	2374	2138
Retention	1893	1326	1662	1412
Percent retention of original enrollment	69	68	70	66

	FALL 1960		SPRING 1961		SUMMER 1961
	CCJC	CTC	CCJC	CTC	
Enrollment	2902	259	2976	659	473
Retention	2002	219	2202	555	296
Percent retention of original enrollment	69	84	74	84	63

	FALL 1961		SPRING 1962		SUMMER 1962
	CCJC	CTC-N	CCJC	CTC-N	CCJC & CTC-N
Enrollment	4197	524	3786	642	547
Retention	2853	462	3029	475	437
Percent retention of original enrollment	68	88	80	74	80

	FALL 1962		WINTER TRI. 1963		SPRING TRI. 1963	
	CCJC	CTC-N	CCJC	CTC-N	CCJC	CTC-N
Enrollment	3557	496	2388	800	659	219
Retention	2541	380	1755	627	477	186
Percent retention of original enrollment	71	77	73	78	72	85

	FALL TRI. 1963		WINTER TRI. 1964	
	CCJC	CTC-N & S	CCJC	CTC-N & S
Enrollment	3647	560	2982	782
Retention	2397	461	2231	681
Percent retention of original enrollment	66	82	75	87

TABLE 14

OREGON STATE UNIVERSITY ENROLLMENTS IN TELEVISED COURSES, ACADEMIC YEARS 1957-1970

Academic Year	Television Facilities	Student Enrollment
1957-1958	KOAC-TV	554
1958-1959	KOAC-TV	787
1959-1960	KOAC-TV	1,265
1960-1961	KOAC-TV	2,440
1961-1962	KOAC-TV	4,319
1962-1963	KOAC-TV	4,095
1963-1964	KOAC-TV	4,256
1964-1965	Limited closed-circuit plus KOAC-TV	5,186
1965-1966	Limited closed-circuit plus KOAC-TV	6,479
1966-1967	Completed closed-circuit facilities	7,549
1967-1968	Closed-circuit	8,300
1968-1969	Closed-circuit	8,400
1969-1970	Closed-circuit	8,500

TABLE 15

Subsystem	Total annual cost (rental or amortization over 5-year period) (dollars)	Annual cost per student station (rental or amortization over 5-year period) (dollars)	Cost per student contact hour* (dollars)
Central computer facility	900,000	220	0.11
Computer systems software	100,000	25	0.01
Student console		360-1,000	0.18-0.50
Central management services	240,000	60	0.03
Communications channels+		18-50	0.01-0.03
Total operational costs per student-contact hour			0.34-0.68

* Annual use per student, 2000 hours (45 weeks at 44 hours per week); maximum number of student stations, 4096; total annual use (4096 stations), 8.2 million student-contact hours. + For telephone connections on a given campus, contingent property-line costs are about $1.50 per month per terminal (1 cent per student-contact hour). For student stations at a distance, communications would be transmitted by means of time-multiplexed television channels for groups of 1000 student stations per channel. At a distance of 150 miles this would cost an additional 2 cents per student-contact hour.

TABLE 16

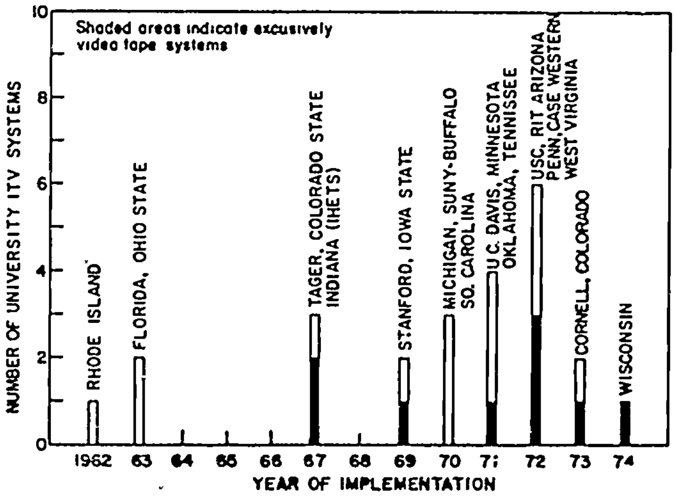


FIG 1

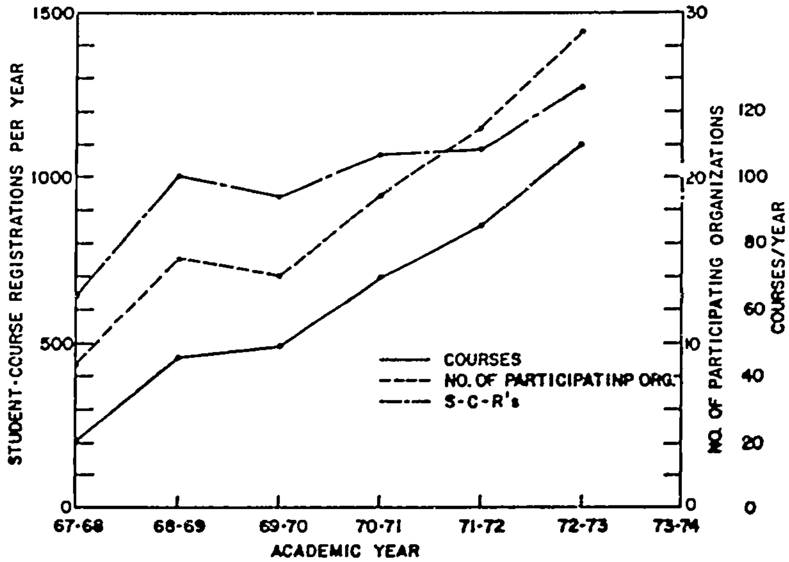


FIG 2

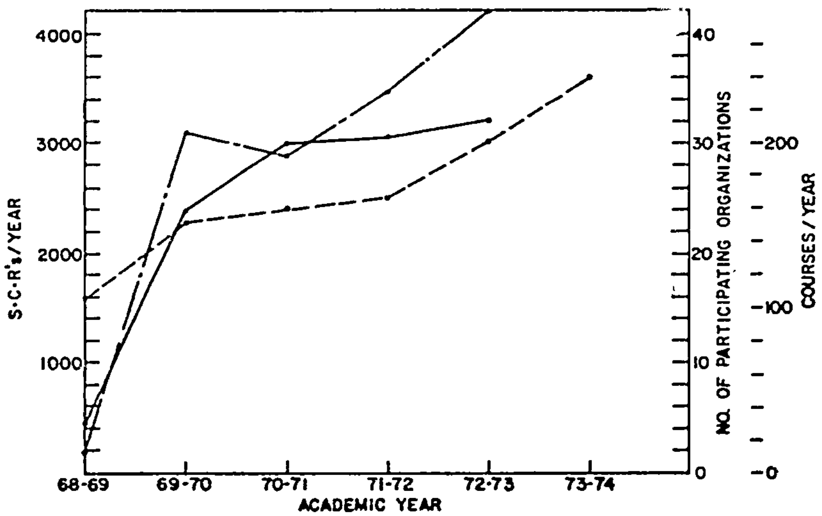


FIG 3

Figure 1 Implementation Rate of University ITV Systems

Figure 2 Colorado State University Participation Pattern

Figure 3 Stanford University Participation Pattern

FULLY-SWITCHED MULTI-POINT VIDEO NETWORK
OF THE INDIANA HIGHER EDUCATION TELECOMMUNICATIONS SYSTEMS

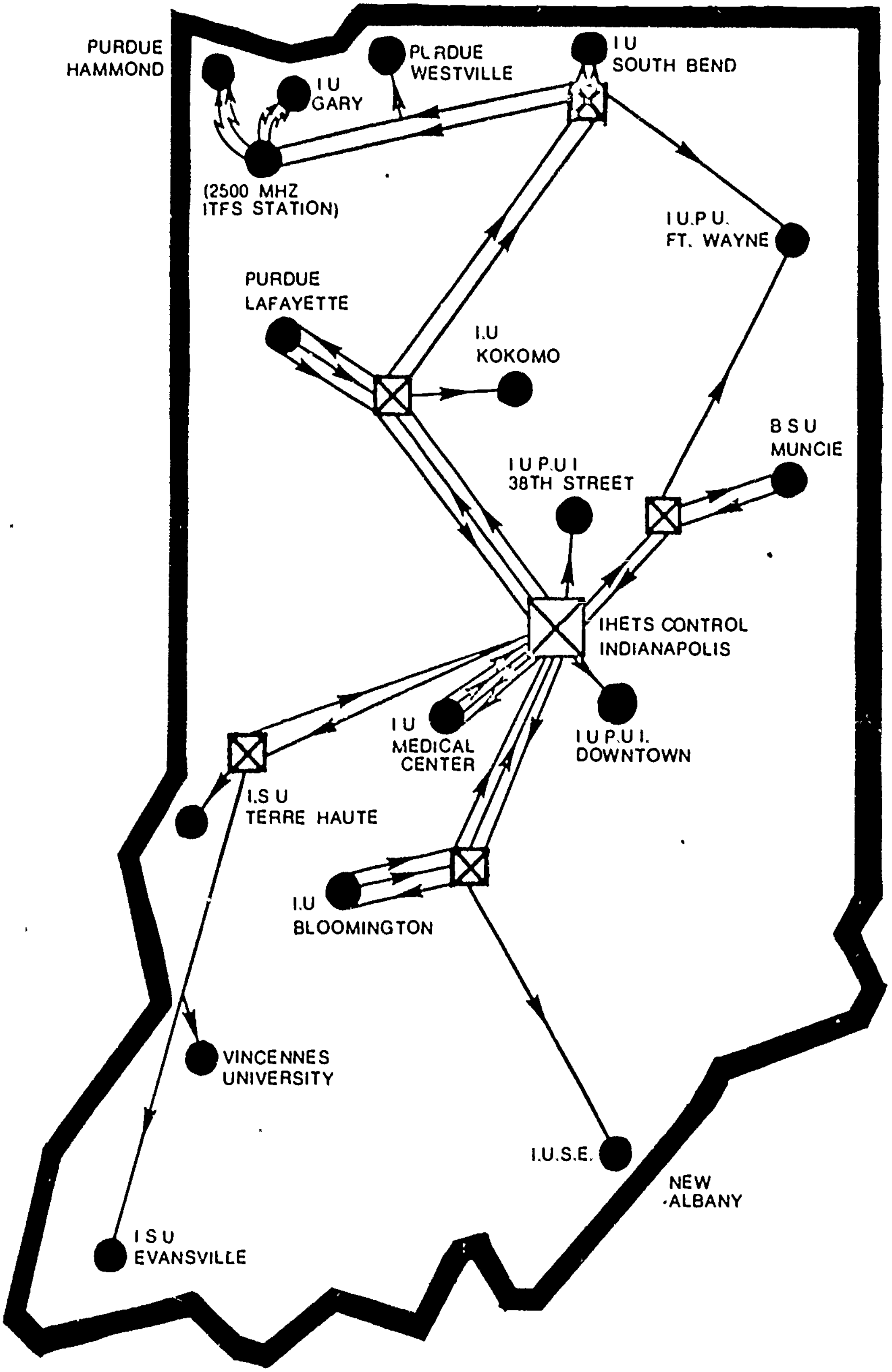
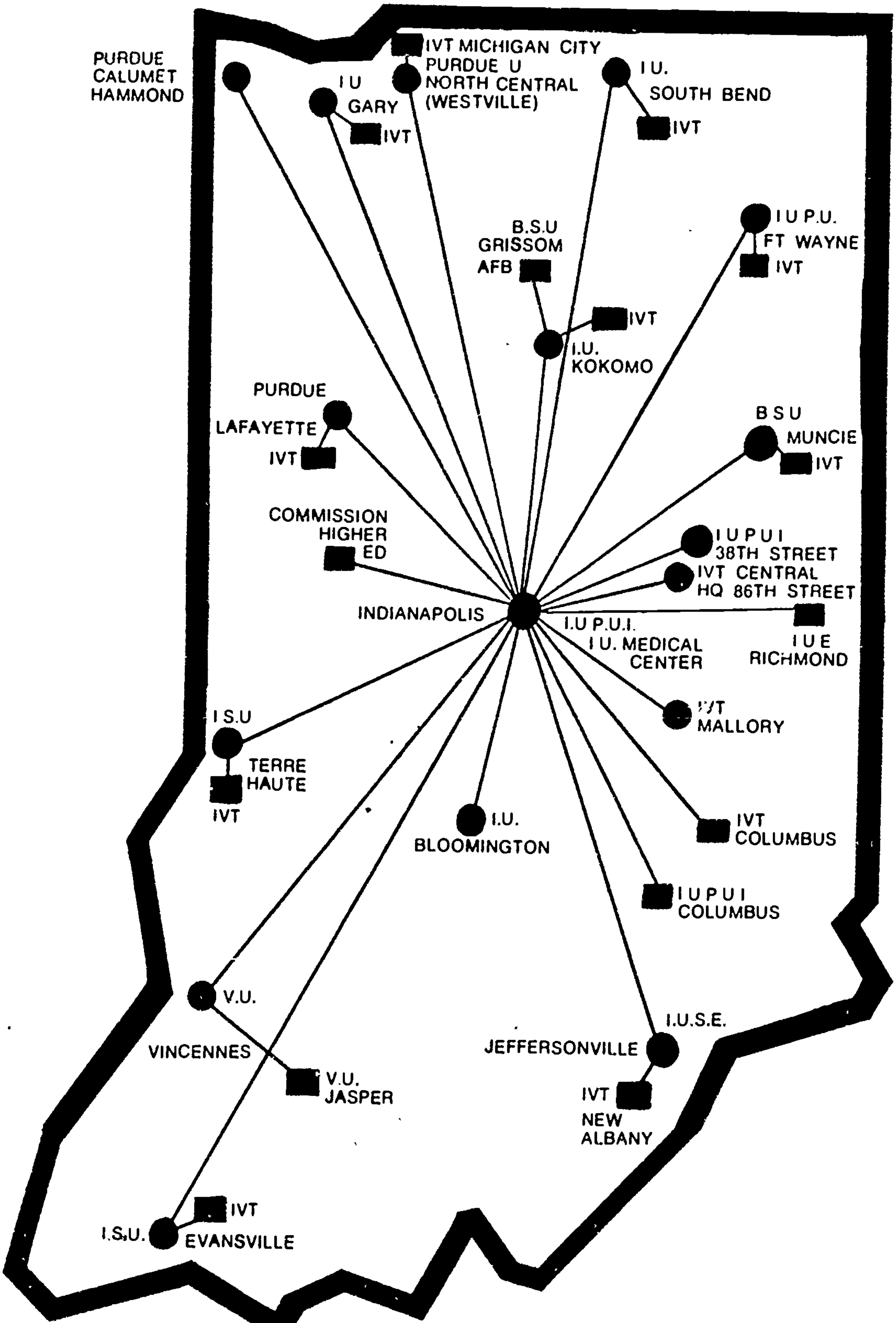


FIGURE 4



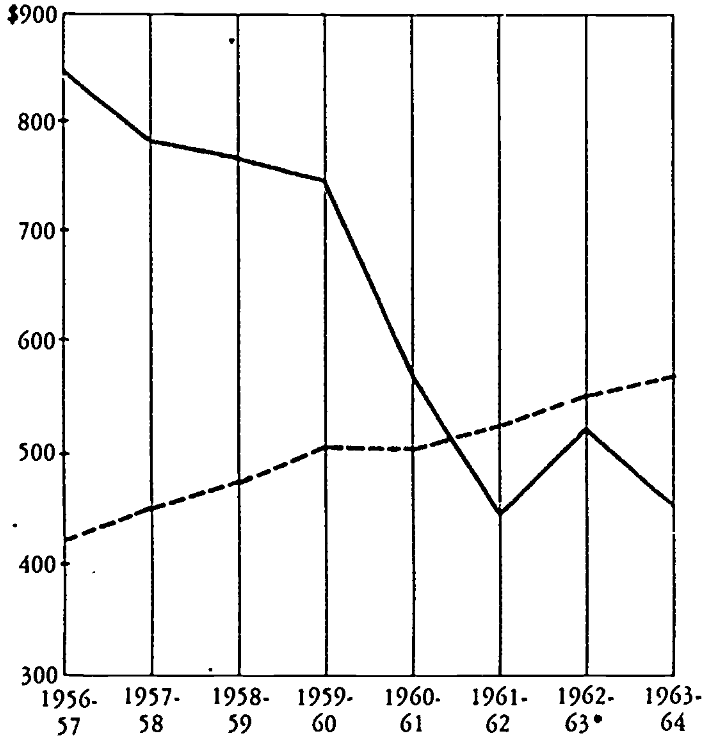
INDICATES A UNIVERSITY CENTREX OR PBX

INDICATES AN OFF-PREMISE EXTENSION

IVT INDICATES VOCATIONAL TECHNICAL COLLEGE REGIONAL CENTER

FIGURE 5

Graph Showing Relative Costs of TV and Conventional Instruction Per Full-Time Equivalent Student Per Year (30 credit hours) from 1956 to 1964



Key: Continuous line represents costs of TV instruction
Broken line represents costs of conventional instruction

*Temporary rise in TV costs between 1962 and 1963 is result of following factors: a) introduction of trimester organization with substantial increase in teacher salaries; b) increase in studio charges; c) decrease in Winter Trimester enrollment because of loss of in-class and concurrent TV students during period of transition from semester to trimester organization.

FIGURE 7

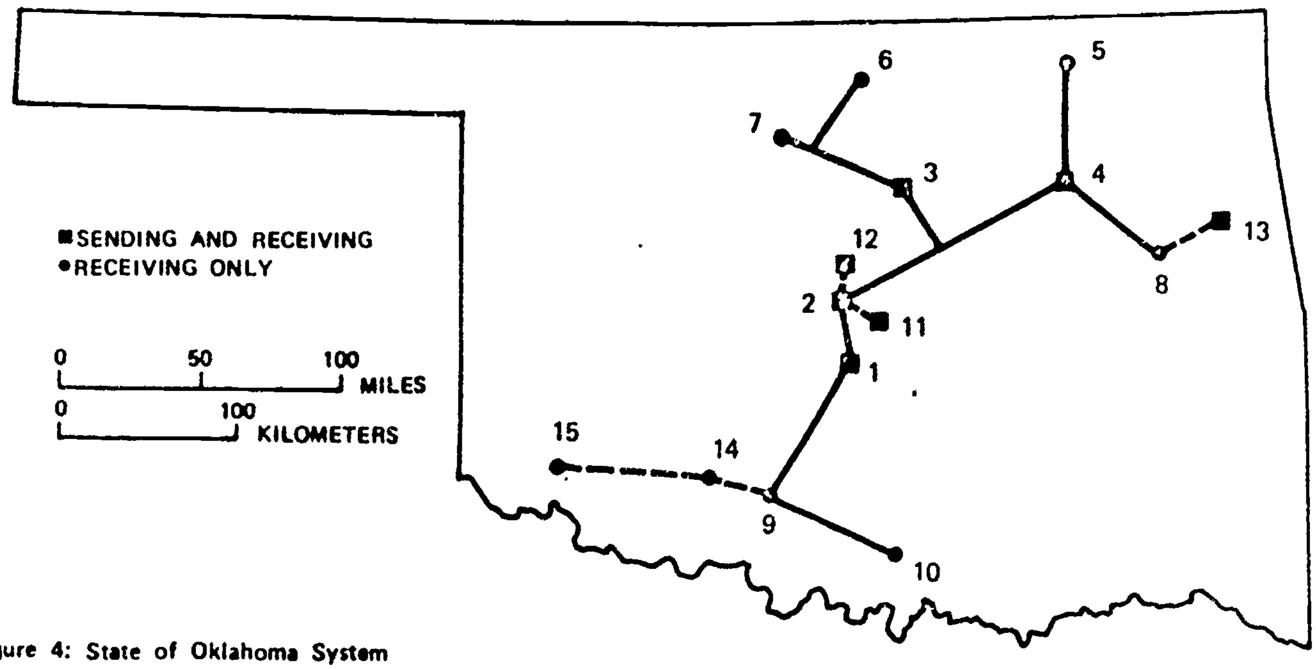


Figure 4: State of Oklahoma System

ORIGINAL

1. University of Oklahoma–Norman
2. Oklahoma Medical School–Oklahoma City
3. Oklahoma State University–Stillwater
4. University of Tulsa–Tulsa
5. Bartlesville
6. Ponca City
7. Enid
8. Muskogee
9. Duncan
10. Ardmore

TO BE ADDED (FALL, 1972)

11. Oscar Rose Jr. College–Midwest City
12. Central State University–Edmond
13. Northeastern University–Tahlequah
14. Lawton
15. Altus Air Force Base

FIGURE 8

ENCLOSURE 1

CITY COLLEGES OF CHICAGO

TV COLLEGE FACT SHEET, 1956-71

THE TV COLLEGE RECORD:

- --Almost 145,000 individuals in almost 215,000 course registrations--roughly 1.5 course registrations per individual.
- --Almost 80,000 students enrolled in almost 115,000 courses for credit
- --Almost 70,000 students enrolled in almost 100,000 courses not for credit.
- --An "unseen audience" soaring from 10,000 viewers per telecast in Fall 1956 to over 280,000 viewers per telecourse in 1971.
- --On the air an average of 26 hours weekly--double the telecast time of Fall 1956.
- --The proportion of courses with occupational and career orientation increased since 1968.
- --The retention percentage (number of students who complete a semester's or trimester's work) averaging between 70-80%.
- --About 80 different college courses offered for credit, plus 5 courses telecast not for credit. (Many of the credit courses repeated in subsequent semesters, raising the total course offerings 60 228.)
- --Special non-credit vocational guidance series--"Start Your Tomorrow Today"--produced with a grant from the State of Illinois Board of Vocational Education.
- --Special non-credit series, "The American Community College," produced with a grant from the U. S. Office of Education.
- --Special non-credit color series, "Man and His Art," filmed in Art Institute of Chicago, with grants from National Endowment for the Humanities and Field Foundation of Illinois.
- --Air Force servicemen now enrolled in televised Data Processing course in Germany.
- --About 350 students already awarded the Associate in Arts degree (60 hours of college work of "C" or better average) entirely by TV.
- --Approximately 2150 students graduated with the AA degree who took, on an average, one semester of their work by TV.

--Concurrent registrations (students taking TV and on-campus classes in the same semester) growing from 3% in Fall 1956 to 20% today.

--Approximately 40% of TV students with plans to teach.

--Eight Years of TV College: A Fourth Report still available from the TV College office.

--TV College: A Fifth Report now in the process of preparation.

--TV College production moving entirely to color in Spring 1972.

--TV College, a service of the Learning Resources Laboratory of the City Colleges of Chicago.

FOR MORE DETAILED INFORMATION, CONTACT THE TV COLLEGE OFFICE AT 5400 NORTH ST. LOUIS AVENUE, CHICAGO, ILLINOIS 60625

ENCLOSURE 2

A PERSPECTIVE ON CABLE TELEVISION AND THE UNIVERSITY

by

Albert J. Morris

The recent conference, Cable Television and the University, covered a wide range of topics and issues. This perspective supplements and clarifies some key points relating to the conference.

What is Television (TV)?

This seems an absurd question. However, that TV can be two fundamentally different things is often not understood. On one hand, TV is used as an educational tool, on the other it is used as an educational delivery system.

To most educators TV is an educational tool, used to enhance, supplement, clarify or make more interesting the educational process. Of the enormous sums spent by the government and foundations on TV, most has been spent in these ways. One end of the spectrum of such use is "Sesame Street." While we have learned that TV is as effective as face-face instruction, we haven't learned much more than that. Even so, some educators still do not believe this while some think TV is better. Many who have tried it hate it while others love it. Some are indifferent. The uninitiated can find reports supporting any position that they may choose to believe in.

TV, as an educational delivery system, is a mechanism for overcoming geography. It is a means of transmitting the educational process to students in remote locations, either live or by videotape (cassette). When TV is used as a delivery system, the system can take many forms.[1] Signals can be: transmitted over wire (telephone lines or cable TV); broadcast (UHF or VHF TV, ITFS or satellites); sent over-the-air point-point (microwave); or recorded (videotape, cassette or disc) or delivered mechanically. All such delivery systems are being used.

Televising on-going classroom instruction is widespread.[2] Reported results are uniformly excellent.[3,4,5] This approach is predicated on the following philosophy: "if it is good enough for the regular on-campus students, it should be good enough for students remote from campus who can participate at great convenience and who may not be able to participate in any other way."

What is Talk-back Television?

TV is now often used for instruction with audio (rarely video) feedback from students to the instructor, either in real time or delayed in time. Although some studies have concluded that talk-back is deleterious to the learning process, most studies have reported that learning with talk-back is "not significantly different" than without talk-back. None of the studies cited during the conference incorporated information from major TV operating systems2 reaching students off-campus.

Although the research implies that talk-back adds nothing to the learning process, few educators will embark on using TV for higher education without some form of interaction. Remote students do not wish to be treated as second-class citizens. Nevertheless, interaction does not have to be in real time nor need it be with the primary instructor. It need not even involve audio or video talk-back. For example, a "sampled response" system from a student terminal is a form of interaction between instructor and student.

Interaction is possible in many modes. It is not necessary that it be on-campus. It could be by phone, or at other schools or meeting places or by audio cassette. Interaction need not be with the regular course instructor. Even on campus, many "sections" are led by teaching assistants. Qualified people to lead the interaction process exist all over. Finally, perhaps the best interaction is that provided by fellow students and that can easily be built into any educational system designed for truly remote students.

What is Cable TV?

What is cable TV and what distinguishes it from broadcast-TV? For the university, cable TV is no different from broadcast TV except in potential availability of multiple channels with low cost of access and the potential of two-way communication. Delivery of the TV message by cable rather than over-the-air is inconsequential. What is important is that with standard TV sets, both cable TV and broadcast TV can reach into every home in the area of coverage. This distinguishes both cable TV and broadcast TV from ITFS, satellites and microwave TV, which require expensive additional antennas and receiving equipment. It also distinguishes cable TV from video recording which requires expensive players and software.

The impact of two-way cable TV communications on the university in the next few years is likely to be negligible, but availability of a low cost, high capacity pipeline into the home for television communications can have significance.

Interaction via Two-Way Cable TV

Is this important to the university? Except for research, universities should forget it for now and for several years to come as a vehicle for normal student-student or student-instructor interaction. The possible use of cable TV for interconnection between institutional locations for program sharing is a much more real near term possibility.

A cable TV system does not include the complex switching capability of the telephone network. Nevertheless, it would be possible for all students to access the originating cable TV studio which could then distribute the talk-back to all participants. However, this is only useful in a live class with a live instructor. The probability is high that little cable TV will involve this mode.

What is more likely, is the offering of live classes to large groups of students whose learning is sampled by questions from the instructors with coded responses by students. This represents an interesting and innovative mode of teaching and will be subject to much future experimentation and evaluation. For universities which want to accomplish significant things now, the normal form of student-teacher interaction does not appear likely over the cable.

On-Campus vs. Off-Campus Students

There is a fundamental difference between on-campus and off-campus students. The bulk of educational research on "learning by TV," "the attitude of TV students," or "the use of talk-back in TV learning," has focussed on on-campus TV students. However, for over a decade, major U. S. universities have been servicing off-campus students by TV with interaction and have reported uniformly excellent results. Unfortunately, none of these systems are included in studies by the "educational researchers."

The reasons for the positive reaction of off-campus TV students are uncertain, but include "greater maturity," "ease and convenience," "can get material no other way," as determining factors. Cable TV students are "off-campus" students. It can be expected that they will do as well and will react as positively to sharing on-campus instructors by TV as their counterparts in other forms of TV systems.

The Economics of Televised Instruction

Estimates of the cost of TV instruction range from $20/hour at Stanford University to $1,000/minute for "Zoom." This ratio of 3000:1 in cost should be presented in some perspective to interested universities. The Stanford ITV Network is the most cost-effective ITV system in operation.[6] Because Stanford is a major university with considerable academic prestige, the following data are presented as a measure of what can be achieved if the "TV educational delivery system" is properly designed and administered:

In 1972-73, the Stanford ITV Network offered 214 courses to 4,129 students representing over 6000 hours of TV programming (about 120,000 student-contact-hours) at an operating cost of $120,000/year. This cost includes all operation, maintenance and administration, but does not include faculty or space costs which already exist. The incremental cost of TV was $20 per TV hour ($1 per student-contact-hour). Amortizing TV capital costs would add $10 per TV hour ($0.50 per student-contact-hour). These numbers represent, in 1974, the minimum cost of producing high technical quality black and white live TV programs in the mode of sharing on-campus instruction with off-campus students.

Compare the above numbers with the cost quoted for "Zoom" of $1,000/minute. This level of cost is associated with TV educational programming designed to be competitive in interest and entertainment to what viewers see on broadcast TV. If higher education by TV needs to entertain, the costs it infers are enormous and untenable. Were Stanford to broadcast 6,000 hours at "Zoom" cost, the annual operating cost increases from $120,000 to $360,000,000. To achieve a cost of $1 per student-contact-hour, the average number of students per class must increase from 20 to 60,000. Can any university anticipate an average course population of 60,000?

The higher education market is relatively small per course. In 1969-70 Oregon State University averaged 350 students per TV course over cable TV. Their total participation numbers grew from 554 in 1957-58 to 8,500 in 1969-70. These numbers represent a more realistic expectation of student population in higher education courses.

One must conclude that any university embarking on the use of TV in a major way, as a vehicle to reach off-campus students, cannot realistically expect to do so and be economically viable unless they share on-campus instruction and do not make a production out of every course.

Some further economic facts might be pertinent. The electronics in a first class on-campus studio classroom can be purchased for about $45,000, see Figures 1 and 2. Room modification costs add between $10,000 - $25,000. It is possible therefor for a university to contemplate that by a capital expenditure ranging between $50,000 - $100,000 and an annual operating cost of about $30,000, it can offer 1520 hours of instruction to cable TV systems during a 38 week academic year.

Must a University be Located in a Cable System Area?

A university need not be located in a cable TV area to effectively utilize cable TV. If a university were in a cable TV area, what might it do? Basically, the only rational requirement for "live" local programming is university sports. Even this is questionable because of probable loss of paid attendance. There are two other university "products" which might be used to service a cable TV system: regular classroom instruction and special events. Even in the case of Oregon State University, which works with a cable TV company in the same town (Corvallis, Oregon), the courses are taped (not live) and are repeated at least twice per day. Once a program is taped, whether it is played on local broadcast TV, a local cable TV system, or a system anywhere else is immaterial as it pertains to the transmission of program content. The primary differences imposed by geopraphy are in the mechanisms used to achieve interaction and questions of administration.

Where a university is in relation to a cable TV system is not important. What is important is for it to decide "what" game to play and "where" to play it. Geography imposes no real limitations.

Cable Company - University Interaction

Cable companies, almost without exception, are hurting financially. Universities can no longer look forward to "freebies." If, in the future, the recommendations of the Office of Telecommunications Policy are implemented, cable TV will gain common-carrier status which would mean every organization would pay for cable access. However, FCC rules now in effect (since March 31, 1972), require that all new cable TV systems in the 100 largest TV markets must have:

- at least a 20-channel capacity;
- one channel reserved for non-broadcast use for each broadcast signal carried;
- three free channels - one for education use, one for municipal government and one for public access;
- additional channels available for lease;
- a built-in two-way capacity, although actual two-way service is not now required.

What does this mean to the university? Today cable TV systems, without exception, need more programming. Further, many cable TV systems have a significant number of unused channels available (in addition to dedicated educational channels). Also, if one believes many surveys, a large number of people, perhaps 50%, would pay for educational programming.

The combination of the above should flash "go" signals if, but only if, the educational system takes into account all of the following:

- Student interests, motivations, desire for reward and recognition and ability to pay.
- Academic recognition and financial reward of faculty participants.
- Maintenance of on-campus academic standards and full control of academic quality by the regular faculty.
- A potential for significant income for the institution with little or no financial risk.
- The prospect for significant financial gain for the cable TV company.

Cable TV companies will give universities free access to TV channels under the right conditions. Availability of free access relates simply to the prospect of cable TV companies deriving income by providing such access. Such income may be derived from:

a. Offering a significant increase in highly valued programming which should bring in new subscribers at no increase in capital investment.

b. Charging more to existing subscribers for the privilege of viewing the educational programming (either by special converters or encoding).

c. Receiving a portion of the fees paid by students on the cable TV system.

In turn, the university might share in incremental income from subscribers who pay extra for the educational service. The university will also receive tuition and fee income.

The ingredients of a viable academic and economic educational system utilizing cable TV are all there. What's more - a "game" plan is available and has already been proposed in California. The faculty remains the key. However, it has been amply demonstrated that if one pays proper attention to their "care and feeding", their full cooperation is available.

The Need for Channel Capacity

Low cost of access to cable TV channels is significant only if the programming is extensive. If all that is offered over TV is the typical one or two courses per academic period, then low cost access is unimportant. However, low cost access, combined with multiple channel availability and extensive programming makes the difference. Suppose a university desired to offer a complete upper division (2-year) program leading to an AB degree, by sharing on-campus instruction with cable TV students? Typically, this requires completion of 900 hours of classroom instruction. Suppose, in order to build diversity into the program, the university offers 1800 hours of instruction. If such programming was offered twice per day and twice per year, 7,200 hours of TV time per year would be required. Such programming if run from 8 a.m. to 10 p.m., 7 days per week, 50 weeks per year would utilize 4,900 hours of channel time. Clearly, the university would need at least two channels. With multiple degree programs, it is easy to envisage a need for 4 channels.

What Cannot Be Taught By TV?

Except for those subjects which require "hands-on" experience, the evidence is that most things can be taught by TV, especially when supplemented with interaction at appropriate times and places. The key is not to rely on TV exclusively as the communications medium. If the educational system design is comprehensive, TV can play a major role, but not the total role.

Conclusion

Cable TV can have a large impact on any institution's plans for TV and establishing an "extended university". To make such plans, without at least considering in detail the cable TV option, simply makes no sense in the decade ahead. Perhaps most pertinent, it is possible to accrue a net surplus of income from a cable TV involvement. What is needed first is an "educational system design," one which covers all bases and which includes a "risk-reward analysis" before one penny is spent on hardware.

/

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ENCLOSURE 3

BLACKBOARD BY WIRE

1. Sylvania Electronic Blackboard

   Requires 3 kHz Std. Tel. line

   Transmitter - x-y writing system with roll up pad - generates FM signals

   Receiver - CRT viewed by CCTV camera - camera feeds TV sets

Costs:		
	Transmitter	\$2,500.
	Receiver	3,500.
	Instructor Audio	600.
	Classroom Audio	489.

2. Victor - Victor Electrowriter Remote Blackboard

   Requires 3 kHz Std. Tel. line

   Transmitter - x-y writing system with roll up pad - generates FM signals

   Receiver - similar pen with transparent acetate paper and transparency projector

   Produces hard copy!

Costs:			1974 Prices
	Transmitter	\$ 735.	\$ 1,000.
	Receiver	910.	1,270.
	Projector	595.	

3. Installations -

   Sylvania -

   Texas A & M - 15 school districts

   University of Illinois/Urbana -

   6 cities/6 companies/remote campus (engineering)

   Alabama Polytechnic Institute -

   Engineering from Auburn 250 miles to NASA Space Center in Huntsville -
   2 way graphics

   Associated Christian Colleges of Oregon -

   3 colleges - George Fox, Cascade and Warren Pacific -
   2 way audio and 2 way graphics

   University of Missouri -

   2 way to Mineral Area College - 85 miles

continued ----

3. Installations - continued

Oregon State University -

Corvallis to Bonneville Power, 80 miles to Tektronics and Div. of Cont. Education in Portland

University of Wyoming -

Univ. to schools (6) in-service teacher training.

University of Wisconsin -

Home econ. from Madison to Milwaukee Ext. Center

Wisconsin State University -

In-service teacher training - 4 school districts.

New Mexico State University -

230 miles to White Sands Missile Range and Western New Mexico University in Silver City.

University of New Mexico -

Eng. from Albuquerque to Holloman A.F. Base in Alamogordo 165 miles

Michigan State -

Eng. from E. Lansing 90 miles to Lear Siegler in Grand Rapids also Ext. Div. in Grand Rapids.

University of Tennessee

Georgia Tech.

Texas A. & M.

Katherine Spaulding College

Nazareth College

Stephens College

Bishops College

Central Methodist College

Fisk University

Grambling College

Kansas Wesleyan University

Langston University

Morehouse College

Southern University

Tougaloo College

Drexel Lord Institute

Rhode Island College

State College of Iowa

Northern Illinois University

ENCLOSURE 4

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Technical and Economic Factors in University Instructional Television Systems

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Abstract - An overview of technical and economic factors which need to be considered in university ITV systems is presented. Cost data are presented which should be useful in planning and decision making. The data can be extrapolated for at least three to five years by adding about five percent per year to all costs

INTRODUCTION

BY THE END OF the 1970s almost every major institution of higher education in the United States will be linked with other teaching institutions and with a surrounding community of scholars by live interactive television. Furthermore, a significant number of such systems will be statewide, not just local area line-of-sight ITV systems. In at least a dozen states local area ITV systems will be supplemented with video tape systems which include delayed "talkback" from remote students to on-campus instructors in real time.

Three major university instructional television networks in Florida (GENESYS) [1], Texas (TAGER) [2], and California (STANFORD) [3], relying exclusively on live interactive television, have been in successful operation for a number of years. Smaller scale versions of similar systems have reported excellent results in Minnesota [4], Wisconsin [5], Ohio State [6], Rhode Island [7], and Michigan [8]. More recently, in Colorado [9], Tennessee [10], and Iowa [11], video tape systems have been operating with considerable success. A recent paper [12] presented at WESCON 1969, summarizes related activities during the past decade and projects probable activities during the decade of the 1970s. An earlier paper [13] outlines the conceptual design of university ITV networks and creates part of the foundation on which universities can arrive at a rational decision relative to participation in similar activities.

This paper will describe typical methods of linking teaching institutions with off-campus students. In discussing ITV systems the paper is concerned primarily with transmission methods. A fundamental assumption is made that the on-campus environment will be studio classrooms similar to those used in the GENESYS, TAGER, and Stanford ITV networks. To get a broad base of support from the faculty, a classroom rather than a studio environment has proven to be essential.

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There are a multitude of transmission means of linking institutions with off-campus students. They fall into two general categories, area coverage systems and point-to-point systems. Area coverage systems include VHF/UHF broadcast TV, CATV, Instructional Television Fixed Service (ITFS), video tape, and satellites. Point-to-point systems include common carrier, private microwave, ITFS, and cable. All of these will be discussed. Examples will be presented of several large scale television systems together with capital and operating cost data. Talkback is presented as a separate topic.

AREA COVERAGE ITV SYSTEMS

VHF/UHF

The earliest area coverage systems for educational purposes use standard VHF/UHF TV transmission. These systems broadcast from an omnidirectional antenna and reach all standard TV receivers over a broad area. This mode of transmission reaches thousands of students with one-way TV. Talkback is impractical because of the large number of students in any one class. VHF/UHF systems will generally not be useful for university ITV systems. Channel allocations are restricted and are not available for servicing a small group as opposed to the general public. Capital and operating costs [14] are relatively high. Capital costs range between \$250 000 to over \$1 000 000. Annual operating costs per channel range from about \$120 000 for a minimum operation to over \$400 000 for a professional operation.

CATV

In analyzing the potential role of CATV it must be understood that a CATV system replaces only the radiation portion of a television system. The TV signal is transmitted by wire to multiple users rather than being picked up directly by their TV sets. In a university ITV system half of the system capital costs are represented by studio classroom, studio control room, and master control room facilities. The other half of the costs are allocatable to the transmission system.

In a given geographic area the ITV network will cover many cities. Some of these cities may have CATV systems, and some may not. In almost every case each city makes its own arrangement for a CATV system. Often, in contiguous towns, different CATV systems companies are involved. This means that, with a high probability, a university ITV

TABLE I
COST OF RECEIVING AND TALKBACK EQUIPMENT
FOUR CLASSROOM - FOUR CHANNEL

	ITFS Transmission (dollars)	CATV Transmission (dollars)
Head end receiving equipment	1100	
TV receiver or monitor with connection, mount, etc	2940	2940
Time share talkback with antenna, transmitter, and matching cable	4190	4190
Engineering, installation, and installation supervision	2520	2520
Total purchase price	10 750	9650
CATV rental price		5/mo
Monthly cost for 10-year equipment lease (includes interest charges)	179 mo	166/mo

network will need a TV transmission system to provide for the total area coverage desired [15].

It can be concluded that the major savings potential inherent in CATV tied in with university ITV networks is at the receiving end of the system; no savings are likely at the university end except in special cases.

In analyzing the potential savings of using a CATV system for local distribution of the university's ITV signal three assumptions must be made. First, the CATV company must have channel capacity available and be willing to dedicate it to the ITV system. Second, the CATV company must be willing to distribute the ITV signal at normal CATV rental costs, typically five to six dollars per month per user. Finally, the FCC must be willing to go along with such utilization of the CATV system The FCC will probably not object to such utilization, but they have never been asked to rule on the subject If the distribution cost changes from the above assumption, it will only change upward and in the direction of making CATV distribution less attractive.

In some CATV systems extra wires are being installed in addition to the TV signal cable in order to allow for future communications from the users back to a control point. It is not possible to use these wires for talkback to the university ITV system Such talkback lines must be truly dedicated to be useful. However, these audiowires may be used in "sampled" response systems where the student can reply to questions posed by the instructor by means of a preset code Such a response is not the kind of true interaction deemed essential in the university teaching process. It does provide an indicator to the instructor of the degree to which students are learning.

Table I shows the estimated cost of receiving equipment and services and the cost of time-shared talkback transmitters for companies participating in an ITFS ITV system. Also shown are the equivalent costs if CATV is used instead of broadcast transmission The comparison is based on a four-channel system with four receiving classrooms. As shown, the existence of a CATV distribution system will save the equivalent of $13/mo compared to a total cost of $179 mo without CATV, or less than 10 percent of the total company site cost. This potential savings, as previously indicated, can only be achieved in very special circumstances. Clearly, it is worth exploring the possibility of making such savings, but it is unlikely that the existence or nonexistence of a CATV system will effect any decisions relative to the economic viability of a given university ITV network.

ITFS

A third type of area coverage system is ITFS. In 1963 the FCC allocated 31 ITFS channels in the 2500–2686-MHz band. By July of 1969 there were applications for 174 channels, and 38 channels were in use. As of January 1971 there were 65 ITFS systems and 157 channels operational. Only a handful of these were allocated to institutions of higher education. These channels use the standard TV format and are typically allocated in groups of four. Maximum transmitter power output is restricted to 10 W/channel. However, the area of coverage can be considerable. At 2.5 GHz transmitting and receiving antenna gain is high compared to VHF and UHF antennas.

ITFS stations can cost as little as 15 percent of a VHF /UHF broadcasting station's capital costs. Operating cost ratios are even lower. Ratios of 20:1 in favor of ITFS are not unusual. Tables II and III give the annual operating budget and capital cost for a typical university ITV system using ITFS TV transmission. Analysis of twelve university ITV systems show the operating cost range to be between $10 to $30 per channel per hour.

The Stanford ITV network [3] is an example of an operating ITFS system. Fig. 1 shows the geographical distribution of the present 28 participating organizations. It also illustrates the actual use of an omnidirectional (160) antenna for area coverage out to 25 mi, and power dividing into two supplemental antenna beams to service San Francisco and Berkeley, both about 40 mi from Black Mountain.

The Stanford four-channel system costs about $625 000. This includes 4 studio classrooms, 4 satellite classrooms, a studio auditorium, master control, 4 microwave studio-transmitter links, four-channel ITFS transmission facilities, ITFS response station receiving facilities, transmitter-studio link, and engineering design, installation, checkout, and consulting fees.

Video Tape

Video tape can be used to implement an ITV system. A salient characteristic of this approach is that the off-campus student receives his instruction delayed in time from the on-campus student. Typically the campus lecture is videotaped while it is being given to the regular class. The tapes are then delivered to the off-campus students by any convenient means. The off-campus student plays the tapes at his location and convenience. He then can talk back to the instructor during prearranged office hours. The video tape system enjoys a geographic advantage over the live system in that line-of-sight between the campus and the receiving location is not a requirement. Theoretically the off-campus student could be located anywhere in the world.

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TABLE II

UNIVERSITY ITV SYSTEM ANNUAL OPERATING BUDGET

Item	8 Hours Day Channel Channels 1 (dollars)	2 (dollars)	3 (dollars)	4 (dollars)	Notes
FIXED					
Director	9000	9000	18 000	18 000	assume ½ time for 1 and 2 channels
Secretary	0	0	3000	6000	assume school supplies part-time for 1 and 2 channels, one-half time for 3 channels
Chief engineer	16 000	16 000	16 000	16 000	
Engineer	0	5000	10 000	10 000	½ time for 2 channels, full for 3rd and 4th channels
Engineer (2nd)	0	0	0	5000	½ time from school
Driver	2000	2000	4000	4000	½ time for 1 and 2 channels, full time for 3 and 4 channels
Direct labor	27 000	32 000	51 000	59 000	
Overhead at 20%	5400	6400	10 200	11 800	
Car	1000	1000	2000	2000	
Tower rental	5000	5000	5000	5000	
Sub-total FIXED COSTS	38 400	44 400	68 200	77 800	
VARIABLE					
Operator costs at 2.50/h	3500				1400 h, 1 channel
		7000			2800 h, 2 channels
			10 500		4200 h, 3 channels
				14 000	5600 h, 4 channels
					assume 8 h/day/channel, 5 days wk, 35 wk yr
TOTAL OPERATING COST	41 900	51 400	78 700	91 800	
Cost/h	29.90	18.30	18.75	16.40	
	30/h	19/h	19/h	17/h	

TABLE III

UNIVERSITY ITV SYSTEM CAPITAL BUDGET

	Number of ITFS Channels 1 (dollars)	2 (dollars)	3 (dollars)	4 (dollars)
Consulting and legal fees	20 000	20 000	20 000	20 000
Program management, design engineering and drawings	35 000	35 000	35 000	35 000
Installation and test	44 000	57 000	69 000	80 000
Studio classrooms equipment	23 000	46 000	69 000	92 000
Studio control	19 000	37 000	56 000	74 000
Master control	8 000	27 000	46 000	49 000
RF transmission equipment emergency power	75 000	88 000	102 000	116 000
Talkback receiving equipment	26 000	27 000	29 000	30 000
Spare parts	6000	12 000	18 000	24 000
Test equipment	15 000	15 000	15 000	15 000
Totals	271 000	364 000	459 000	535 000

Unfortunately, while television is a mature technology, video recording systems are undergoing great changes. Up through 1969 every manufacturer had his own format in 1/2-in or 1-in tape machines. Interchangeability between manufacturers was impossible. Reliability and head life left much to be desired. Video tape performance was widely variable even from a given manufacturer, and video tape wear and VTR head wear were problems. Nevertheless, in the period of a remarkably few years, inexpensive machines have been developed, some selling for under $1000, which can give excellent performance under controlled conditions.

In 1969–1970 a number of developments were close to fruition which will profoundly change the situation of delayed TV systems in the 1970s. These include:

1) format standardization of video tape recorders;
2) contact duplication of video tapes;
3) video tape cassettes;
4) Avco's Cartrivision;
5) the CBS Electronic Video Recorder (EVR);
6) RCA's Selecta Vision.

Perhaps the outstanding example of a video tape system is the Colorado State University Research in Graduate Education system (SURGE) [16]. This system serves 14 companies along the eastern slope of the Rocky Mountains, stretching from Fort Collins to Colorado Springs 140 mi away.

Capital costs of a typical video tape system include the on-campus classroom origination facilities, which are the same as for a live TV system plus a recording facility. A recording facility to service two studio classrooms costs about $45 000 and a reuseable supply of video tape about $40 000. Operating costs are about the same as a live system and will range between $10–$30/h.

Both the University of Tennessee and Iowa State University have already implemented video tape systems of their own. The initiation of many similar systems in the next few years is a certainty.

Satellites

Echo, the first communications satellite, was launched in 1957. Since then, in quick succession, have followed Courier, Telstar, Relay, Early Bird, and now the Intelsat series. The channel capacity has increased from a single telephone channel to hundreds of telephone channels and up to 12 television channels. Up to 40 television channels are now being proposed. The enormous channel capacity of satellite relays, coupled with the great distances covered by a single hop, typically 3000 to 7000 mi, make communication satellites potentially the least costly most effective means of long distance communication known.

This statement on cost is, of course, relative. The key cost to consider is the cost per student contact hour. For university level programs, particularly if credit is to be given and the talkback mode is used, the cost of satellites as a transmission medium is prohibitive. As a mass communications medium the cost factors are attractive. The use of satellites will also be attractive for occasional worldwide seminars and interchanges between widely separated institutions.

Point-to-Point ITV Systems

Microwave point-to-point systems (2, 6, or 12 GHz) are commonly used for applications where several relays or hops are in series. For example, transcontinental network television uses over 100 relays for this purpose. These systems are FM FM systems rather than AM FM systems such as in standard TV. They have better differential phase and gain as well as noise characteristics than AM–FM systems and are, therefore, superior for relaying service. Where microwave point-to-point systems are contemplated for use in area coverage, each receiving location requires a separate receiver transmitter link for each channel of ITV. Thus an ITV system reaching 40 companies with four simultaneous channels would need as many as 160 separate receivers and a large number of transmitters and antennas.

Capital costs for point-to-point microwave systems are approximately $15 000 to $20 000 per channel per location. In contrast, an ITFS or VHF UHF system merely requires a single transmitter for each channel and a single multichannel receiver at each receiving location. Clearly where a large number of receiving locations in a given area are contemplated, point-to-point microwave is prohibitively expensive.

Common Carrier Microwave

The first (1965) large scale instructional television operating system (GENESYS) uses point-to-point common carrier microwave. GENESYS originates programs on the University of Florida, Gainesville, campus and at Cape Kennedy, Orlando, and Daytona Beach. Receiving only sites are located at Patrick AFB, Kennedy Space Center, the Naval Training Device Center, and Boca Raton (Fig. 2).

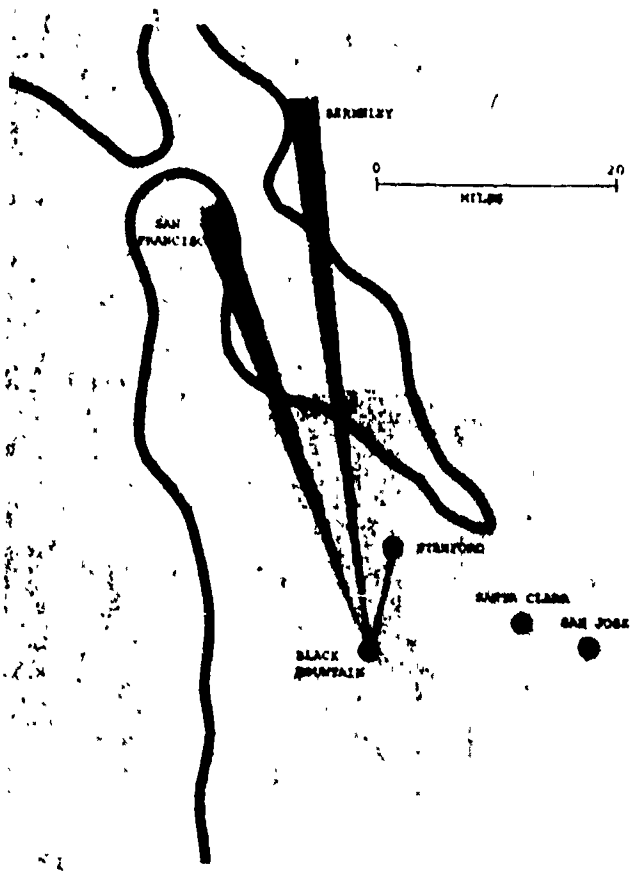

Fig 1. Stanford ITV network.

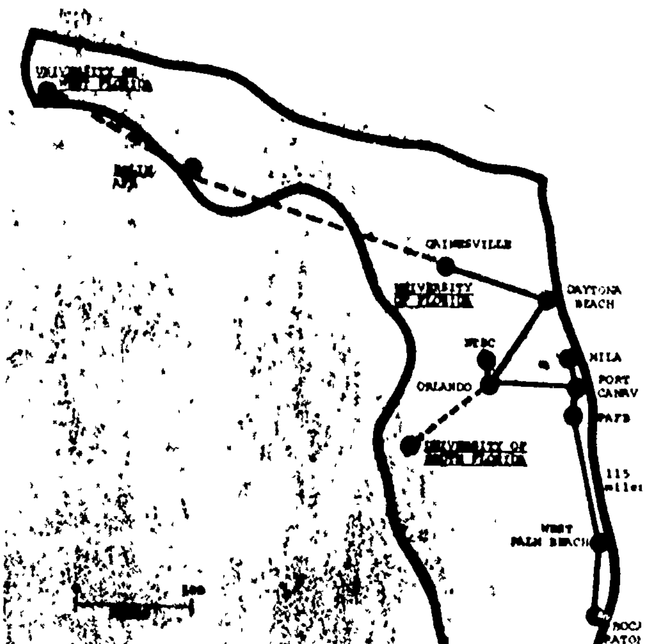

Fig 2. University of Florida ITV network.

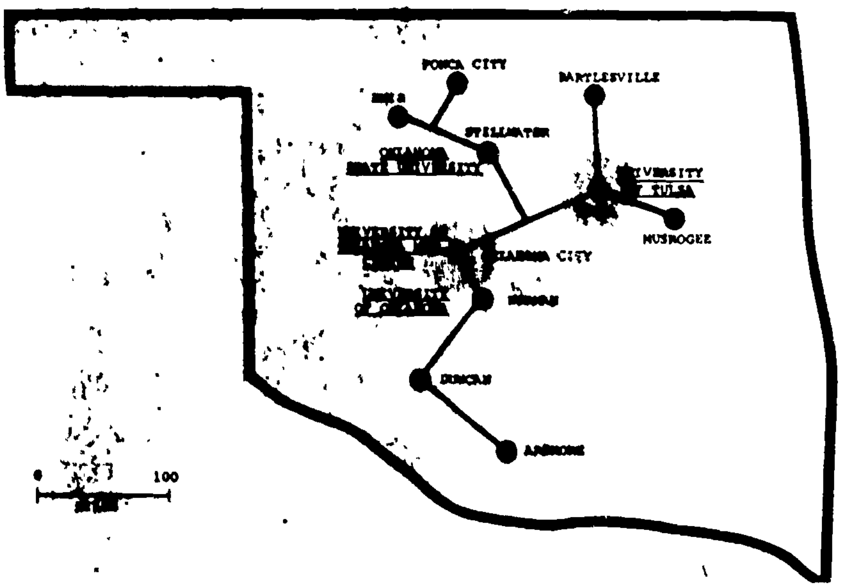

Fig. 3. State of Oklahoma ITV network.

In GENESYS the point-to-point microwave and audio facilities are leased from the telephone company. The leased line costs are over $150 000 per year. Projected ten year lease costs will exceed $1 500 000. The system was funded by an appropriation of $1 511 000 by the Florida state legislature.

Private Microwave

The TAGER ITV system [17] is a private point-to-point microwave system which interconnects 7 teaching institutions and 11 companies. It is owned and operated by TAGER with leased telephone lines for talkback. Cost analysis studies by TAGER comparing owned and operated facilities versus leased common carrier facilities indicated a 50 percent cost savings in favor of owned and operated when amortized over 10 years.

Capital costs for the microwave backbone system are estimated at slightly over $1 000 000. The first typical receiving channel cost is $40 000, with additional channel costs of about $20 000 each.

Because of cost considerations, TAGER is converting from a completely point-to-point system to an ITFS system with a microwave backbone. ITFS will be used for area coverage and microwave will be used to interconnect areas.

The State of Oklahoma ITV network [18] is another example of a private point-to-point microwave system servicing several ITFS area systems. A microwave relay system will transmit televised courses from four campuses to eight cities (Fig. 3). The central control tower is to be located at the University of Oklahoma Medical Center in Oklahoma City. Courses will be broadcast from the Medical Center, the University of Oklahoma campus in Norman, Oklahoma State University at Stillwater, and the University of Tulsa at Tulsa. Closed circuit two-channel ITV classes will be received in Tulsa, Oklahoma City, Muskogee, Bartlesville, Ponca City, Enid, Duncan, and Ardmore. The 19-hop microwave contract has been awarded for $888 835. The total anticipated cost, including the ITFS transmission equipment and the studio classrooms, is 1.7 million dollars.

ITFS

ITFS can also be used for point-to-point microwave. The main difference from regular point-to-point microwave service lies in the type of modulation. ITFS uses standard TV AM–FM modulation versus FM–FM for regular microwave point-to-point systems.

The choice of ITFS versus microwave must consider distance, number of channels, number of relays, color versus black and white, precipitation statistics, and other factors. There are some generalizations which are pertinent. If the system is to transmit color, added equalization will almost surely be needed in an ITFS system of over two hops. ITFS signals are not significantly affected by precipitation, whereas 6 GHz and 12 GHz microwave are. An ITFS down converter is much less expensive than a microwave receiver (about 1:6), and yet it can receive simultaneously four ITFS channels. Therefore, on the receiving end of a four channel system, a 24:1 cost factor in favor of ITFS exists. In some cases multiple channels (up to four) can be transmitted through a single ITFS transmitter. Fading at 2–2.5 GHz is considerably less than at 6 GHz or 12 GHz. All solid-state transmitters exist for microwave, but not for ITFS at this writing. It is fair to say that, in considering any point-to-point application, both the ITFS and microwave options should be analyzed before making a design decision.

Cable

Cable can be used for point-to-point transmission. There are three choices, the telephone company, CATV, or privately owned cable. Privately owned cable will cost about $8000 per mile if installed on poles, and can cost well over twice that if put underground. CATV is always a special

TABLE IV

TELEPHONE COMPANY CHARGES FOR VIDEO SERVICE (1971 RATES)

Line Charges	Under 25 mi[a]	Over 25 mi[b]
First channel	$20/mo/¼ mi	$30/mo/mi
Second and third channels	$2.50/mo/¼ mi	$16/mo/mi
Fourth and fifth channels	$2.50/mo/¼ mi	$10/mo/mi
Terminal Charges		
First channel input equipment	$50/mo[c]	same
Second–sixth channels input equipment	$20/mo/channel[c]	same
First channel output equipment	$12/mo[d]	same
Second–sixth channels output equipment	$6/mo[d]	same

[a] Basic one time termination charge of $785/channel.
[b] Basic termination charge not specified.
[c] Basic termination charge of $850/channel.
[d] Basic termination charge of $270/channel

case for each area, and was treated earlier. Telephone company charges for video service are independent of whether they use cable or microwave—it's their choice. Charges will depend on the number of video channels required, and are based on a ten year amortization plan. Termination charges are considerable. See Table IV for typical rates.

TALKBACK IN ITV SYSTEMS

This section will deal with the technological approaches to talkback in ITV systems and the costs relating thereto. Unlike the basic ITV system, which can be point-to-point or broadcast over a wide area, talkback systems are all point-to-point systems. In all cases, each user need be connected point-to-point only with the originating source. The interconnection between a given user and all other users is always handled by retransmission using the basic ITV transmission facilities.

There are three common ways in which talkback can be handled, telephone, standard microwave equipment (FM multiplex radio), and ITFS response stations (FM 2.6 GHz radio) [19]. In each application cost and performance criteria must be evaluated, and tradeoff studies must be made. Performance criteria to be considered include bandwidth, distortion, and noise. In all applications one should assume the need for a dedicated service because of the large number of hours of programming, and because dialup telephone service has proven, in practice, to be unsatisfactory. Bandwidth and distortion considerations govern the potential use of the system for both voice and data. If data are to be handled then data rate and other technical specifications become a factor.

In practice the major consideration becomes cost. There is no talkback function that can be performed by FM radio that cannot be performed with telephone lines. Telephone lines can be used in any application, whereas ITFS response stations are restricted by FCC rules to use with ITFS TV transmission systems. Microwave FM radio can be used anywhere except in areas where the spectrum is already fully committed. However, it cannot be used at a common frequency from multiple points to a common point in a given area. This, therefore, means separate receivers to receive talkback from each remote location, and the cost becomes prohibitive compared to ITFS response stations. ITFS response stations can all operate at a common frequency and, therefore, can utilize a single talkback receiver for all remote users.

In all cases signalling capability should be included. The optimized talkback system is one which allows a remote student to ask a question and get direct undelayed access to the classroom if the instructor is willing to be interrupted. However, it should also allow the instructor the privilege of not being interrupted if he so chooses. In that case the instructor needs a signal, usually a light, which indicates to him that a remote student wants to ask a question.

In configuring a telephone approach to talkback it is advantageous to get all sending points in a given exchange to join at the exchange and, with one set of lines, go between exchanges. The costs to go from within an exchange area to the exchange point are defined as intraexchange (local) costs. There will be as many of these costs to add up as there are participating organizations in an exchange area. The cost to go between exchanges are interexchange costs. There should be only one set of these costs between any two exchanges. If two exchanges are located in different states, then the costs are determined by interstate rather than by intrastate rates.

All lines should be simplex (one way only) service. All lines should be truly dedicated. They should not be shared with any other service, nor should they be connected at battery points or in any other way with another service, or else noise problems are probable.

Telephone company rates are governed by state public utility commissions (PUC) or by the FCC. FCC controlled rates are almost always lower, and they apply to program grade lines for broadcast service Some telephone companies will interpret "broadcast service" in a way which prevents them from using FCC rates for a university ITV network. Others will use the lower rates automatically. In Table V California PUC rates as well as FCC rates for different services are shown to illustrate the significance of the cost differences.

Specially treated voice bandwidth circuits are available for data use [20]. For 24-h dedicated intrastate service these lines all cost $3.65/mi/mo, plus special conditioning charges per month per connection. The conditioning charges which go with each grade line are as follows. 2001, 3002 ($0). C1 ($10), C2 ($38), C4 ($45.50).

In September 1968 a quotation for talkback channels was received by Stanford from the Pacific Telephone and Telegraph Company which conforms to the intrastate FCC 260 rates shown in Table V. This quotation was based on 6005, Schedule A, 100–5000-Hz program grade lines. It is of interest to extrapolate what it would have cost the existing 27 organizations which support the Stanford ITV network over a ten-year period based on this quotation and compare this cost to the alternative approach (actually

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TABLE V

TELEPHONE COMPANY CHARGES FOR AUDIO SERVICE

Designation	Technical Characteristics	Intrastate FCC/PUC Local Mileage Charges	Intrastate FCC Interexchange Charges	Intrastate PUC Interexchange Charges	Station Connection Charges Monthly
2001	300-2700 Hz response not guaranteed—signaling included		$3.65/mi/mo 24 h service		less than 25 mi $10 each term; more than 25 mi $20 each term
6003 (Schedule C)	200-3500 Hz speech quality limited distances, non-equalized	$3.50/mo first ½ mi $11.25/mo each addl. ½ mi	$4.00/mi/mo 24 h service	$5.20/mi/mo/24 h + $60/mo/bridging connection	
6005 (Schedule A)	100-5000 Hz music and good quality speech	$3.75/mo first ½ mi $1.50/mo each addl. ½ mi	$4.25/mi/mo 12 h service	$9.20/mi/mo/24 h + $250/mo/bridging connection	$93/24 h (not required for less than 25 mi)
6007 (Schedule AA)	50-8000 Hz orchestra quality	$3.85/mo first ½ mi $1.60/mo each addl. ½ mi	$6.35/mi/mo 12 h service	not offered in Calif.	$149/24 h (not required for less than 25 mi)
6009 (Schedule AAA)	50-15 000 Hz opera quality	$4.10/mo first ½ mi $1.85/mo each addl. ½ mi	$7.95/mi/mo 12 h service	not offered in Calif.	$185/24 h (not required for less than 25 mi)
(Signaling)		$2/mo/½ mi	$0.75/mi/mo		$5/connection

used) of doing the same task with ITFS response station FM radio:

Telephone Company Charges (10 years)	Monthly Charge/Channel
61 interexchange miles at $4.50/mi	$ 274.50
28 station connections at $55/connection for 8-h service	$1540.00
61 interexchange miles at $0.25 mi/hr for 4 incremental hours	$ 61.00
27 local connections at $11.25/connection (assuming 1½ mi local connection)	$ 303.75
	$2179.25

Over a period of ten years, and for four channels of operation, the total telephone company charges for talkback would be:

$$2179.25 \times 4 \times 120 = \$1\,046\,040.$$

Alternatively the cost of 4 simultaneous channels of FM radio (ITFS response station) transmitters is $12 500. Assuming 5 percent for sales tax and 5 percent per year for maintenance, the total cost to 27 companies for such equipment over a ten-year period is

$$12\,500 \times 27 \times 1.05 \times 1.5 = \$531\,563.$$

This amounts to over $500 000 less than the equivalent cost of telephone lines.

Recently a new version of the ITFS response station transmitter has been developed which permits time-shared talkback. A single transmitter can service 4 channels (actually up to 8 channels), but only 1 channel at a time. Switching is automatic. As long as the transmitter is keyed by the microphone switch of a given student, no other student can [illegible] until the first student releases his switch. At that point, any other student has access to the transmitter for his own use.

The approach of time-shared talkback may be inconvenient from time to time, but not often. In a given off-campus classroom, students will tend to question each other and discuss problem areas among themselves before using the talkback system. For this reason there is a tendency to get one question per off-campus classroom rather than one question per student. Under these circumstances the use of time-shared talkback makes considerable sense.

A 4-channel time-shared talkback transmitter costs $4000. This would reduce the ten year cost to 27 companies to

$$\frac{4000}{12\,500} \times \$531\,563 = \text{approximately } \$170\,000.$$

This approach would have resulted in a saving of about $876 000 relative to phone line costs.

Obviously less expensive phone lines could be used. However, based on a demonstration setup by the telephone company for Stanford, which directly compared the performance of an ordinary voice grade line to the Schedule A line discussed previously, all persons present were quite satisfied with the Schedule A line performance, and not at all satisfied with the performance of the voice grade line. Recently, this experiment was repeated by the University of Minnesota, Minneapolis, with the same results. This is the reason for using the Schedule A line as the basis of the cost comparison.

Microwave FM radio is widely used for voice and data communications circuits. In the Stanford system it is used to transmit talkback from the transmitter site to campus with all 4 voice channels plus telemetry signals all multiplexed on a common 12-GHz carrier. In this same system the companies use ITFS response stations to reach the transmitter site where all incoming signals are received in a common receiver, demodulated, and multiplexed on the 12-GHz carrier for retransmission to Stanford. Microwave FM systems will be used for talkback where talkback repeaters are needed or where multichannel single point-to-single-point service is required.

Summary and Conclusions

University ITV networks will be feasible only with area coverage systems. Of such systems only two can be expected to be economically viable for a significant amount of programming, ITFS and video tape.

Utilization of satellites for educational purposes will probably be sensible only where many thousands of students need to be reached simultaneously and where talkback is not required. In higher education the occasional use of satellites for worldwide seminars may be expected, but not for regular credit courses leading to degrees.

CATV and VHF/UHF TV may be usable, but only in special cases. It is unlikely that CATV can ever service an entire network area covering many cities. It is likely that it can be used in some cities in certain geographic areas. If VHF/UHF channel time is available to a university at a low cost (less than \$50/h) then some utilization may be sensible. However, these stations cannot exist by selling time at such low rates, and the pressures will be high and continuous to either raise the rates or reduce the hours made available for university purposes.

Video tape systems are the least expensive way to get wide area coverage. They have particular merit wherever a live ITV system cannot be economically justified. They have merit as a way to get started and as a first step towards a live ITV system. Video tape systems do require extra faculty time if delayed talkback is used, as it should be. This means released time for the faculty and represents a significant cost. The most efficient use of a video tape system is to supplement a live ITV system. In this way the off-campus students get the best of both.

Because of performance, cost, versatility, channel availability, and privacy, ITFS has to be the most important system approach to a university ITV network. A survey of university plans throughout the country makes this fact self-evident.

Point-to-point ITV systems play a vital role in most university ITV networks. They are used for studio–transmitter links, for repeaters to distant locations, and for service to special points not reached by the area coverage antenna. For short distances on owned land, privately owned cable may be the choice. For longer distances privately owned microwave or ITFS may be best. Common carrier service will always be more expensive. It is used where the university does not want system responsibility and is willing to pay a premium to an outside operator.

For talkback, phone lines, ITFS response stations, and microwave will all be used. Often they will be used simultaneously. Cost tradeoff studies must be made in each case to choose the optimum low cost system.

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Appendix D-2

EDUCATIONAL COGNITIVE STYLE:

The Value of the Concept for Educational Delivery Systems

A REPORT

Submitted to

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July 10, 1974

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EDUCATIONAL COGNITIVE STYLE:

The Value of the Concept for Educational Delivery Systems

The purpose of this paper is to provide background information about the concept of Educational Cognitive Style as it has been conceptualized by Dr. Joseph Hill (currently president of Oakland Community College, Oakland, Mich.). This paper will also attempt to present some applications of the concept to learning environments and will address itself to the question "What can Educational Cognitive Style mapping do to guide the selection of media hardware and software in a neighborhood learning center for the adult urban disadvantaged?"

The information herein is based on the author's background in audio-visual instruction and the practical application of the concepts of Cognitive Style mapping to the individualization of learning opportunities. The term "learning opportunities" is used deliberately because he feels that teaching strategies and instructional applications must be selected <u>after</u> considering the learner's needs. (Scholl, 1972) The learner should be the central concern in all our undertakings. Educators will be successful as educators only if their students are able to learn what they need to learn.

<u>The Learning Process</u>: The learning process has been discussed by this author previously as a suggested focus for instructional developers. (Scholl, 1972) It might however, be worthwhile at this point to review this basic model to give the reader a visual representation so that educational cognitive style and learning environments with their associated factors can be seen in perspective.

Figure 1. Basic Learning Model

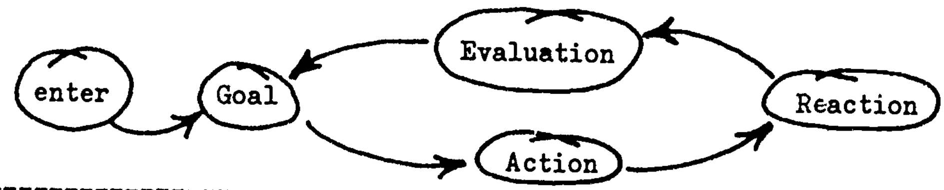

Figure 1 illustrates the basic learning model. The model can be made more elaborate by adding subcategories under each of the four headings of GOAL, ACTION, REACTION and EVALUATION, but it cannot be made simpler. Each item in the basic model depends upon the item which precedes it in the circular flow. Entry into the learning cycle is always at the point of the GOAL. Goals come first.

The very first GOALS of the human organism are biological in nature. Since our basic concern is human learning we must point out two of the basic assumptions of the Educational Sciences. They are first, that man is not content with biological satisfactions alone and therefore continually seeks meaning and second, that man is a social creature with unique capacity for deriving meaning from his environment and personal experiences through the creation and use of symbols.

The first meaning for the human organism is in the qualitative area. As the five senses become more highly developed each takes its place in providing information to the organism. For the human learner, at the earliest level, the GOAL is food. See Figure 2. The ACTION is crying, the REACTION is feeding and the EVALUATION is relief from hunger. This leads the organism to evaluate crying as the appropriate ACTION to reach the GOAL of food. Figure 2 gives additional examples. Implicit in this discussion is the fact that we are dealing with human learning and that human beings vary in their ability to learn from the results of their actions and subsequent reaction.

Human learning is a very complex process even though it follows the four basic steps outlined in the learning model. Two things become evident as one looks at the model -- first, human beings can remember and therefore are able to build up a lifetime of EVALUATIONS which we call experience. These evaluations are colored in large part by reactions of people around the individual as well as his physical environment. Second, we should note that learning is deeply involved with memory, colored with feelings and limited by past experiences. Therefore, the understanding of learning and the application of an appropriate educational strategy to the learning process needs an all encompassing, practical system of dealing with these many issues.

An attempt at such a system is educational cognitive style ("cognitive mapping") which purports to state in standarized terminology, the way in which a given student learns.

What is Educational Cognitive Style?

As the concept is used by Dr. Hill and as it will be used in this paper, Educational Cognitive Style emphasizes the word education and is therefore meant to imply a practical, useful application of the psychological concept of Cognitive Style. The term Cognitive Style appears in much psychological literature and reflects the attempts by psychologists to discover new information and develop fundamental laws and principles. Dr. Hill has borrowed the psychological principles written about by Witkin, Merton and many others and applied them to the practical everyday aspects of education.

Figure 2. Learning Cycles

Need	Action	Reaction	Evaluate
L_1 Food	Crying	Food	Good
L_2 Pan on Stove	Touch pan	Pain	Bad - Don't touch that pan on that stove.
L_3 Bowl of hot water	Reach to touch	"Hot" (verbal - no meaning)	Touch anyway
L_3 Bowl of hot water	Touch	Pain	Bad - Don't touch "Hot"
L_4 Pass GED test	Thought	I'm dumb	Forget goal
L_5 Pass GED test	Go to learning center	Positive and helpful attitude-We can help you-Self assuring	I think they can help! I'll try.
L_5 Pass GED	Return to the learning center	"Here is the first thing to do."	I did it. Good!
L_5 Pass GED-Math	Study special learning package	Pass self-test	I can learn Math. I'll try English.
L_5 Pass GED-English	etc.	--	--

In the development of his concept of Cognitive Style, he has established a group of elements which he terms the Educational Sciences.

The Educational Sciences is an applied or derivative field and has the same relationship to psychology that pharmacy has to chemistry, the same relationship that the clinical practice of medicine has to biology. It is Dr. Hill's hope* that the conceptual framework of the Educational Sciences will soon allow an educator to prescribe instructional strategies for individual students much as a medical doctor now prescribes medicine for individual patients or inoculations for groups of individuals.

The Educational Sciences form a common structure within which inquiry of significance into fundamental aspects of education can be conducted.

> The Educational Sciences provide a conceptual framework and scientific language for the applied field of education that approach the level of precision found in such derivative fields as medicine, pharmacy, engineering, law, and nursing. Articulation of problems and phenomena now become possible in terms of the "sciences," and, as a result, inadequate communication and resultant misinterpretation and fragmentation in the field of education are alleviated. (Hill and Nunney, 1974)

Although Dr. Hill has been working with his structural concept of the Educational Sciences for approximately 20 years it must be said that the system is incomplete. Details are constantly being filled in and modifications made as new knowledge is developed by researchers in the fundamental disciplines. In the process of creating and developing the overall concept of the Educational Sciences, Dr. Hill has made some assumptions. These are as follows:

1. Education is the process of searching for meaning.
2. Thought is different from language.
3. Man is a social creature with a unique capacity for deriving meaning from his environment and personal experiences through the creation and use of symbols.
4. Not content with biological satisfaction alone man continually seeks meaning. (Hill and Nunney, 1974)

There are seven Educational Sciences. They are:

1. Symbols and their meanings
2. Cultural determinants of the meanings of symbols

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*I am here interpreting Dr. Hill from his statements made at the Institute for Educational Sciences and from personal discussions during this period of time in addition to discussions at the American Educational Sciences Association in Detroit, Michigan.

3. Modalities of inference
4. Memory concern
5. Cognitive styles of individuals
6. Counseling, administrative, teaching and student styles
7. Systemic analysis decision-making (Hill and Nunney, 1974)

The first four Educational Sciences are considered elements of the larger concept of cognitive styles of individuals. Although there is a theoretical basis for the Educational Science of Memory-concern, at the practical level it is not presently being used as part of an individual's cognitive style. Since this paper is concerned with the educational cognitive style of individuals, the element of memory-concern and the additional sciences of counseling, administrative, teaching, and student styles and systemic analysis decision-making will not be discussed.

The Elements of Cognitive Style

A cognitive style map, in practice, is a pictorial organization and representation of the elements of symbols and their meanings, cultural determinants and modalities of inference. Within the science of symbols and their meanings there are two basic types of symbols: theoretical (T)* and qualitative (Q).

Theoretical Symbols

The theoretical symbols are those which "present to the nervous system, and then represent to it, something different from that which they themselves are." (Hill and Nunney, n.d.) Two types of symbols fit into this defined category. They are words (linguistic-L symbols) and numbers (quantitative-Q symbols). Either of these symbolic forms can be transmitted by sight (Visual-V) or sound (Auditory-A).

The letters c-u-p stand for a physical object we use every day. But the letters and the sequence of the letters themselves have no direct relationship to the physical object itself. The same is true of the spoken word "cup." To rephrase the definition then in terms of the example we can say the word cup as heard from someone's lips presents stimuli to our ears and represents to our receptors something different from the visual and auditory word cup. The same logic can be applied to numbers.

Qualitative Symbols

Qualitative symbols are defined as symbols that "present and then represent to the nervous system of the individual that which they (the symbols) themselves are to that individual." (Hill and

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*Definitions for the unique terms of the Educational Sciences will be found in Appendix A.

Nunney, n.d.) There are three sources of qualitative symbols: (1) sensory stimuli, (2) programmatic effects, and (3) cultural codes.

The first major category of qualitative symbols are the sensory stimuli, our five senses. Auditory stimuli classed as qualitative symbols Q(A) do not refer directly to words but are associated with sounds, tones of music, bird calls, and animal sounds. Visual qualitative Q(V) symbols refer to the ability of a person to see and compare the world of form and color. The qualitative olfactory Q(O), savory Q(S) and tactile Q(T) symbols refer to the human ability to obtain information through the sense of smell, taste and touch respectively. Those individuals who have their five senses functioning at normal capacity will have these elements in their maps. Paraphrasing the general definition, we can say that qualitative symbols associated with the sensory stimuli present and then represent to the five senses of the individual that which they, the symbols (pure sensation of sound, sight, smell, taste, and touch) themselves, are to that individual (music, picture, burning wood, salt or soft).

The five qualitative symbols which are programmatic in nature deal with the individual's ability to synthesize a number of symbolic mediations into a performance demanding monitoring of a complex task, such as playing a musical instrument or typewriting (proprioceptive (P)). The categories refer to the general ability as outlined in the definition and the predominance of right handedness (PD), the predominance of left handedness (PS), the abilities to control body motion (PK) and timing (PTM). Individuals who have natural or developed athletic ability find much meaning in the programmatic part of their environment. Playing baseball requires a great deal of proprioceptive ability. Right handedness and left handedness become important in the strategy of the game while motion and timing of many complex tasks are also involved.

Ten qualitative symbols remain. See Appendix A for definitions. They are associated with cultural codes. People respond to these cultural codes and their response can be measured. Therefore we see that they vary in at least the following ten ways:

1. Their sensitivity for what other people are feeling Q(CEM)
2. Their ability to enjoy "beauty" Q(CES)
3. Their commitment to a set of values, principles, duties and/or obligations Q(CET)
4. Their ability to play a role, to produce an effect on another person Q(CH)
5. Their ability to communicate by and understand "body language" Q(CK)
6. Their ability to perform body movement according to form (dancing, bowling, etc.) Q(CKH)
7. Their ability to judge "proper" physical and social distance Q(CP)
8. Their knowledge of themselves Q(CS)

9. Their ability to "sell" Q(CT)
10. Their ability to respond to time expectations Q(CTM)

Quickly reviewing then we find there are two types of symbols: Theoretical, which can be either words or numbers, and Qualitative, which are sensory, programmatic, or codes. These symbols are used by man to acquire knowledge and meaning from his environment and personal experience. See Figure 3.

Cultural Determinants

The second Educational Science is called Cultural Determinants. There are three cultural determinants of the meaning of symbols, individuality (I), associates (A), and family (F).

A person who displays the individuality determinant is self-motivated. This is reflected by his ability and need to work alone, to make up his own definitions in his own words and to explain a situation in terms that have personal meaning for him.

The person with an Associates determinant will learn more if he can talk to peers and friends of all ages who are not family members. He will try to understand and derive meaning as his ideas relate to the ideas and understandings of other individuals. He will also tend to discuss a situation and present ideas in the words of people he associates with rather than in his own words. The person who has this cultural determinant in his cognitive style will tend to prefer and learn more from small group discussions and related group activity.

The person who has the Family determinant will, if possible, tend to solve problems and look at situations as a relative might. He will also give considerable attention to the thinking and feeling of his family when analyzing a situation for its meaning.

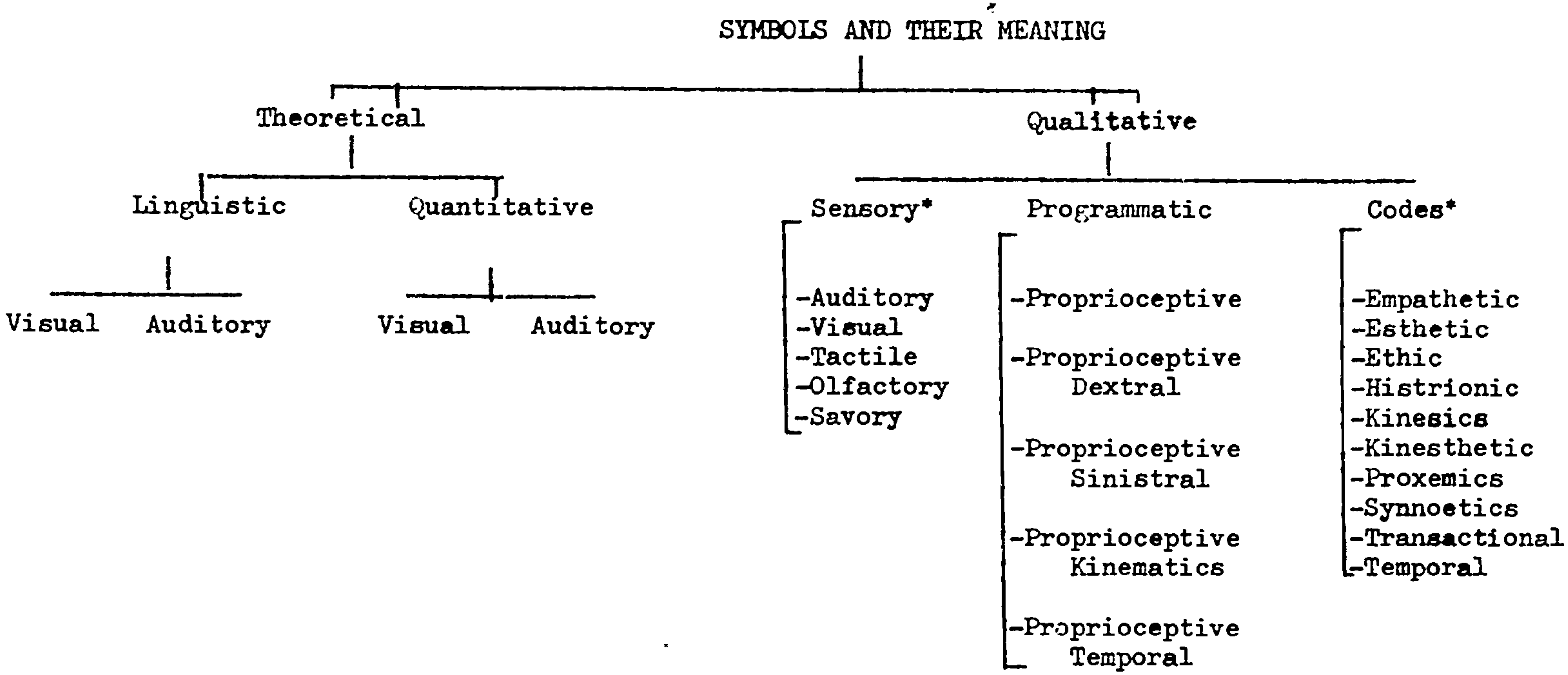
Modalities of Inference

The third Educational Science, modalities of inference, indicates that form of reasoning an individual uses to solve problems. The five modes of inference are magnitude (M), difference (D), relationship (R), appraisal (A), and deductive (K).

A person who uses magnitude as a form of inference to derive meaning will use categorical reasoning. He will classify and use norms when accepting or rejecting a hypothesis and will also have a great need to define things in order to understand them.

The individual who uses difference as a form of inference will have a pattern of reasoning which will be in terms of one-to-one contacts. He will tend to think of differences and to work on a

Figure 3. Symbols and Their Meanings



*See text and appendix for full discussion of individual terms simple one-to-one thought process. This is the person who, in the middle of or after a lecture, will say "Yes, but what if?" This type of thinking characterizes creative individuals who tend to try something different because they want to know "What if?".

The person who uses the form of inference will bring together a number of dimensions and accept or reject ideas on the basis of their likeneses. He will also tend to analyze a situation to discover its individual parts. This person will spend a great deal of time in his thinking process comparing and contrasting elements and solutions.

The person who uses the appraisal form of inference will use all three of the previous inference patterns, magnitude, difference, and relationship and generally will give equal weight to each. He typically will require a great deal of time to come to a decision about any hypothesis. He will be able to look at all sides of an issue or problem but may find great difficulty in making a decision. This person will classify and categorize to determine if one category differs from another, try to analyze all the parts and then synthesize the dimensions before coming to a decision or accepting or rejecting an hypothesis.

The deductive form of inference is based on logic. A person using this type of reasoning will tend to do extremely well at the type of thinking needed for geometry. This person may be very uncomfortable with the idea of inexactness. He will very much prefer a situation where he can reason that if he applies rule one and then rule two the result will be inevitable.

Combining the Elements

Educational Cognitive Style is the product of the elements of the first three Educational Sciences. As elements within each science are determined for an individual they present a profile of the individual. A concerned individual, with a knowledgeable counselor, can use the profile to understand how a person derives meaning from his environment.

The profile or "Cognitive Style Map" has tended to be the most widely discussed part of the seven Educational Sciences. A Cognitive Style Map is shown in Figure 4.

How the Educational Cognitive Style is measured will be discussed in the next portions of the paper. It should be pointed out however, that there are two different kinds of Educational Cognitive Style. One is an "ability style" which is measured objectively and represents what the person is capable of. The other is a "preferred style" measured by preference inventories and represents the style he would choose to use if he had such a choice.

D2-14

Figure 4.

SS NO.	NAME	SEX	CAMPUS
888-88-8880	J D Studt#4	F	9

12 T'(AL)	12 T'(AQ)	12 T(VL)	12 T(VQ)		
Q(CP)	--	--	--		
Q(CET)	--	--	--		
Q(CEM)	--	--	--		
Q(CES)	--	--	--	F	
Q(CS)	--	--	--	I'	M
Q(CT)	--	--	--		
Q(CK)	--	--	--		R'
Q(V)	--	--	--	A'	
Q(O)	--	--	--		
Q'(CKH)	--	--	--		
Q'(T)	--	--	--		
Q'(P)	--	--	--		

TEST	ELEMENT	%TILE	ELEMENT	%TILE	ELEMENT	%TILE
1	T(VL)	70-79				
2	T(AL)	40-49				
3	T(VQ)	60-69				
4	T(VL)	90-99				
5	T(AQ)	26-29				
6	T(VL)	70-79				
R DL VL 11.5						
7,8	Q(CEM)	80-89	Q(CES)	70-79	Q(CET)	90-99
	Q(CH)	20-25	Q(CK)	50-59	Q(CKH)	30-39
	Q(CP)	90-99	Q(CS)	60-69	Q(CT)	50-59
9	I	40-49	A	26-29	F	70-79
10	M	60-69	D	10-19	R	40-49
	L	40-49				

These two styles may agree but generally there is at least some disagreement. College graduates typically prefer to search for meaning by reading (Theoretical Visual (Linguistic and/or Quantitative)). However, because much of higher education consists of searching for meaning by listening (Theoretical Auditory (Linguistic and/or Quantative)) it must be assumed that college graduates are capable of learning by hearing. Suppose also that an individual wanted to learn the fundamentals of American History and government so that he could pass the General Educational Development high school equivalency test. He might be capable of reading the information but he might prefer to listen to it. Given the choice, this student would listen to a radio program or a tape recording to prepare himself for the GED test rather than read the information out of a book.

It might also be noted that Educational Cognitive Style changes over time. If, in the example just given, the student found that listening to a radio program or an audio tape proved to be an inefficient method of getting information (too much time, inability to skim and quickly find facts buried in the center of a tape, etc.) he might come to prefer to read the information he needs to reach the goal he has set for himself.

How Is Educational Cognitive Style Determined?

An Educational Cognitive Style is identified by testing. It is based on standardized tests, specially developed inventories, special constructions, sensory tests, and simple problems with ambiguous instructions.

Constant reference will be made to Oakland Community College (OCC) and its practice of Cognitive Style Mapping and counseling. Dr. Joseph Hill, President of OCC, developed the Educational Sciences concept and is the leading proponent and user of the system. Educational Cognitive Style mapping is only now beginning to be used at other institutions. The practice has been transplanted through the teachings of Dr. Hill and by the pioneering use of mapping at OCC.

The Test Battery

The test series (see Figure 5) administered at OCC to incoming students varies from semester to semester. They are still in the process of trying out standardized tests to determine which ones have the best predictive validity for mapping. They are also trying out, on an experimental basis, new tests of Cognitive Style for which no standardized tests are available. Additionally, some tests have been dropped because they proved to be too difficult to administer due to negative student reaction.

To test a student's ability to derive meaning from the written word, the written analogies test of the DAT test, and English grammar test and the Nelson-Denny reading test are given. Grade level scores

Figure 5. OCC Test Battery

#	Style element	Source	Type	Mode	Timed
1	TVL	Standard	Written Analogies	Read	Yes
2	TAL	Standard/OCC	Short Stories	Listen	Yes/No**
3	TVQ	Standard	Math	Read	Yes
4	TVL	Standard	Reading	Read	Yes
5	TAQ	OCC	Math	Listen	Yes/No**
6	TVL	Standard	English Grammar	Read	Yes
7	Q codes	OCC	IA***	Read	No
8	Q codes	OCC	IA***	Read	No
9	Cultural Determinants	OCC	IA***	Read	No
10	Inference	OCC	IA***	Read	No
11	QV	Standard/OCC	Non-verbal Incomplete Figures	Slides	No
12	QA	OCC	Sound Effects	Listen	No
13	QT	OCC	Pegboard	Touch	No
14	QO	OCC	Scent Tapes 3M	Smell	No
15	QS	OCC	Salt-Sweet Sour-Bitter	Taste	No
16	Q(CP)	OCC	Close-Touch-Point	Observer Check Sheet	No

*indicates a modified test
**indicates a timed presentation and an untimed answer
***Introspective Analysis

and standard scores are determined. The tests for visual-linguistic ability are ones which must be read. They are timed tests. A written math test is also timed. It is given to determine if the student can derive meaning from mathematical symbols in written form. Two additional tests are given to complete the set of timed tests. These consist of an auditory math test to test the ability of a student to gain quantitative information through the auditory senses and a series of short stories, tape recorded from a standarized reading comprehension test, to test the ability of a student to get theoretical linguistic information through the auditory channel.

The ability of a student to receive qualitative visual information is tested by the Raven-Matrices test. It is a non-verbal test of a student's ability to visualize an incomplete figure. An auditory reasoning test consists of sound effects taken from standard sound effect records. A pegboard is used for blind pattern duplication to test the qualitative tactile element. The subjects feel the pattern with one hand and reproduce it with the other hand. Olfactory cards have been supplied by the 3M company of the type used in point-of-purchase advertising. By scraping the fingernail across the olfactory card a scent is released which the student must identify.

Most of the qualitative symbols that are programmatic in nature, the cultural determinants and the modalities of inference, are tested for by the use of introspective analysis inventories. (See Appendix B for sample items) These are like interest inventories in that there are no "correct" answers and they therefore require the respondent to be honest with himself. Although the inventories have built in checks for consistency, it is possible for the test subject to give the tester an incorrect picture of himself. The inventories used at Oakland Community College were made by the staff of the testing center and written in terms and words suitable for young adults who want to attend a community college.

A hand-marking process is available for scoring these inventories. However, OCC uses a computer to score and also to store all individual bits of information.

Scores for all the tests are given in percentile rank. The scores for each element are then placed into one of three categories--major orientation, minor orientation, and negligible orientation. Any subject whose score falls in the 50-100 percentile rank is said to have a major orientation for that element. Any student who falls in the 26-49 percentile rank is said to have a minor orientation for that element, and any student who falls in the 25th percentile rank or below has a negligible orientation.

On the Cognitive Style listing, an element for which a student has a major orientation will appear with no notations (example T(VL)). An element appearing on the map with a prime (example T'(AL)) indicates a minor orientation while elements with a negligible orientation are not listed. Reading Level (R DL VL) which is computed from the standardized reading test is also listed. R DL VL scores are used to suggest remedial reading programs for those students who would most surely fail in regular college classes with large reading assignments.

Informal Methods

Two other methods can be used to "map" Cognitive Style. The first is to simply ask a student if he prefers one mode of information presentation or another. This yields the preferred Cognitive Style as mentioned earlier. Rarely will a person say that he would prefer to read a book if he finds reading difficult. If a student is honest with himself and the interviewer, this method gives a good perspective into what kinds of material will motivate him to try to gain meaning from his environment.

Cognitive Style mapping has been used at the elementary school level and at levels as low as preschool. At these levels the second of the informal methods, observation, is used to determine a Cognitive Style. Observations are made of the student's behavior; things he does when he is free to choose, his reaction to other students in a play situation, his linguistic and computational skill development. At this point, observational mapping is a very tentative sort of thing although people have a very good feeling about the results it gives. Observers must infer from what they see what element in the Cognitive Style is being exhibited. However, as one reads the literature on this, one has the impression that this may be a technique which insures that the teacher will pay considerable attention to individual differences.

Validity and Reliability

Dr. Hill's teaching areas are mathematics and statistics and he does concern himself with validity and reliability. However, with the philosophy that the Educational Sciences is practical, he is very relunctant to quote any statistical figures for fear they might be too literally interpreted.

The Educational Sciences do not purport to exhibit the accuracy required of a scholarly scientific investigation. They are applied or derivative fields of knowledge. Dr. Hill has said he hopes they will be practical and not academic and that they will not be considered a fundamental discipline. He would like to see them considered as practical but not necessarily learned and scholarly. There is no attempt now, nor do I anticipate any attempt being made in the future, to make the Educational Sciences into a fundamental discipline.

A cognitive style map of an individual is useful only as it reflects reality, the reality of student performance and/or the confirmation by observers (in most cases teachers) of the accuracy of the map. This procedure gives a use validity. The map is to be used only as a diagnostic tool. If there is any conflict between student performance and the observers report, the cognitive map is reevaluated. The map is changed if there is a reason to do so, since it is only a tool.

Another factor de-emphasized in the Educational Sciences is reliability. Strict reliability measures are not terribly important as far as the individual is concerned. A person is expected to change over time. As a student acquires more educational experiences and more life experiences, his cognitive style elements should and will change. The student should become better able to more accurately control his response to his environment and to extract meaning from the symbols, both theoretical and qualitative, around him. It is, in fact, the responsibility of the educational establishment (university, community college or neighborhood learning center) to augment the cognitive style elements so that deficiencies will, if possible, be eliminated.

Svagr (1973) states:

> The task of defining valid and reliable tactics for producing cognitive style maps has not been completed. The efforts at the present time should be regarded as exploratory and pioneering. They are limited to empirically determining profiles or an entire map, hand-scoring an interest inventory, or using the computer to score and organize the results of an extensive paper-pencil inventory. As the need for a Cognitive Style Mapping becomes greater, more variations will be developed. If the Cognitive Style Map permits the teacher to select a successful method for a student, the map, however obtained, is valid. The critical variable is predictive validity for success for the student. The sophistication of the evaluative instrumentality is not the primary concern and is always secondary to the predictive validity for the student.

No student should fail because he is unable at any moment to extract meaning from his environment. A student, weak in a particular cognitive element, should be given supplementary training if possible. At the very least he should have this weakness pointed out to him so that he can make an attempt, if he wishes, to develop himself as an individual. On the other hand, strengths should be emphasized also so the individual can use these to his advantage.

Psychology and Cognitive Style

The fundamental discipline of psychology deals with various aspects and relationships suggested by the four part basic model of learning. One problem psychology deals with is the question of how the spoken word "hot" becomes associated with the feeling of pain of hot. One group of researchers looks for associations and another group looks for connections. Other psychologists look for the relationship of stimulus and response and still others look at the conditions under which operant behavior becomes conditioned. Another group has a theory of motivation, while Gestalt psychology attributes learning to "insight". These fundamental disciplines are attempting to establish principles and laws of learning while the educator is concerned with helping an individual meet his own and/or society's goals.

A group of psychologists are doing what they call ATI--Aptitude Treatment Interaction--research (Bracht, 1970; Coop and Sigel, 1971; DiVesta, 1973; Hall, 1974; Haskel, 1971; Koran, 1972; Snow and Salomon, 1969; Salomon, 1972). Basically, their work involves trying to isolate a particular application aptitude (similar terms found in the literature are trait, ability, Cognitive Style element) and then finding and isolating a treatment (similar terms are learning strategy, teaching strategy, method) that, when applied to individuals with the identified attribute, will consistently give the best learning score. It should be pointed out again that this effort on the part of psychologists has as its goal the development of new knowledge, laws, and principles. With this goal psychologists must control their stimuli and in most cases they work with meaningless or esoteric subject matter. All of the concepts of the Educational Sciences were verified, referring to psychological literature similar in nature to the ATI research now being reported.

Scientific researchers are understandably reluctant to make unqualified statements of results. The following quote from Haskell (1971) is typical of the present results of ATI research.

> The programmed learning environment tended to favor those who were inclined to be slow and methodical (low general activity) and/or who could be characterized as agreeable and easy to get along with (high friendliness), while those who were more likely to be characterized as aggressive (low friendliness) appeared to perform better under the conventional type of instruction. (p. 293)

Koran (1972) is also somewhat cautious and feels that perhaps

> ...ATI research may serve as a basis for selecting subjects more likely to profit from either self-paced or conventional classroom instruction. Moreover, self-paced programs may be able to provide different instructional materials for different types of subjects within the program. (p. 14)

Psychological researchers are looking for specific aptitudes which have an effect on instructional treatments. General ability measures such as intelligence are not very useful. Bracht (1970) writes:

> Despite the large number of comparative experiments with intelligence as a personological variable, no evidence

> was found to suggest that IQ score and similar measurements of general ability are useful variables for differentiating alternative treatments for subjects in a homogeneous age group. (p. 638)

Bracht (1970) also feels administrative considerations ought to be taken into account for generating hypotheses about ATI.

> Experimenters should begin to formulate hypotheses about ATI with administrative factors such as cost in mind. For example, suppose treatments A and B cost $3.00 and $5.00 respectively, per student. If low-ability students perform significantly better on B and middle-and high-ability students do equally well on both, the following decisions may be made: (a) Give treatment A to the middle- and high-ability students and (b) give treatment B to the low ability students. (p. 640)

Although researchers are eternally optimistic about the results of their research and the progress being made to add to the fund of man's knowledge, their feelings about the present status of ATI research are probably summed up by Hall (1974) as he notes in his concluding statement:

> We don't know enough about scope and sequence of content; characteristics of learners; design and validation of instructional strategies; interaction effects of learners, content and treatment; evaluation of student responses; procedures for modifying presentations; and identification of appropriate data for modifying the system -- to name just a few of the variables. (p. 22)

How Can Educational Cognitive Style Be Used

Individual Student Counseling

As a practical matter, the concept of Educational Cognitive Style has had its greatest impact on the student counseling process. A counselor attempts to determine a student's goal and then to develop a program which will help the student reach his goal with the greatest efficiency. Educational Cognitive Style maps give the counselor information about specific individual abilities.

Suppose a counselor were to work with a student who wanted to pass the High School GED test. Suppose also that the map indicated that the student had a reading level of 6.5 and had a relatively low ability to acquire meaning from the spoken word (low comprehension score). If the student agreed that he did not like to read very much and also found it difficult to listen to a speech for any length of time, some choices would be clear. The student would have to do remedial work to improve his reading level and he could spend short periods of time listening to tape recorded material with self-tests, if available, to help him absorb the content material and meaning necessary to pass the test. GED test items must be read. The nature of the task requires that the student gain meaning from reading words and quantitative symbols. He must pass a visual paper and pencil test. Short self-tests after a short listening experience promote test-taking skills and self-confidence.

Take another example. A woman of forty whose family has grown has the desire to return to school. If she has no specific goal, a map of her cognitive style is helpful to discuss with her the areas where she is particularly strong or areas where she might be weak. The map provides a structure and a vocabulary to talk about strengths and weaknesses and to discuss a program, or the remedial work necessary, if advanced learning activities are to be undertaken. If an individual has high ability but lacks self-confidence (element Q(CS)), the map which shows his strength can help his self-confidence and build his self-image.

If a student has a vocational goal, the map is a very good place to start to see if the way the student derives meaning is consistent with his vocational goal. It shows if desire and ability are matched. For example, if the student wants to be a bookkeeper and has lower than average ability to deal with numbers, this problem should be pointed out immediately. If he wants to be a chef and has a poor sense of taste or smell, this poses a rather large problem and should be indicated immediately. If a student wants to go into a vocation that requires a good academic background (teaching, law, management, etc.) but has an average or below average ability to deal with words and numbers and also reads with below average comprehension, he should be made aware of his handicap. Many individuals coming from an impoverished background have not had the variety of experiences which let them find out what they do well. The map can give them an idea of how they compare with others and also can point out to them the areas where they are most likely to have the greatest success.

Group Counseling

Since all of life is a search for meaning it is essential that everyone understand how he, as an individual, derives meaning from his environment. A cognitive style map is not a tool to be used just by the counselor but is one to be used by the individual as well. Group counseling involves teaching a group of individuals how to read their personal cognitive style maps, giving the group information about what the elements mean and how they relate to educational and vocational choices they may want to make.

The map is not a terribly difficult thing to read, particularly when it is one's own map. Three to five hours of group instruction is usually sufficient. Since group work is considerably more efficient in terms of cost effectiveness it is the method of choice in some cases.

Exceptions occur when people have difficulty making decisions, or when, as occasionally happens, the map does not truly reflect what the individual feels are his real abilities. In these latter two cases, individual counselling is indicated.

Planning - Collective Style

Just as there is a theoretical average to any set of scores there is theoretically a "collective cognitive style." A collective cognitive style is constructed by surveying a population to determine if more than 70 or 80% (percentage chosen by the constructor) of the population has a style element. If so, the element is added to the "theoretical style."

There is a certain value in having information about collective styles for planning purposes. If one finds that the group which will use a facility has a minor or negligible ability to gather information from the printed word, two things immediately are evident. First, because we live in a print oriented society, some provision should be made for remedial reading instruction. In other words, the T(VL) should be augmented. Second, if the institution hopes to teach substantive content material during the augmentation process, much of the instruction will have to be given via the auditory element T(AL).

Generally speaking, students who live in the urban ghetto situation score lower on the theoretical elements. This statement applies specifically to young adults coming from the inner city areas and motivated to go on to Oakland Community College. Unfortunately, a collective cognitive style for the adult urban disadvantaged is unavailable. While individuals in this category may have had their cognitive styles mapped at OCC, the information is not categorized in computer storage by socio-economic class or by location. Also, the population of cognitive style maps on file would tend to be those of highly motivated individuals who would have had enough information and self-confidence to want to attempt what, for them, would be higher education. Three doctoral dissertations which might provide information about this subject are those by Baecher (1973), Robinson (1969) and Zapinski (1973). Unfortunately these unpublished papers were not available for review by this author at the time of the report.

It is this author's view that the best way to establish a collective cognitive style for the adult urban disadvantaged would be to run a pilot study in the area to be serviced by a learning center. To be useful, a sample must be drawn from the population to which the information will be applied. Since many of the qualitative elements of cognitive style are culturally derived, it would appear that this strategy would give the best information. The research would not have to be terribly expensive. It might be encouraged by a college or university or it might be undertaken by a researcher interested in this problem for its own sake.

Learning Environments

Knowing what we do about the Educational Sciences, can we design learning environments which will be efficient? This author feels it is reasonable to assume that there are positive implications for learning environments in the categories of persons, processes, properties.

Persons

Some form of personal contact must be made with each student. Since the Educational Cognitive Style Map is not made by a mechanical process nor is the validity and reliability of the map judged in mechanical terms, the human learner must have contact with someone to whom he can relate.

Earlier the point was made that it is quite possible for the test taker to influence the results of the inventories. Individuals also think of these inventories as tests which are very, very important. This attitude that there is a "right or wrong" answer to these "tests" must be countered. The presence of a patient, empathetic human being is the best way to overcome this fear. The "counselor" might well be a para-professional or someone from the community who has high Q(CET), Q(CEM) and Q(CT). Someone, in other words, who is committed to society's goals, can feel what another person feels and can maintain a positive communication interaction.

Processes

Salomon (1972) lists three instructional processes. He labels them remedial, compensatory, and preferential. The remedial process tries to fill in gaps within the limits of specific performances. The compensatory process operates when the deficiencies are actually left untouched and only their debilitating effects are circumvented. The preferential model capitalizes on what the student is already capable of doing. All three processes proposed by Salomon are based on the assumption that the strengths and deficiencies of the student are known.

The particular process chosen will depend on the objectives of the student. If someone comes to the learning center simply to learn survival skills the preferential process is probably best. If the student wants to upgrade himself in his job the remedial method approach is probably the best choice. If the student has an advanced vocational goal the preferential model should be followed, capitalizing on what the student is already capable of doing to give him some feeling of success. A parallel remedial program will fill in the deficiencies and gaps so further learning can take place at the advanced level.

Cronbach (1967) identified four methods which have been used to adapt education to the individual. He lists them as adaptation within a predetermined program, adaptation by matching goals to the individual, adaptation by erasing individual differences, and adaptation by altering instructional method. It can be seen that an understanding of specific student abilities is absolutely necessary to the success of all four methods. Cognitive Style Mapping is the best tool educators now have available to meet this need.

Resnick (1972) writes

> In urbanized and industrialized societies there is probably no more important skill in gaining control over one's own life than reading and associated skills of literacy. (p. 74)

No one can really argue with this point of view, because "reading and associated skills of literacy" are the theoretical aspects of Educational Cognitive Style. They ought to be emphasized and promoted as much as possible.

However, in a population where students are more likely to have qualitative ability, it seems that the multi-track approach (preferential, remedial, and compensatory) should be available. With all these processes possible, in fact probable, in the neighborhood learning center the only reasonable, economically feasible solution to the problem of enough of the right learning resources is to mediate instruction.

Properties

One of the things the Educational Sciences says to us is that we must have media. Media is particularly necessary when students are deficient in the theoretical abilities. A student must be able to get information from his environment, and media in all its forms (audiovisual presentations, games, films, slides, models, mock-ups, field trips, etc.) should be available for developing content background.

Many general articles are written with titles which indicate that they relate media selection to individualized instruction. Careful reading though, reveals no specific statements indicating that medium A should be applied in situation Y. Wilson (1974), Duane (1974). Duane lists nine different media and nine different media characteristics. There is no indication in this article, however, of the value of any particular medium to match any given student attribute.

Media should be selected for its mode of inference and herein lies a great problem. Media producers have made and advertised their materials to appeal to the widest possible audience. Educators have purchased and used materials of a general nature as an "aid" to general classroom instruction. The whole AV system is organized around this type of classroom instruction. To start selecting media on the basis of mode of inference, materials are going to have to be previewed, evaluated and catalogued according to a different system. The process of constructing and selecting media suggested by Van Mondfrans (1970) would be a good model to follow.

The Educational Sciences also seems to dictate that spaces for learning be varied and flexible. Some individuals will work better as individuals (I). Others will learn better by operating in an associates (A) environment. This means carrels and tables for the I's, seminar rooms and take home materials for the A's.

At this point let us return to Figure 2 and consider the problem posed by an individual (L_5) who has as his GOAL to pass the GED test and receive a high school diploma. If he feels this need, but, because of past failures, feels he is incapable of learning, he will either forget it or rationalize by saying he does not really need it. Suppose though, that this student approached a learning center for help. The ACTION must be positive, helpful and reassuring, with the implicit attitude that the center will do its best to help. The student must feel comfortable, as if he is in the company of someone who understands. The learning center should try to have the subject **evaluate his** GOAL seeking experience positively so that he will want to come back for further help.

The counselor at the learning center needs to be able to analyze the needs of the student. There is no necessity here for formal testing, but tactful questioning is needed. The concept of Educational Cognitive Style can now be applied. It would be best if the student were evaluated by a battery of tests to determine his Educational Cognitive Style. However, if he refuses to do this or if the population using the learning center is fearful of "tests", a check sheet for an interview evaluation similar to that supplied in Appendix B could be used.

The operator of the learning center should be able to locate information about the various components of the GED tests and find learning packages which will prepare the student for each section of the test. The student should meet with success on the first few visits to the learning center. This means that the instruction should be in small packages so that limited goals may be achieved in a relatively short time. Subtasks need to be established so that the student can see progress toward his ultimate goal.

Learning Materials

To equip a learning environment in harmony with the Science of Educational Cognitive Style there are a number of options, each having its strong and weak points. Since under normal conditions most of the information one receives comes through the visual and auditory senses it would seem reasonable to equip every learning center with basic devices to test these senses. Simple reading charts for testing near and far vision would be adequate at the beginning. If, however, a subject has a great deal of trouble reading and all other indications are that he has the vocabulary and the ability to recognize printed words, it might be well to either have an eye movement camera available or be able to send the student to a central location to test his eye movement pattern while reading.

Some device to test a person's ability to hear and comprehend speech would seem in order also. This need not be a complex or expensive audiometer, but rather a simple screening device--perhaps a standard tape recording to be played back to the subject through ear phones.

When equipping a learning center for students one has four different options. They are 1.) get one of everything, 2.) buy nothing until something is needed, 3.) concentrate on qualitative media and 4.) concentrate on theoretical media.*

If one were to buy one of everything it would probably be found that some items, equipment and material would not be used and the investment in these items would be lost. If, on the other hand, one opts to buy nothing until it is needed for a curriculum, purchases would have to be expedited. Students might well lose interest if they were not able to get the material they needed quickly.

If the curriculum of the learning center is content-oriented for survival skills, the qualitative media of both sight and sound with motion and color would seem to be in order. It would seem likely also that the adult urban disadvantaged would find it more difficult to gain meaning from the printed page than from the spoken word and the qualitative aspects of pictures because of environment and past learning experiences. Color is known to motivate, as are motion, music and the other qualitative aspects of the sound-color-motion presentations of film or television.

If the curriculum of the learning center were to concentrate on the theoretical aspects of information processing so students could learn in an academic setting toupgrade themselves in their jobs or to prepare themselves for higher education, the choice would have to be a heavy dependence upon the printed media to augment the student's ability to gain meaning from printed material (theoretical symbols). Since certification requires the ability to take and pass examinations, theoretical symbol processing of information must be augmented.

It is difficult, if not impossible, to point out specific media to be used for specific purposes until those purposes are established and individual learners are identified. Each medium may provide examples of all the different symbolic mediations and probably none of the media is mutually exclusive. Gagne, in a speech to a DAVI conference (1968) made the following statements "...no single media is likely to have properties that make it best for all purposes." "...the most important

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*Theoretical media includes any medium in which the content is primarily words and/or numbers presented visually or aurally.

single criterion for choice of medium is often the nature of the learning task itself." The answer to the question of which media to use may be found by "matching specific instructional functions with media." This author feels Educational Cognitive Style concepts point to the truths of these statements.

Conclusion

A number of final statements need to be made: 1. The Educational Sciences is a conceptual framework for the applied field of education. It should not be considered a single science or the science of education. 2. The Educational Sciences exist as a functioning system which can be added to or modified as further empirical data is gathered. 3. The fourth Educational Science, Educational Cognitive Style, is a concept to help students know themselves, at the same time helping counselors, administrators and teachers understand their students. 4. The Educational Cognitive Style of an individual is neither good nor bad. It merely represents the interactions of the many individual cognitive elements and reflects the way a person searches for meaning in his environment.

This paper has attempted to present the Educational Sciences, and in particular, the concept of Educational Cognitive Style as an integrated system of ideas for looking at the individual students. Consideration has been given to the testing methods, both formal and informal, that are possible. No recommendation has been given, nor is one warranted, to indicate which type of evaluation is most useful since validity and reliability depend upon how well the map reflects the individual. The uses of Educational Cognitive Style for individual student counseling were given. Preference was shown for individual student counseling. The fact that no collective Cognitive Style presently exists for the adult urban disadvantaged was noted. Learning environments were suggested and particular emphasis was placed on the idea that mediating the learning environment seems to be the only practical solution to individualization.

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APPENDIX A

Definitions of Terms Unique to the Educational Sciences - taken from: THE EDUCATIONAL SCIENCES, Dr. Joseph E. Hill, Oakland Community College, No Date, 11p.

The four theoretical symbols are:

T(VL) Theoretical Visual Lingusitic - ability to find meaning from words you see. A major in this area indicates someone who reads with better than average comprehension.

T(AL) Theoretical Auditory Linguistic - ability to acquire meaning through hearing spoken words.

T(VQ) Theoretical Visual Quantitative - ability to acquire meaning in terms of numerical symbols, relationships, and measurements.

T(AQ) Theoretical Auditory Quantitative - ability to find meaning in terms of numerical symbols, relationships, and measurements that are spoken.

The five qualitative symbols associated with sensory stimuli are:

Q(A) Qualitative Auditory - ability to perceive meaning through the sense of hearing. A major in this area indicates ability to distinguish between sounds, tones of music, and other purely sonic sensations.

Q(O) Qualitative Olfactory - ability to perceive meaning through the sense of smell.

Q(S) Qualitative Savory - ability to perceive meaning by the sense of taste. Chef's should have highly developed qualitative olfactory and savory abilities.

Q(T) Qualitative Tactile - ability to perceive meaning by the sense of touch, temperature, and pain.

Q(V) Qualitative Visual - ability to perceive meaning through sight.

The qualitative symbols that are programmatic in nature are:

Q(P) Qualitative Proprioceptive - ability to synthesize a number of symbolic mediations into a performance demanding monitoring of a complex task (e.g., playing a musical instrument, typewriting); or into an immediate awareness of a possible set of interrelationships between symbolic mediations, i.e., dealing with "signs." While qualitative proprioceptive symbolic intelligence is most readily observable in seemingly automatic motor responses such as reading and playing music, certain types of theoretical mediation also require qualitative proprioceptive codes. For example, the synthesis of a number of symbolic mediations is evident when an individual upon seeing a sign of smoke immediately interprets it as evidence of fire and experiences an interplay of many sensations including smell of smoke, and sensation of heat. In this instance a network of previous experiences and related associations produces the theoretical mediation of fire along with the other qualitative aspects.

Q(PD) Qualitative Proprioceptive Dextral - a predominance of right-eyed, right-handed and right-footed tendencies (a typically right-handed person) while synthesizing a number of symbolic mediations into a performance demanding monitoring of a complex task (e.g., playing a musical instrument, typewriting).

Q(PK) Qualitative Proprioceptive Kinematics - ability to synthesize a number of symbolic mediations into a performance demanding the monitoring of a complex physical activity involving motion.

Q(PS) Qualitative Proprioceptive Sinistral - a predominance of left-eyed, left-handed and left-footed tendencies (a typically left-handed person) while synthesizing a number of symbolic mediations into a performance demanding monitoring of a complex task (e.g., playing a musical instrument, typewriting).

Q(PTM) Qualitative Proprioceptive Temporal - ability to synthesize a number of symbolic mediations into a performance demanding the monitoring of a complex physical activity involving timing.

The remaining ten qualitative symbols associated with cultural codes are:

Q(CEM) Qualitative Code Empathetic - sensitivity to the feelings of others; ability to put yourself in another person's place and see things from his point of view.

Q(CES) Qualitative Code Esthetic - ability to enjoy the beauty of an object or an idea. Beauty in surroundings or a well-turned phrase are appreciated by a person possessing a major strength in this area.

Q(CET) Qualitative Code Ethic - commitment to a set of values, a group of principles, obligations and/or duties. This commitment need not imply morality. Both a priest and a criminal may be committed to a set of values although the "values may be decidedly different."

Q(CH) Qualitative Code Histrionic - ability to exhibit a deliberate behavior, or play a role to produce some particular effect on other persons. This type of person knows how to fulfill role expectations.

Q(CK) Qualitative Code Kinesics - ability to understand and to communicate by non-linguistic functions such as facial expressions and motions of the body (e.g., smiles and gestures).

Q(CKH) Qualitative Code Kinesthetic - ability to perform motor skills. or effect muscular coordination according to a recommended, or acceptable, form (e.g., bowling according to form, or golfing).

Q(CP) Qualitative Code Proxemics - ability to judge the physical and social distance that the other person would permit, between oneself and that other person.

Q(CS) Qualitative Code Synnoetics - personal knowledge of oneself.

Q(CT) Qualitative Code Transactional - ability to maintain a positive communicative interaction which significantly influences the goals of the persons involved in that interaction (e.g., salesmanship).

Q(CTM) Qualitative Code Temporal - ability to respond or behave according to time expectations imposed on an activity by members in the role-set associated with that activity.

The three cultural determinants of the meaning symbols are:

(I) Individuality - the "individuality" influence is frequently reflected by the individual's need to quote definitions, or explain situations, in his own words.

(A) Associates - the "associates" influence is frequently evidenced by an individual who understands that which is under consideration, but explains or discusses these matters mainly in the words of his associates who may be involved with him in the situation.

(F) Family - the "family" determinant is frequently portrayed by the individual possessing it through examples he may use in explaining a situation or solving a problem (e.g., either parents, children, wife, husband, sibling, cousin, etc., are used to illustrate a situation analogous to the one under consideration).

The elements which indicate an individual's modality of inference are:

(M) Magnitude - a form of "categorical reasoning" that utilizes norms or categorical classifications as the basis for accepting or rejecting an advanced hypothesis. Persons who need to define things in order to understand them eflect this modality.

(D) Difference - This pattern suggests a tendency to reason in terms of one-to-one contrasts or comparisons of selected characteristics or measurements. Artists often possess this modality as do creative writers and musicians.

(R) Relationship - this modality indicates the ability to synthesize a number of dimensions or incidents into a unified meaning, or through analysis of a situation to discover its component parts. Psychiatrists frequently employ the modality of relationship in the process of psychoanalyzing a client.

(L) Appraisal - is the modality of inference employed by an individual who used all three of the modalities noted above (M,D, and R), giving equal weight to each in his reasoning process. Individuals who employ this modality tend to analyze, question, or in effect, appraise that which is under consideration in the process of drawing a probability conclusion.

(K) Deductive - indicates deductive reasoning, or the form of logical proof used in geometry or that employed in syllogistic reasoning.

APPENDIX B

Respond to the statements below by checking the <u>one</u> word which most nearly represents your feeling about each statement.

THEORETICAL AUDITORY QUANTITATIVE T (AQ)	USUALLY	SOMETIMES	NEVER
1. I find it comfortable to add spoken or dictated numbers mentally.			
2. I quote statistical data in order to prove my point in an argument.			
3. Verbal mathematics tests are easier for me than written mathematics tests.			
4. When taking courses in mathematics, I find it easy to "talk in formulas" with my classmates and teachers.			
5. It is easy for me to remember the numbers and formulas I have heard during a conversation.			
6. I can remember a telephone number once I have heard it.			
7. I discuss "sale" prices with others before I go shopping.			

THEORETICAL VISUAL LINGUSITIC T(VL)	USUALLY	SOMETIMES	NEVER
1. My written explanations are more understandable than my spoken ones.			
2. I prefer classes which rely heavily on textbooks for information.			
3. I score high on achievement tests which depend upon reading comprehension.			
4. I prefer maps to verbal directions when I am going to a strange place.			
5. I prefer to read a newspaper myself rather than have someone read it aloud to me.			
6. I prefer to read directions rather than have someone interpret them to me.			
7. I understand more easily when I read information rather than when I hear it.			

QUALITATIVE CODE KINESTHETICS Q(CKH)	USUALLY	SOMETIMES	NEVER
1. When it is necessary, I can repair objects without watching my hands.			
2. I feel I am better coordinated than most people.			
3. Learning to throw a ball the right way is important.			
4. When learning a new dance, I am willing to practice the steps until I can do them perfectly.			
5. To become a good typist, I would practice correct finger movements.			
6. I have enjoyed acquiring good motor skills so that I compete successfully in sports.			
7. I have practiced handwriting skills so that I write legible now.			

	USUALLY	SOMETIMES	NEVER
QUALITIVE CODE PROXEMICS Q(CP)			
1. I would wait to be introduced to a famous person rather than introduce myself.	___	___	___
2. I prefer to ask favors of close friends and associates rather than from work supervisors.	___	___	___
3. I can recognize those who will welcome friendly overtures from me.	___	___	___
4. Unless spoken to first, I do not speak to a supervisor.	___	___	___
5. First names are good if the other person prefers first names.	___	___	___
6. If I bump against another person in a store, I know whether to apologize profusely or with a single word.	___	___	___
7. I know which strangers enjoy a pat on the back if I have an occasion to congratulate them.	___	___	___
CULTURAL DETERMINANTS I (Individuality)			
1. I make my own political choices.	___	___	___
2. One's religion is a purely personal decision.	___	___	___
3. I would rather do things my way even if this does not conform to the expectations of my family or friends.	___	___	___
4. When given a problem to solve, I determine the best solution by myself.	___	___	___
5. I do not need others to help me make decisions.	___	___	___
6. After gathering data from many sources, I make decisions alone.	___	___	___
7. When given a job to do, I prefer to do it myself.	___	___	___
MODALITY OF INFERENCE M (Magnitude)			
1. I work best in an organized or structured situation.	___	___	___
2. I have no sympathy for people who break the law.	___	___	___
3. Life is simple if you go by the rules.	___	___	___
4. I prefer working in situations where standards and rules are stated explicitly.	___	___	___
5. In recreation as well as work and life in general, I find it essential to "play by the rules."	___	___	___
6. When shopping for clothes, I buy without further comparison if I find the article I had in mind.	___	___	___
7. In evaluating the performances of others, I find it important to determine the standards which were set for them.	___	___	___

Appendix D-3

DESIGN FOR A NEIGHBORHOOD LEARNING CENTER

A REPORT

Submitted to

Telecommunications Project
321 Arnold House
University of Massachusetts
Amherst, Mass. 01002

by
Merrill Otlchick Asscciates
Springfield, Massachusetts

August, 1974

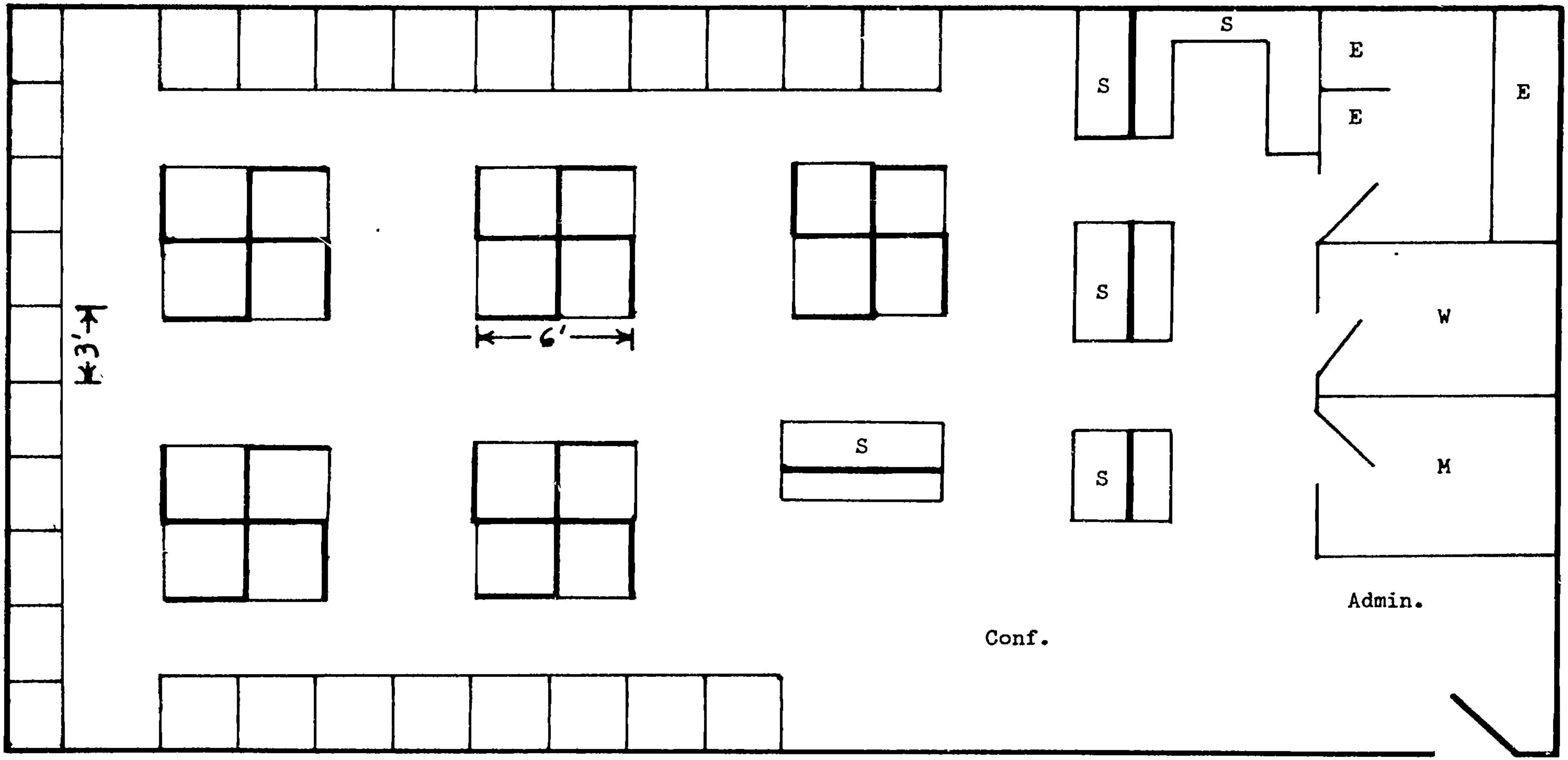
THE NEIGHBORHOOD LEARNING CENTER

The principle function of the Neighborhood Learning Center, accessible to all on a need basis approximately 18 hours per day throughout the year, is to provide the materials, the equipment and the facility in which one can acquire the skills, attitudes or knowledge needed on three levels--survival, developmental and/or academic. In terms of the probable numbers of people making use of the NLC during any one day, although the gross number will vary with the time, seasons and attitudes of the people in the area, it is assumed that no more than fifty persons will be at the center at any one time. Further, it is presupposed that probably no two persons will be in need of the same material at precisely the same time and that therefore, people will want to study individually rather than in a group situation. To be able to provide appropriate facilities, it is suggested that a minimum area of 1800 square feet be divided into six areas to service these persons. (See TYPICAL FLOOR PLAN Attached).

The major part of this facility will house at least 48 individual carrels located in an area approximately 30 x 42 feet. Here we find free standing as well as peripherally mounted carrels, which provide approximately 6 square feet of work space apiece. Each of the wall carrels should have a double electrical outlet attached to it in order that materials may be viewed using any machine which operates on electricity. The carrels which are free standing in the center of the room should be located under the ceiling lights such that there is a minimum of 5 foot candles of illumination on the surface for easy viewing of the print materials to be used. Because the wall-attached carrels will utilize projection equipment, it is most desirable that the periphery of the room have indirect lighting controlled by a dimmer switch on each of the three walls in order to insure that the area may be darkened to a minimum of 1/10 foot candle of illumination at the point of projection on the facing wall or on a rear-screen unit used in the carrel. Light control in the rest of the NLC (toilet, equipment storage closet, materials storage, conference and administrative section) should be appropriate to the functioning of th respective areas.

In the event an area chosen for the NLC has front-facing windows, it should be desirable to cover these windows with light exclusion as well as light diffusion shades. During the darker days of the year, little ambiant sunlight will show into the room to prevent projected pictures from being visible to the learners, but as the days move toward spring and summer, it is very possible, depending on the physical orientation of the center, that at times light would have to be subdued in order that people can work in comfort, while at other times light will have to be excluded entirely. In order to accomplish this goal, the two types of light control will have to be placed on the windows.

Since much of the learning at the peripheral study carrels will be involved with the use of projection/viewing equipment, careful consideration must be given to the electrical and ventilating systems built into the NLC.



TYPICAL FLOOR PLAN - - - OFFERING

1. 48 study carrels
2. Material Storage Areas (S)
3. Equipment Storage Area (E)
4. Toilet Facilities (M & W)
5. Clerk/Administrator Desk Area (Admin.)
6. Conference and Counseling Area (Conf.)

Typical electrical power requirements are as follows:

Item	Power in Amperes
16 mm sound motion projector	9
opaque projector	9
overhead projector	4
slide projector	5
8 mm film projector	1
tape recorder	1
record player	1
TV receiver	2

Multiplying these numbers by the number of peripheral carrels (28) we find that it is most desirable that several different lines be located on the wall area rather than a single service supplying electrical power to all carrels on the same wall.

Similarly, because there may be as many as 48 persons working at the carrels at any one time, and because several pieces of equipment may generate additional heat in the room, a climate controlling air conditioner would be most desirable. It should be noted that a minimum standard for air exchange in a room is 15 cubic feet of air per minute per person.

Since a comfortable learning environment should be the hallmark of the NLC, it is strongly recommended that the ceiling be acoustically treated so that noise from the projectors and others working will not affect persons in adjoining carrels. To aid even further in the attempt to control the noise level, carpeting should also be installed at the time the NLC is being prepared.

Once the carrels have been installed, and the lighting, heating and ventillation taken care of, the other five areas should be developed. The materials most appropriate to the disadvantaged urban adult will be books. pamphlets and other print materials written in Spanish and in basic English which persons will find located in the central Material Storage Areas which are located between the carrels and the other areas of the room. There should be flourescent lighting fixtures immediately above this area so that it will be easy to retrive materials from the floor to ceiling shelves located there. Further toward the equipment storage room is a larger Materials Storage Area which will house the bulkier filmstrip packages, the slide/sound materials, the cassette and reel-to-reel tape recordings, the 8 mm loop films, the records and the models, flat print pictures that will be available to the learners. Finally, located near the Conference area of the Center and close to the administrative desk will be several lockable cabinets and closed shelves to be used as storage area for materials/equipment coming from, or to be sent from the center to, another agency. Immediately behind this area and facing toward the carrels will be a materials storage area to house materials being worked on by individual learners, such as notebooks, pens/pencils, rulers, etc. which can be left in the area overnight.

In the far right corner of the Center is an Equipment Storage Room. Here we find two carts which will be used to transport equipment from the Storage Room to the carrels and then back again. On the storage shelves will be the projectors, reels, spare bulbs, springs and tools which can be used to maintain and to repair the equipment needed to view the materials.

Bordering on the Storage Room are the toilets and immediately adjacent to that is the area for the administrator and clerk who will staff the NLC. A telephone, typewriter and file will be all the necessary accounterments as most of the work of the center will take place in the carrel area.

The conference area will also serve as a reception and group discussion area and will be used for counseling when required. It will be furnished with comfortable upholstered chairs and low tables to provide some "home-like" atmosphere near the entry to the center.

The question of what materials should be housed in a Neighborhood Learning Center devoted to helping urban disadvantaged adults reach new levels in their quest for survival remains a secret--a secret still mystifying the staffs of JESI, Neighborhood Youth Corps, etc. All that is really known at this date is that there are a few projects that have developed indigenous materials and procedures which have helped others in other urban areas (see Projects Related to Teaching the Adult Disadvantaged and Materials and Programs Found Effective in Teaching-Learning Situations for Minority Adults, attached). Some of the characteristics of the materials found most effective were they that were bi-cultural, sequenced, programmed, had relevancy to job opportunities, were visually oriented and were regularly and frequently available to anyone who wished to use them. Contact with each of the organizations listed in the attachments would have to be made to ascertain the best available materials based on their experience.

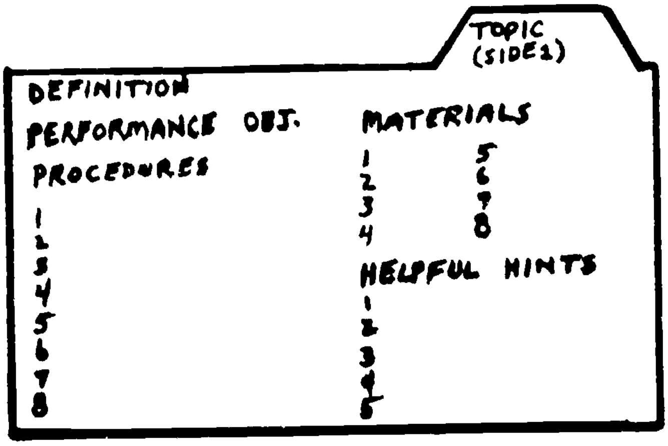
In order to help a person keep track of the work which he/she will do at the Center a Self-Help Card system for monitoring one's progress should be kept on file (see attached form). Due to the fact that a learner may not be able to come to the Center regularly, this card will help reorient the person to the objectives to be achieved during the next visit. In addition, this card will facilitate the locating and retrieving of the necessary equipment and materials at the next learning session. Finally, this card procedure will aid in the identification of the appropriate time during which certain equipment or particular materials should be inspected or removed from service.

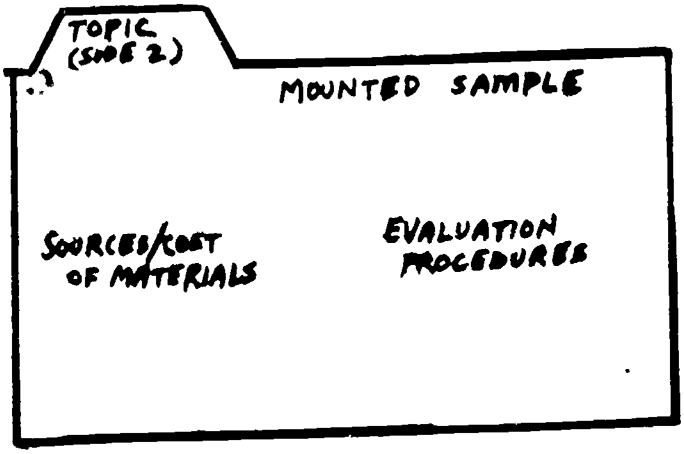
The cost estimates for establishing a Neighborhood Learning Center will vary, but there are some materials as well as equipment costs that can be kept in mind on a per unit basis. Such audio-visual materials as computer-originated data and broadcast instructional television programs do not meet the needs of persons attending the NLC due to the tremendous cost of equipment for which there is a dearth of software. We must focus on the costs for commercially prepared filmstrips, audio tapes, recordings, slides, study prints, globes, transparencies and 8 mm cartridge films. The following are representative costs per unit of materials mentioned above:*

Filmstrips	$7
Audio Tapes	$6
Records	$5

*Erickson, CWH, Administering Instructional Media Programs, MacMillan Co., N.Y. p. 550.

SELF-HELP CARD for Individualizing Instruction*





*Midgley, Thomas K. "Individualizing Instruction With the Step-by-Step Self-Help Card," Audiovisual Instruction. March, 1974, pp. 48-49.

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Slide Sets	$4
Study Print Sets	$4
Globes	$50
Transparencies	$4

Costs for Packets of Media average:

8 mm cartridge film set (10 film)	$600
Audio tape sets (20 tapes)	$60
Slide sets (30 slides)	$15
Filmstrip Sets (silent) (4 filmstrips)	$12
Filmstrip Sets (sound) (4 filmstrips)	$20

It should be pointed out, however, that much of the materials to be used in a NLC must address the question of how the neighborhood itself operates, and to that end, some slide and filmstrip production, 8 mm films and audio tape recordings should be produced locally.

The costs for the hardware to furnish the Center will be most heavily influenced by the installation of the fifty or more carrels which are found in the Center. It is possible to purchase commercially produced carrels. Three popular manufacturers are listed below:

Howe - CLI Study Mastr	$128.50 w/light + AC outlet
MPC - Flexi Carrel Model 1	$65.00 " " " "
Rheem LC297	$68 - 95.25 " " "

These are all wall placed carrels.

Howe - Ct544 Pin wheel	$75.50 per position
McNeff - 200 S4 Rossette Acousti-Carrel	$115.00 " "
Guild - 1000 S4	$125.00 " "

These are all free standing units of 4 or 6 bays. However, it is appropriate to point out that it is very possible for individuals to make their own carrels and save a large amount of money. One method is to purchase wood locally and to make carrels which would be basic enclosures in which people could find privacy for study. The problem is that with the cost of wood for framing, the purchase of plywood for dividers and the cost of electrical outlets and light fixtures, little savings will be realized. Another alternative however, is the use of TRI wall. This cardboard-like composition material is available for about $7 per sheet (7') and it can withstand a lot of use. This material has been used and promoted by Education Facilities Laboratories (Madison Avenue, N. Y.) and Educational Development Laboratories (Newton, Mass). It would seem a thorough investigation in the use of this material is appropriate.

A final comment concerning costs for materials and equipment. Replacement due to accidental damage averages about 2% of materials per year and 1% of the cost of equipment per year. For replacement due to normal wear and tear, 8% of the materials should be figured (after the second year of operation) and 12% replacement of equipment should be expected (after the third year of operation based on each piece utilized at least three times every week). Replacement due to revision or substitution of materials should be pegged at about 5% per year based on the monitoring of software requested by NLC users.

The types and makes of equipment to be made available are suggested by the materials to be housed in the Center. Attached is a list of equipment and their prices* as of 1973-74 as reported by the National Audio Visual Association in the 19th Edition of the Audio Visual Equipment Directory. Until specific program materials (software) are selected no recommendation can be made on the number of various equipment units needed by each NLC.

Equipment List

Type	Mfg.	Cost
8 mm Motion Picture Projectors		
Ehtagraphic 120A	Eastman Kodak Co.	144.50
820A Silent Film Loop	Technicolor Inc.	149.50
Filmstrip Projectors (silent)		
745-C Specialist Autoload	Bell & Howell Co.	159.95
VR 25R	Viewlex, Inc.	164.95
28A6A Remote Control	Dukane Corp.	169.50
Filmstrip Projectors (w. sound)		
14A285G (Records)	Dukane Corp.	240.00
SSAC (Tape Cassette)	Viewlex Inc.	294.95
Messanger VII (Tape Cassette)	Graflex Division	264.50
Filmstrip Previewers (silent)		
735	Bell & Howell	34.95
Study Mate II	Graflex Division	27.50
Superviewer V134	Viewlex Inc.	54.95
Slide Projectors		
Ehtagraphic Model B-2	Eastman Kodak	159.00
Preview, AV-II, 6694	Honeywell Audio Visual	219.50
Record Players		
ATC-302 Instant Replay	Audiotronics Corp.	94.95
AVT-20B	Newcomb Audio Products	94.95
1450-C	Rheem Califone	98.00
275-5AV Portable	V-M Corp.	74.90
Audio Tape Recorders/Players (Reel-Reel)		
70TC	Rheem Califone	220.00
TC 106 AV	Sony Corp.	189.95
6024 AV	Wollensak/3M Co.	189.95

Audio Tape Recorders/Players (Cassette)

3050A	Bell & Howell Co.	59.95
AV-77	Rheem Califone	65.00
TC-66	Sony/Superscope Inc.	59.95

Projection Carts

C42E	Bretford Mfg. Inc.	79.00
L54E	Jack C. Coffey Co.	78.70
W42E	H. Wilson Co.	53.00

Storage Cabinets

200 Series Stacking Cabinets	Bretford Mfg. Inc.	276.00
Luxor Unlimited	Jack C. Coffey Inc.	109.80 - 194.80
Instructional Materials Filing Cabinets	H. Wilson Corp.	29.00 +

Reading and Tachistoscopic Devices

Pa Ser Projector	Cardinal Associates	169.00
Controlled Reader Junior	Educational Development Lab.	220.00
Tach-X Tachestoscope	" " "	210.00
Pacer 121A	Psychotechnics Inc.	94.00

Television Receivers

CVM-1200 UA (color)	Sony Corp of America	595.00
CT-25V (color)	Matsushita Electric Corp.	550.00
D8800 (color)	Magnavox Video Systems	495.00

PROJECTS RELATED TO THE TEACHING OF THE ADULT DISADVANTAGED

WASHINGTON, D.C. PROJECT "GO"

The District of Columbia Board of Education, Washington, D.C.

1. To provide innovative adult basic education in such areas as communication skills, computational skills, citizenship education, consumer education, health, hygiene, safety, and family life education.

2. To provide instruction that helps enrollees to cope in many worlds - at home, in the neighborhood, and on the job.

3. To cooperate with agencies in the development of specialty or generic curricula.

4. To cooperate with different agencies in providing counseling, job placement, and job development.

5. To provide overall staff development for ABE teachers and counselors.

DEMONSTRATION AND EVALUATION OF PROGRAMMED LEARNING IN ABE LEARNING CENTERS

Department of Education, Office of Education, Trenton, New Jersey

1. To reach, involve, and motivate undereducated, non-contributing members of society through innovative ABE.

2. To use innovative methods and materials in connection with existing ABE resources to provide a comprehensive program with MDT Multi-Skill Centers.

3. To develop, demonstrate, and evaluate innovative approaches to ABE through programmed materials, individualized instruction, one-to-one tutorials, and TV tapes.

THE URBAN ADULT EDUCATION INSTITUTE

The Detroit Public Schools, Detroit, Michigan

To identify ways to broaden and increase educational and employment opportunities for uneducated and undereducated adults through multi-media approaches using the latest in educational technology, including programmed instruction and other forms of self-directed learning experiences.

OPERATION WORDPOWER

Chicago Committee on Urban Opportunity, Chicago, Illinois

To equip four Urban Progress Centers with the means to give wordpower training to area residents. The proposal is based on two premises:

The education of the functionally illiterate youth and adult must be an educational and social experience which prepares the enrollee to cope with the world of work in an urban environment.

The Urban Progress Center, with its unique meshing of human and environmental development services, is a setting in which this process may occur with the greater effectiveness.

A MULTI-AGENCY DEVELOPMENTAL ADULT BASIC EDUCATION PROGRAM

The Massachusetts State Department of Education, Boston, Massachusetts

To coordinate with Harvard University, Boston University, the University of Connecticut, and Action for Boston Community Development, Inc., in planning a multi-agency developmental Adult Basic Education Program combining innovative curriculum design and computer assisted instruction.

PROJECT COOPERATION (THE MARTIN LUTHER KING, JR., PROJECT)

The Berkeley (California) Unified School District, Berkeley, California

1. To provide jobs for the undereducated and underemployed.

2. To improve basic competencies for continuing employment.

3. To enlist labor unions, community agencies, the public schools and industry in these efforts.

4. To provide activities necessary for developing participants' social skills.

NEW CAREERS AND INDUSTRIAL EDUCATION CENTER

The University of the State of New York, New York, New York

1. To demonstrate a new system for bringing the unemployed and unemployables and the partially employed into jobs. The job is the major goal.

2. To demonstrate a partnership between a leading State educational agency and private business.

AN EXPERIMENT IN TRADE-RELATED ADULT BASIC EDUCATION

Laborers' International Union of North America, Local #423 in cooperation with Leo Kramer, Inc.

1. To expand knowledge of teaching techniques and methods for stimulating and motivating disadvantaged adults.

2. To train local union leadership in the use of instructional techniques and materials (including audio-visual equipment) relevant to program.

3. To develop and produce materials from the world of work for building reading and computational skills.

4. To mesh the project with ongoing pre-vocational skills program in union.

5. To join with other community resources in upgrading the skills of the hard-core unemployed. To take ABE to the Community and to work with Model Cities, CEP, WIN, The National Alliance of Businessmen, and others.

COORDINATION OF THE ADULT BASIC EDUCATION COMPONENTS OF FOUR FEDERALLY FUNDED AGENCIES IN THE KANSAS CITY (MISSOURI) METROPOLITAN AREA

The School District of Kansas City, Kansas City, Missouri

1. To combine the resources of the ABE program funded by the Office of Education and the ABE components of the MDTA, CAP, and Work Experience programs for a more concentrated and effective program.

2. Reach the hard-core undereducated who have not been reached by on-going programs, using pertinent techniques of recruitment and location of educational facilities.

3. To collect data on the functions of the different techniques and services used in the project. To analyze the data and to determine which techniques and services--singly and in combination--best promote student participation and learning as measured by standardized tests.

QUITMAN COUNTY MISSISSIPPI, ADULT LITERACY PROGRAM

Mary Holmes Junior College, West Point, Mississippi

1. To identify and select existing adult education materials adapted to specific needs of the rural Negro community in the deep South and develop new materials.

2. To develop a student-centered curriculum and student developed materials.

3. To identify new strategies for educating the illiterate and semi-illiterate adults.

4. To identify guidelines for the establishment and administration of community-based adult education programs.

A DEMONSTRATION, DEVELOPMENTAL, AND RESEARCH PROJECT FOR PROGRAMS, MATERIALS,

FACILITIES, AND EDUCATION TECHNOLOGY FOR UNDEREDUCATED ADULTS

Morehead State University, Morehead, Kentucky

1. To develop a demonstration and research center within the Appalachian Region to focus increased attention on the umemployed or underemployed, undereducated populus from poverty-ridden families in an area with a predominately rural clientele.

2. To mobilize all resources in the area, such as educational programs administered by the State Department of Education, Community Action Agencies, Regional Educational Laboratories, Vocational Rehabilitation, Economic Security, Public Health Departments, and other agencies serving the same population.

THE DESIGN AND DEMONSTRATION OF A LEARNING-CENTER INDUSTRIAL SITE CONCEPT IN ADULT BASIC EDUCATION INCLUDING AN EVALUATION OF THE EFFICACY OF THE SYSTEM IN A RURAL STATE

The University of Arkansas, Fayetteville, Arkansas

1. To work with industry and the community to provide ABE for persons in locations across the State where the growing industries are creating jobs.

2. To develop methods of recruitment, teaching skills, materials, and supporting services that will assist project participants in the transition from rural life in newly industrialized areas.

3. To define and coordinate the roles of the University and the State Department of Education and other community agencies to support the ABE program, particularly in establishing programs for the disadvantaged adult.

4. To provide a base for continuance of the programs initiated by the project after discontinuance of federal funding drawing on State, industrial, and local service agencies and organizations.

EXPERIMENT IN MOTIVATING FUNCTIONAL ILLITERATES TO LEARN

Tuskegee Institute, Tuskegee, Alabama

1. To carry out experimentation and validation of techniques used in teaching rural functional illiterate adults, giving them limited stipends prorated on performance to motivate them.

2. To give meaningful counseling and guidance to the participants and their families, (b) to identify among the participants those who can benefit from further academic or skill training and to make the necessary referrals, and (c) to initiate self-help programs in economic improvement with those involved in the experimental program.

INDIVIDUALIZED EDUCATION CENTER FOR MEXICAN-AMERICAN AND PUBLIC AID RECIPIENTS

McMinnville Public School, District No. 40, McMinnville, Oregon

To develop a programmed learning educational center oriented to the needs of the Spanish-surnamed American.

A TOTAL SYSTEMS APPROACH ATTACKING THE EDUCATIONAL PROBLEMS OF THE ILLITERATE SPANISH SURNAMED ADULTS

Southwestern Cooperative Educational Laboratory, Inc. (SWCEL) Albuquerque, New Mexico

To help the illiterate Spanish surnamed adult

1. To develop English skills.

2. To develop culturally appropriate behavior patterns through TV, films, instructional materials, etc.

A CENTER FOR ADULT BASIC EDUCATION LEARNING (PROJECT CABEL)

Fairfax and Arlington Counties, City of Alexandria, Virginia, Baileys Cross Roads

1. To develop a national evaluation center for Adult Basic Education instructional materials. Materials will be collected from State Directors of Adult Basic Education, publishers, testing services, and other Government agencies to be validated with the varied populations of the greater metropolitan area.

2. To develop evaluation models to determine the applicability of specific materials for particular sub-groups within the general population.

DIAGNOSTIC DEVELOPMENT DEMONSTRATION PROJECT IN THE PROCESSES OF EDUCATING ADULT MIGRANTS

National Educational Associates for Research and Development, Inc. Fort Lauderdale, Florida

To develop a prototype system to demonstrate how many problems related to educating a group of mobile persons may be overcome at a reasonable cost.

A DEVELOPMENTAL AND DEMONSTRATION PROJECT IN THE USE OF MODERN EDUCATIONAL TECHNOLOGY FOR THE INSTRUCTION OF UNDEREDUCATED ADULTS

North Carolina State University, Raleigh, North Carolina

D3-16

To identify, develop, and evaluate innovative materials and instructional systems that will accelerate and enhance learning for under educated adults through the use of educational technology, and media.

THE EVALUATING OF GUIDANCE-COUNSELING SERVICES IN THE OFFICE OF EDUCATION REGION VII AND THE DEVELOPMENT OF AN EFFECTIVE GUIDANCE COUNSELING PROGRAM FOR ADULT BASIC EDUCATION STUDENTS

The University of Texas at Austin

1. To evaluate current ABE guidance counseling practices and procedures.

2. To develop an educational model for local school districts.

3. To produce a teacher-training and counselor training in-service package.

MATERIALS AND PROGRAMS FOUND EFFECTIVE IN TEACHING-LEARNING SITUATIONS FOR MINORITY ADULTS

1. The Job Corps' "English as a Second Language"...contact Leon Schertler, head of the Job Corps Division of Program Direction and Coordination, U.S. Dept. of Labor, Washington, D.C.

2. Learning Through Hands...occupational opportunities for Mexican Americans...contact the Texas Educational Foundation, Inc., El Paso, Texas.

3. SER...offers disadvantaged Spanish Americans a host of vital services which open up pathways to education and employment...contact SER, Los Angeles, Calif., Mr. Robert Cueller, Deputy Director for Planning, Evaluation and Management Information Systems.

4. BOLT...Basic Occupational Language Training...Language training for the Spanish-speaking adult...contact Mario Serrano c/o the Manufacturer's Hanover Trust company, New York, N.Y.

5. The Language and Thinking Program....teach basic language via a multimedia approach...contact CEMREL, Inc., St. Louis, Mo.

6. Career Opportunity Program....an educational career development model bringing low-income area adults into classrooms....contact Education Development Center, Inc., Newton, Mass.

7. A wide variety of materials are available from the NATIONAL MULTIMEDIA CENTER FOR ADULT BASIC EDUCATION...contact Mr. Lloyd L. Feinstein, Adult Continuing Education Center, 14 Normal Avenue, Montclair State College, Upper Montclair, N.J.

8. Allen, R. L. and Allen V. F. Listen and Guess,...a set of books, tapes and records giving practice in intensive listening skills....contact McGraw Hill Company, N.Y.

9. Dorry, G. N. Games for Second Language Learning,...Games that may be

used by individuals and groups of all ages to learn a new language.... contact McGraw Hill Company, N. Y.

10. English Grammar Exercises, Special English,...a series of tapes designed for non-native speakers of English...contact Macmillian Co., New York.

11. Project STRIVE...a project to enable adults to become more confident through a greater competence in managing their lives and to become more committed to pursuing learning. This project is dedicated to providing useful information and education to adults who have attended but never completed high school...contact Mr. John Golden, Corporation for Public Broadcasting, Washington, D. C.

PRODUCERS AND DISTRIBUTORS OF AUDIO-VISUAL MATERIALS IN SPANISH

Write to them for information and catalogs. Some of the materials are for purchase, others are for rent or lending. Some are in English, but about the Spanish-speaking in the U. S.

Allend'or Productions
4321 Woodman Ave.
Sherman Oaks, Calif. 94103

16 mm Films for Adults

Allyn & Bacon
470 Atlantic A e.
Boston, Mass. 02110

Tapes with books. For Children & Adults

American Book Co.
300 Pike St.
Cincinnati, Ohio 45202

Records & Tapes. For Adults

American Dental Association
211 East Chicago Ave.
Chicago, Ill. 60611

16 mm Films & 35 mm Filmstrips. For All.

American Documentary Films, Inc.
379 Bay St.
San Francisco, Calif.

Films for Young Adults & Adults.

Audio Visual Center Media Library
The University of Iowa
Iowa City, Iowa 52240

16 mm Films for Young Adults & Adults

Audio Visual Instructional Media Services N. W.
Handelskade 8
Curacao, Netherlands Antilles
P. O. Box 1010 Hollywood, Calif.

16 mm Films for Adults on several subj's.

Audio-Visual Productions
8 East 36 St.
New York, N.Y. 10016

Films for Young Adults & Adults

B. F. A. Educational Media
2211 Michigan Ave.
Santa Monica, Calif. 90404

16 mm Films in all subjects.

Bailey Films
6509 De Longpre Ave.
Hollywood, Calif. 90028

Films for Children. Some might be used with Young Adults & Adults.

American Management Association, Inc.
130 50th St.
New York, N. Y. 10020

Films for Adults.

Arte y Cultura, A. C.
Liverpool No. 48 5to piso
Mexico 6, D.F.

Filmstrips with records. For Adults.

Atlantic Productions, Inc.
1252 La Granada Dr.
Thousand Oaks, Calif. 91360

Films for Young Adults & Adults

Audio Lingual Educational Press
45 West Park Ave. (Box 390)
Long Beach, New York 11561

Materials to teach Spanish as a second language.

Capitol Records
Hollywood and Vine
Hollywood, Calif. 90028

Records. For All.

Carousel Films, Inc.
1501 Broadway
New York, N. Y. 10036

16 mm & 8 mm Films. 1 in Spanish on the miracle of reproduction "The day life begins"

La Causa Distribution Center
3725 E. 14 St.
Oakland, Calif.

Films. For Young Adults & Adults.

Center for Mass Communication of Columbia University Press
562 W. 113 St.
New York, N. Y. 10025

16 mm Films. For Adults

The Blue Giraffe, Ltd.
23-80 48th St.
Long Island City, N. Y. 1103

Records, Folklore, Music of several countries.

Brandon International Films
221 W. 57th St.
New York, N. Y. 10019

16 mm Films for All.

Bray Studios Inc.
630 9th Ave.
New York, N. Y. 10036

16 mm Films for All.

Caedmon Records
505 8th Ave.
New York, N. Y. 10016

Records. For All.

Cooks Records
101 2nd St.
Stanford, Conn.

Records. For Young Adults & Adults.

Coronet Films
65 E. South Water St.
Chicago, Ill. 60601

16 mm Films for All.

R. D. Cortina, Co.
136 W. 52 St.
New York, N. Y.

Tapes & records. For All.

Crown Publishers
419 Park Ave. S.
New York, N. Y. 10016

Records for Adults.

Crusade for Justice
16th & Downing
Denver, Colo.

Films for Young Adults & Adults.

Centro Audio Visual Educativo, A. C.
Liverpool 65-206
Mexico 6, D. F.

Filmstrips for Adults.

Charles Cahill & Associates
5746 Sunset Blvd.
Hollywood, Calif. 90028

Films & records. For All.

Chilton Books
401 Walnut Street
Philadelphia, Pa. 19106

Filmstrips, tapes & records. For All.

Churchill Film
662 North Robertson Blvd.
Los Angeles, Calif. 90069

16 mm & 8 mm Films for Young Adults.

Cine-Tele
6325 Santa Monica Blvd.
Hollywood, Calif. 90038

Films for All.

CMS Records, Inc.
14 Warren St.
New York, N. Y. 10007

Records on musical & literary works of Latin Am.

Factory Mutual Public Relations & Publications
1151 Boston-Providence Turnpike
Norwood, Mass. 02062

Films for Adults.

Film Associates
11559 Santa Monica Blvd.
Los Angeles, Calif. 90025

16 mm films for All.

D. C. Heath, Co.
285 Columbus Ave.
Boston, Mass. 02116

Tapes for Adults.

District of Columbia Tuberculosis & Respiratory Disease Assoc.
1714 Mass. Ave. N.W.
Washington, D. C. 20036

16 mm Films for Adults.

Don Bosco, S. A.
Apartado postal 920
Mexico 1, D. F.

Filmstrips & Films with records. For Children & Young Adults.

Encyclopedia Britannica Educ. Corp.
425 North Michigan Ave.
Chicago, Ill. 60611

16 mm & 35 mm Films & Filmstrips.

Eye-Gate House, Inc.
146-01 Archer Ave.
Jamica, New York 11435

Filmstrips & Records. For Adults.

Hudson Photographic Industries, Inc.
Irvington-on-Hudson
New York, N. Y. 10533

Educational filmstrips, some with cassettes & books. For Children.

Indiana University
Audio-Visual Center
Bloomington, Indiana 47401

Films, 16 mm For Adults.

Inter-American Safety Council, Inc.
140 Cedar St.
New York, N. Y. 10006

16 mm films & 35 mm slides. For All.

D3-20

Folkways/Scholastic Records
165 W. 46 St.
New York, N. Y. 10036

Records for Children.

Friendship Press
475 Riverside Drive
New York, N. Y. 10027

Filmstrips & Records. For All.

Gamco Industries, Inc.
Creative Visuals
Box 1911
Big Spring, Texas 79720

Transparencies for learning Spanish as a second language. For All.

Graphic Arts Films, Inc.
Box 176, Glenville Station
Greenwich, Conn. 06830

16 mm films. For Adults.

Harcourt,Brace & World
757 3rd Ave.
New York, N. Y. 10017

Tapes & Records for learning Spanish as a second language.

Harvest Films, Inc.
11 W. 42nd St.
New York, N. Y. 10036

16 mm films for Adults.

McGraw-Hill Text Film Division
330 West 42nd St.
New York, N. Y. 10036

16 mm films for Young Adults & Adults.

Media Plus, Inc.
60 Riverside Dr. Suite 11 D
New York, N. Y. 10024

Multimedia bilingual kit on the stories & legends of some Latin American countries.

International Film Bureau, Inc.
332 South Michigan Ave.
Chicago, Ill, 60604

16 mm films, tapes, & filmstrips.

Internation Tutors
17350 Gresham St.
Northridge, Calif. 91324

Audio-visual method to teach Spanish as a second language.

Instituto Latinoamericano de la Communicacion Educativa ILCE
Apartado 18862
Mexico 18, D. F.

Films, Filmstrips & other audio-visual materials. For Children & Young Adults.

Alfabetizacion Laubach Mexicana, A. C.
Berlin 26 Despacho 2
Mexico 6, D. F.

Slides for Adults.

Linguaphone Institute, Inc.
437 Madison Ave.
New York, N. Y. 10022

Records. Complete course to learn English & Spanish.

Lorraine Music Co., Inc.
23-80 48th St.
Long Island City, New York 11103

Sound filmstrips & records. Teach Spanish as a second language.

OAS Visual Arts Department
Organization of American States
Washington, D. C. 20006

Filmstrips, slides & pictures. All levels. For loan only.

The Ohio State University
Department of Photography
156 West 19 Ave.
Columbus, Ohio 43210

16 mm films for Adults.

Medical Communications, Inc.
280 Park Ave.
New York, N.Y. 10017

Filmstrips with records in medical subjects.

Modern Learning Aids
1212 Avenue of the Americas
New York, N. Y. 10036

16 mm. films for Young Adults & Adults.

Motion Picture Service
Office of Information
U. S. Dept. of Agriculture
Washington, D.C. 20250

16 mm. films & T. V. For Adults mainly.

Multi-Media Productions, Inc.
580 College Ave.
Palo Alto, Calif. 94306

Films for Young Adults & Adults.

National Audiovisual Center
National Archives & Records Service
General Services Administration
Washington, D.C. 20409

16 mm. educational films, for Young Adults & Adults. Also, color filmstrips.

National Film Board of Canada
680 5th Avenue
New York, N.Y.

16mm. films, For All.

National Textbook Corp.
8529 Niles Center Road
Akokie, Ill. 60076

Records & Tapes. For All.

GED Productions
2921 West Alameda Ave.
Burbank, Calif. 91505

16 mm. films for Young Adults & Adults.

Pathescope Educational Films, Inc.
71 Weyman Ave.
New Rochelle, N.Y. 10802

Tapes, filmstrips, books, aural review recordings. Teach Spanish as a second language, Secondary level.

Paul Burnford Film Productions
662 North Robertson Blvd.
Los Angeles, Calif.

Films for Young Adults & Adults.

The Pennsylvania State University
Audio-Visual Services
6 Willard Bldg.
University Park, Penn. 16802

Films for Language Arts, Advanced.

Planned Parenthood-World Population
810 Seventh Ave.
New York, N. Y. 10019

16mm. films on planned parenthood.

Prothmann Associates, Inc.
650 Thomas Avenue
Baldwin, New York 11510

Slides on arts of Spain & Latin America. For Adults.

Puerto Rico, Department of Educa-
tio
Division of Community Education
San Juan, Puerto Rico

Films for Adults.

Pyramid Films
Box 1048
Santa Monica, Calif. 90406

Films to learn Spanish as a second language. High School.

Singer
1345 Diversey Parkway
Chicago, Ill. 60614

Filmstrips with cassettes or records. For All.

Quality Film Laboratories Co.
450 West 56 St.
New York, N. Y.

Films for Adult Education.

RCA Educational Sales
1133 Avenue of the Americas
New York, N. Y. 10036

Records & Tapes to teach Spanish as second language. Popular musical records of Latin American singers.

RCA Record Division
1 5 E. 24 St.
New York, N. Y. 10010

Records. For All. Popular music.

Regents Publishing Co.
200 Park Avenue South
New York, N. Y. 10003

Tapes for Adults. Spanish Grammar.

Roundtable Films
321 South Beverly Hills
Beverly Hills, Calif. 90212

16 mm. films for Adults. Advanced.

Sandak, Inc.
4 East 48 St.
New York, N. Y. 10017

Slides for All.

Science Kit, Inc.
2299 Military Rd.
Box 69
Tonawanda, New York 14150

Science kit with Spanish manual.

Secretaria de Salubridad y Asistencis
Dr. Jorge Gage Barragan, Director
Seccione Dirección
Lomas de Plateras
Mexico 10, D. F.

Films for Young Adults & Adults.

Southwest Council of La Raza
11 West Jefferson Ct. No. 416
Phoenix, Arizona

Films for Young Adults & Adults.

Southwestern Cooperative Educational Laboratory
117 Richmond Dr. N. E.
Albuquerque, New Mexico 87106

Video tapes for Adult Basic Education.

Spanish Music Center, Inc.
Belvedere Hotel
319 W. 48 St.
New York, N. Y.

Records for All.

Spoken Arts
59 Locust Ave.
New Rochelle, N. Y. 10801

Records for All.

Henry Strauss Distributing Corporation
31 W. 53 St.
New York, N. Y. 10019

16 mm. films for Adults. Advanced.

Teaching Film Custodians, Inc.
25 West 43 St.
New York, N. Y. 10036

Films showing the principles and methods of teaching a second language.

Trans-World Films, Inc.
332 South Michigan Ave.
Chicago, Ill. 60604

16 mm. films; tapes & filmstrips. For All.

United Farm Workers Organizing Committee
P. O. Box 130
Delano, Calif.

Films for Young Adults & Adults.

Universal Education & Visual Arts
221 Park Avenue South
New York, N. Y. 10003

16 mm. films for Chi dren.

University of Wisconsin
Bureau of Audio Visual Instruction
Madison, Wisconiin

Films for Young Adults & Adults

Urban Media Materials
P. O. Box 133
Flushing, New York 11365

Films for Young Adults & Adults.

Utah Migrant Council
Salt Lake City
Utah

Films for Young Adults & Adults.

Visual Products Division
3 M Company
Box 3344
St. Paul, Minnesota 55101

Transparencies to teach Spanish as a second Language.

Walt Disney
800 Sonora Avenue
Glendale, Calif. 91201

16 mm. films for All.

Weston Woods
Weston, Connecticut
06880

Motion pictures, filmstrips, sound filmstrips, super 8 sound recordings, cassettes. For Children.

World Council of Credit Unions, Inc.
1617 Sherman Ave.
Box 431
Madison, Wisconsin 53701

16 mm. films & 35 mm. slides on credit unions.

WFF'N PROOF
P. O. Box 71
New Haven, Connecticut 06501

Equation games in Spanish.

The Disc Shop
1815 Connecticut Ave. N. W.
Washington, D.C.

Records. For All. Popular music & selected readings. One of the best collections of records in Spanish in the U. S.

Appendix D-4

PROTOTYPE MEDIA DEVELOPMENT

A REPORT

Submitted to

Telecommunications Project
321 Arnold House
University of Massachusetts
Amherst, Mass. 01002

by
Dr. Juan Caban
School of Education
University of Massachusetts
Amherst, Massachusetts 01002

August 16, 1974

Thoughts on the Design of Culturally and Linguistically Specific Instructional Materials

In designing instructional materials for specific communities it is essential that one first know and understand the community. The designer must have personal knowledge of the people and where they live. It is not sufficient to read about them and their problems. The designer needs to identify issues which come out of the concrete experience shared with him by members of the community. To the degree that the designer can understand the needs of the group and the nature of their community life will the instructional material attain the focus necessary to achieve its goals.

Each of us filters experience in a unique way. The result is information which conforms to a pattern or arrangement which we find satisfying. Because of this fact the instructional materials designer needs to check his choice of organization, images, words and music using community advisors as "filters." This procedure insures that designer bias is limited and that specific community characteristics are emphasized.

Media that has been developed out of a specific community focus, using images from that community accompanied by narration reflecting the speech of that community should communicate best to members of that specific community.

In practice this means that instructional materials using this approach are not readily useable by other groups because of their specific group identity. As with individualized instruction the material should be most effective with the group for which it was designed.

Using the Culturally and Linguistically Specific Approach

With regard to the Urban Learning Centers, the design of instructional or learning materials for use by the community could be done by members of the community itself. Some members could be trained in the design and production of instructional materials. The process would allow for the development of materials having a local community focus. Central to this approach would be the use of individuals who are culturally and linguistically distinct. In questions where the production presented complexities beyond the technical expertise of Urban Learning Centers they could have access to college and university staff and facilities to aid in solving problems.

In short, the community supplies the manpower to run the Urban Learning Center and to develop some learning modules dealing with matters of importance to those living in the area.

Developing the Instructional Material

It seems advisable for ULC's to be able to design and gather the basic elements of the instructional materials to be developed. For example, in the case of the slide/tape on housing in Springfield which accompanies this report the basic elements were slides and music. The ability to photograph the places and persons who were to appear in the slide show was the minimum requirement in developing the learning module. The slide/tape module required equipment capable of taking photographs outdoors as well as indoors. This equipment would minimally be a single lense reflex camera with an electronic flash.

The nature of automatic photographic equipment today make it entirely feasible to train a community member in the use of a 35mm camera and to expect that the resulting color slide would be adequate for instructional use.

In the case of the video tape module the situation was similar. For example, the operation of video tape equipment is, in some regards, even simpler than photographic equipment. The making of a video recording is a process which is quickly learned.

In the case of both photographic slides and video tape for media modules the final production procedures requires equipment and skills which might not readily be found in Urban Learning Centers. It is for this reason that it would be recommended that the services of the audio-visual center of a nearby college or university be considered. Such a relationship could be mutually beneficial as each would gain; ULC in the extra equipment made available to it and the college the opportunity to be involved with real issues and needs.

Cost of Instructional Materials

In determining the cost of slide/tape and video tape modules accompanying this report one needs to look at the following:

Materials:

Slide /tape -

6 each	35mm film and processing @ 7	$42
	graphics materials	$10
	audio tape	$ 5
		$57

VTR -

6 each	1/2 inch half hour video tape @ 12	$72
	audio tape	$ 5
	graphics materials	$10
		$97

Labor:

Slide/tape	60 hours @ ?
VTR	70 hours @ ?

One can see from the above that labor is a factor which will contribute greatly to the cost in direct proportion to the rate being paid for labor.

It goes without saying that the cost of developing prototype material is always greater than the unit cost once it is in production. Culturally and linguistically specific materials will be relatively expensive to produce but if they do their job well then it will justify the expenditure.

Telecommunication Project Prototype Media for Urban Learning Center

Overview:

The basic premises underlying the production of the prototype media modules to be used in Urban Learning Centers were the following:

a) They were to be cultural and linguistically specific

b) They were to deal with subjects of interest to the urban community

c) They were to utilize relatively simple technology to produce the messages

Two groups were selected to function as target populations for which learning materials would be designed, one was black the other was Spanish speaking (Puerto Rican).

Content for the learning materials was selected from among the subjects of greatest interest to the Community Advisory Council. These were housing repair to rental property and information about the University Without Walls.

Slide/tape and video production were chosen as the medium for communication because they were the least complex and extensive training was not necessary for their adequate utilization.

Design of media

It was decided that each medium (slide/tape, video) would be used with each population group.

The slide/tape was selected for the housing module because it was felt that color would add interest and that it would lend itself to a straight forward presentation of information. On the other hand, video was used with the University Without Walls module as it deals basically with a student's view of what the UWW Program means to him and what he would advise others who want to enter the program. The intimate one-on-one nature of video makes it a natural choice for this case.

In the case of each medium it was decided to select faces and places which could be easily identified as culturally specific.

The text was kept simple and direct avoiding complex wording. The English scripts were written first and then translated into Spanish. All titles were translated into Spanish except those for which there was no Spanish equivalent or which related to a specific agency which could not be identified otherwise. The scripts are attached as Exhibits A and B.

The narrators were chosen for their culturally and linguistically specific voice quality. The Spanish narrator was a Puerto Rican.

Music for the module was selected with each group in mind, rhythmic, and easily identifiable.

Credits and Titles were chosen to indicate:

a) project sponsorship (Telecommunication Project etc.)

b) identification (Urban Learning Center)

c) hypothetical series (For Your Information)

d) specific topic (Housing in Springfield)

e) information to be gained from the module (Getting It Fixed)

Production Procedure

A. Slide/Tape:

1) Tentative script prepared after gathering information on needs, regulations, procedures and locations for shooting housing.

2) Photographing sites and individuals
3) Simplification of script
4) Translation into Spanish
5) Preliminary Assembly on light box
6) Preparation and copying of credits and titles
7) Selection of music
8) Final Assembly of slides, titles and credits
9) Recording of narration and music
10) Re-recording and editing for exact time
11) Transfer to Wollensak cassette
12) Addition of pulses for slide change

B. Video Tape:

1) Tentative script prepared after gathering information on program and selection of UWW student
2) Video taping of location at the University of Massachusetts
3) Video taping interview with UWW student
4) Simplification of script
5) Translation of script into Spanish
6) Preparation of credits and titles
7) Video taping still photos, slides, credits and titles
8) Editing titles and University sequence
9) Editing interview and credits
10) Selection of music
11) Recording narration and music
12) Dubbing narration and music onto video tape

Equipment Used

A. Slide/Tape:

1) 35 mm single lense reflex and electronic flash

2) cassette recorder

3) phonograph

4) reel-to-reel tape recorder and microphone

5) copy stand and lights

6) light box

7) slide projector

8) cassette sync recorder

B. Video Tape:

1) Portable 1/2" Video tape recorder

2) Quartz lights

3) Extension cables

4) Microphone

5) Tripod

6) VTR Editing unit (Sony 3600 & 3650)

7) Reel-to-reel tape recorder

8) Phonograph

Exhibit A

Prototype Media for

Urban Learning Center

"Springfield Housing:

Getting It Fixed"

A Slide/Tape Presentation
Submitted to
Telecommunications Project
321 Arnold House
University of Massachusetts
Amherst, Mass. 01002

by

Dr. Juan P. Caban
School of Education
University of Massachusetts

August 1974

VIDEO	AUDIO
1. Title: "TELECOMMUNICATIONS PROJECT UNIVERSITY OF MASSACHUSETTS AMHERST"	MUSIC
2. Title: "URBAN LEARNING CENTERS"	
3. Title: "FOR YOUR INFORMATION"	
4. Title: "HOUSING IN SPRINGFIELD"	
5. Aerial view Springfield	
6. Project Housing	
7. Black Couple	Wherever you live in Springfield you have certain rights as tenants

	VIDEO	AUDIO
8.	Title: "RIGHTS OF TENANT"	These rights are protected by laws
9.	Title: "GETTING IT FIXED"	The housing you rent must meet the housing standards set by the Springfield Housing Authority
10.	Super "Getting It Fixed" over radiator	If <u>your</u> apartment (Pause) has no heat (Pause)
11.	Super "Getting It Fixed" over broken window	or a broken window (Pause)
12.	Super "Getting It Fixed" over peeling paint	or peeling paint (Pause)
13.	Super "Getting It Fixed" over leaky faucet	or leaky faucets, you can get it fixed at your landlord's expense

VIDEO	AUDIO
14. MAN LISTEN ON TELEPHONE	The first thing you should do is contact your landlord (Pause) Tell him what is wrong with your apartment and ask him to fix it.
15. CODE ENFORCEMENT BUREAU	If your landlord does nothing for two days you should contact the Code Enforcement Bureau
16. BUILDING	Located at the Springfield Health Department Building at 1414 State Street
17. Super 737-5304 SIGN	Follow the sign to the Housing Department or call 737-5304
18. MAN BEHIND DESK	The Code Enforcement Bureau will tell your landlord to fix your apartment. This service is free. Your landlord will pay for the repairs.
19. SIGN: "HAMPDEN COUNTY HOUSING COURT"	If the repairs are not done by the required time, your landlord will be taken to court.

VIDEO	AUDIO
20. Building	Your landlord cannot force you to move because you use these
21. Court House	services. Threats from your landlord should be reported to the Housing Court clerk.
	located in the Superior Court Building on Elm Street near City Hall
	The Housing Court clerk will investigate and take your landlord to court if necessary
22. Broken window	At any time for any problems
23. Neighborhood Office	with your housing or landlord, you
24. Sign: "Greater Springfield"	can contact a local Neighborhood Office of the Community Council of "Greater" Springfield.
25. Women at desk	Their personnel will help you and see that your problems are solved.
27. Title: "PRODUCER: JUAN P. CABAN ASSISTANT: NICOLAS D'OMBRAIN"	
28. Title: "University of Massachusetts	

"VIVIENDAS EN SPRINGFIELD"

VIDEO	AUDIO
1. Titulo: " PROYECTO DE TELECOMMUNICACION UNIVERSIDAD DE MASSACHUSETTS AMHERST"	MUSICA
2. Titulo: "CENTROS URBANOS DE ESTUDIO"	
3. Titulo: "PARA SU INFORMACION"	
4. Titulo: VIVIENDAS EN SPRINGFIELD	
5. Vista aeria	
6. Casas	
7. Pareja	Donde quiera que usted resida en Springfield
8. Titulo: DERECHOS DEL INQUILINO	Tiene ciertos derechos como inquilino. La ley protege estos derechos.

VIDEO	AUDIO
9. Titulo: "REPARACION"	La vivienda que ustedaalquile debera estar de acuero con las normas establecidas por el Negociado de Viviendas de Springfield.
10. Super "REPARACION (sobre radiador)	si su apartamento carece de calefaccion,
11. REPARACION (sobre vidrio roto)	tiene algun vidrio roto,
12. REPARACION (sobre pintura descascarada)	pintura descascarada
13. REPARACION (sobre pluma de agua rota)	o plumas de agua rotas, usted puede mandar a hacer estas reparaciones cargandoselas al casero.
14. Hombre con telefono	Haga lo siguiente: Primero, comuniquese con el casero. (Pausa) Notifiquele lo que sucede con su apartamento y pidale que lo arregle.

VIDEO	AUDIO
15. Titulo: CODE ENFORCEMENT BUREAU	Espere dos dias solamente. Si el casero no cumple, comuniquese con la oficina de "Code Enforcement Bureau"
16. Super CALLE STATE NUM. 1414 (Edificio)	Localizada en el edificio del Departamento de Salud de Springfield Calle State Num. 1414
17. Super TELEFONO 737-5304 (Rotulo)	Siga el rotulo del Negociado de Viviendas o llame el número 737-5304
18. Hombre detras de escritorio	La Oficina de "Code Enforcement Bureau" le exigira al casero que arregle su apartamento. Este servíce es gratuito. El casero pagara por los arreglos.
19. Rotulo: "HAMPDEN COUNTY HOUSING COURT"	Si los arreglos no estan completos en el plazo indicado, el casero sera llevado a la corte.
20. Edificio	Su casero no puede obligarle a Ud. a mudarse por haber hecho uso de estos servicios. Cualquier amenaza de parte del casero debera ser notificada a la persona encargada en la Corte de Viviendas.

	VIDEO	AUDIO
21.	Corte Suprema	situada en el edificio de la Corte Suprema en la Calle Elm cerca de la Alcaldia. La Persona encargada investigara el caso y llevara al casero a la corte si fuera necesario.
22.	Venta vota	Todo problema relacionado con su vivienda o casero
23.	Oficina	debera comunicarse a la Oficina local del Concilio de "Greater"
24.	Rotulo: "Greater Springfield"	Springfield
25.	Hombre detras de un escritorio	donde se le ayudara a usted a resolver cualquier problema de esta indole.
26.	Titulo: "PRODUCER: JUAN P. CABAN ASSISTANT NICOLAS D'OMBRAIN"	MUSICA
27.	Titulo: "University of Massachusetts"	

Exhibit B

Prototype Media for
Urban Learning Center

"University Without Walls"

A Video Presentation
Submitted to
Telecommunications Project
321 Arnold House
University of Massachusetts
Amherst, Mass. 01002

by

Dr. Juan P. Caban
School of Education
University of Massachusetts

August 1974

VIDEO	AUDIO
1. Title: "TELECOMMUNICATIONS PROJECT UNIVERSITY OF MASSACHUSETTS AMHERST"	MUSIC
2. Title: "URBAN LEARNING CENTERS"	
3. Title: "FOR YOUR INFORMATION"	
4. Title: "FROM TOP OF UNIVERSITY OF MASS. LIBRARY DOWN TO PATIO ROOM TO STUDENTS WALKING"	More people are going to college today than ever before. More programs are available to meet their needs.
5. Title: "UNIVERSITY WITHOUT WALLS"	University Without Walls is a special undergraduate program for full time students leading to a bachelor's degree.

VIDEO	AUDIO
6. MS. BLACK GIRL	Universities are now offering more programs designed to meet the needs of individuals who might not normally have the opportunity to attend college.
7. SERIES OF C.U. OF STUDENTS	
8. L.S. STUDENTS IN CLASS	
9. C.U. STUDENT	We recognize that people often have experiences that parallel university study.
10. L.S. UNIVERSITY POND, PAN TO: FINE ARTS BUILDING, ZOOM TO: C.S. OF BUILDING	University Without Walls gives credit not only for academic study but also for such related experiences as work, technical training, travel, special skills and other life experiences that are not normally related to traditional academic programs.
	Each student negotiates his program with a University of Massachusetts faculty member in accordance with his own needs.

VIDEO	AUDIO
11. C.U. Ed Donawa	Mr. Ed Donawa, who has been in the University Without Walls program for a year shares with us his feelings about the program.
12. M.S. DONAWA (The rest of program follows the unfolding thoughts Donawa has on UWW -- Camera select shot according to natural interest)	(Ed Donawa discusses his views on University Without Walls and what students in the program should be aware of in their relations to instructors.)
13. L.S. Donawa and his wife sitting on couch in his living room	
14. Title: "PRODUCER: JUAN P. CABAN ASSISTANT JEFFERY RABIDOUX	MUSIC
15. Title: "UNIVERSITY OF MASSACHUSETTS"	—30—

Prototype Media for

Urban Learning Center

(Spanish Version)

"La Universidad Sin Paredes"

A Video Presentation
Submitted to
Telecommunications Project
321 Arnold House
University of Massachusetts
Amherst, Mass. 01002

by

Dr. Juan P. Caban
School of Education
University of Massachusetts

August 1974

VIDEO	AUDIO
1. Titulo: "PROJECTO DE TELECOMMUNICACION UNIVERSIDAD DE MASSACHUSETTS AMHERST"	(MUSICA)
2. Titulo: "CENTROS URBANOS DE ESTUDIO"	
3. Titulo: "PARA SU INFORMACION"	
4. L.S. Desde el tejado la biblioteca de la University de Mass. hacia el patio -- zoom hacia estudiantes caminando	(MUSICA DE FONDO) Un sinnúmero de personas asiste a colegio hoy más que antes. Existen muchos programas de estudio que responden a las necesidades del estudiante universitario.
5. Titulo: "UNIVERSIDAD SIN PAREDES"	Algunas universidades ofrecen pro- programas diseñados para satisfacer las necesidades de alumnos que normalmente no tendrian la oportunidad de asistir a la universidad.

VIDEO	AUDIO
6. M.S. Estudiante Siguiendo Por Unva Serie de C.U.'s De Otros Estudiantes	Reconocemos que a veces algunos alumnos han tenido experiencias paralelas a los estudio academicos.
7. M.S. Estudiantes en el Salon de Clase.	La Universidad Sin Paredes otorga creditos, no solamente por estudio academico, sino tambien por experiencias tales como entremaniento tecnico, trabajo realizado, viajes emprendidos, aptitud, etc., relacionadis normalmente con programas de estudio academico tradicional.
8. L.S. Laguito De La Universidad, Pan to: Edificio de Bellas Artes, Zoom to: C.S. Del Edificio	El estudiante prepara su programa de estudio de acuerdo con sus necesidades, con la ayuda de un profesor de la Universidad de Massachusetts.
9. C.U. Francisco Ojeda	El senor Francisco Ojeda quien ha estado en el program de la Universidad Sin Paredes durante el periodo de un año, expresa sus ideas sobre el mismo.

VIDEO	AUDIO
10. M.S. Señor Ojeda (La Coninuacion Del Programa Determina la Seleccion De Vistas Fotograficas)	Y lo que significa para el estudiante adulto el asistir a la Universidad Sin Paredes, la que exige Del Principiante Documantar sus experiencias para recibir credito en el programa.
11. Titulo: "PRODUCER: JUAN P. CABAN ASSISTANT: JEFFERY RABIDOUX	MUSICA
12. Titulo: "UNIVERSIDAD DE MASSACHUSETTS"	

Appendix E

Original and Revised Brochures

E-1 - Original
E-2 - Revised

August, 1974

The following brochures were designed to be folded in thirds. The portion forming the outside cover, being shown as the outside of the brochure and the portion viewed when the brochure is unfolded, being shown as the inside.

Why not find out for yourself? Visit the Adult Learning Center, 50 Franklin Street, Worcester, Mass. Across the Common from Worcester Center! Telephone: 757-7478.

JOHN CONNOR, SUPERINTENDENT
WORCESTER PUBLIC SCHOOLS

IT'S BASIC . . . EDUCATION HELPS

ULT LEARNING CENTER
FRANKLIN ST.
RCESTER, MASS. 01608
RCESTER PUBLIC SCHOOLS

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HIGH SCHOOL CERTIFICATION PROGRAM

ADULT LEARNING CENTER
50 FRANKLIN ST., WORCESTER, MASS. 0
TEL. 757-7478

E-5

Original Brochure - Outside
E-1

"I had trouble filling out a job application. That's why I came to the Center."

The Adult Learning Center is the place to learn how to get more out of life. Practical things like reading, math, science, literature and social studies. After all, a little more knowledge can mean a lot — whether you're filling out applications, planning a family budget or just trying to keep up with what's going on.

"At first, I was a little scared about going back to school. But nobody rushes you at the Center. You learn at your own speed. Besides, I met a lot of people in the same boat."

You can begin at the Center any time of year, from 9:00 A.M. to 9:00 P.M., Monday through Friday. Classes are small and friendly. Students receive individual attention, and get to know and help each other in discussion groups. Even though the Center uses the very latest teaching machines and textbooks, it's all free.

"I started out with reading, but after a while I figured I could handle other subjects. It'll take time, but I'm going to try for my high school certificate."

The Adult Learning Center has a lot to offer. You can take what you already know and add to it, or you can aim at a high school certificate.

"I think coming to the Center is the best thing I've ever done for myself. Today, you need all the education you can get — just to get a decent job. But an education can help you enjoy your life more. Isn't that worth something, too?"

Original Brochure - Inside

416

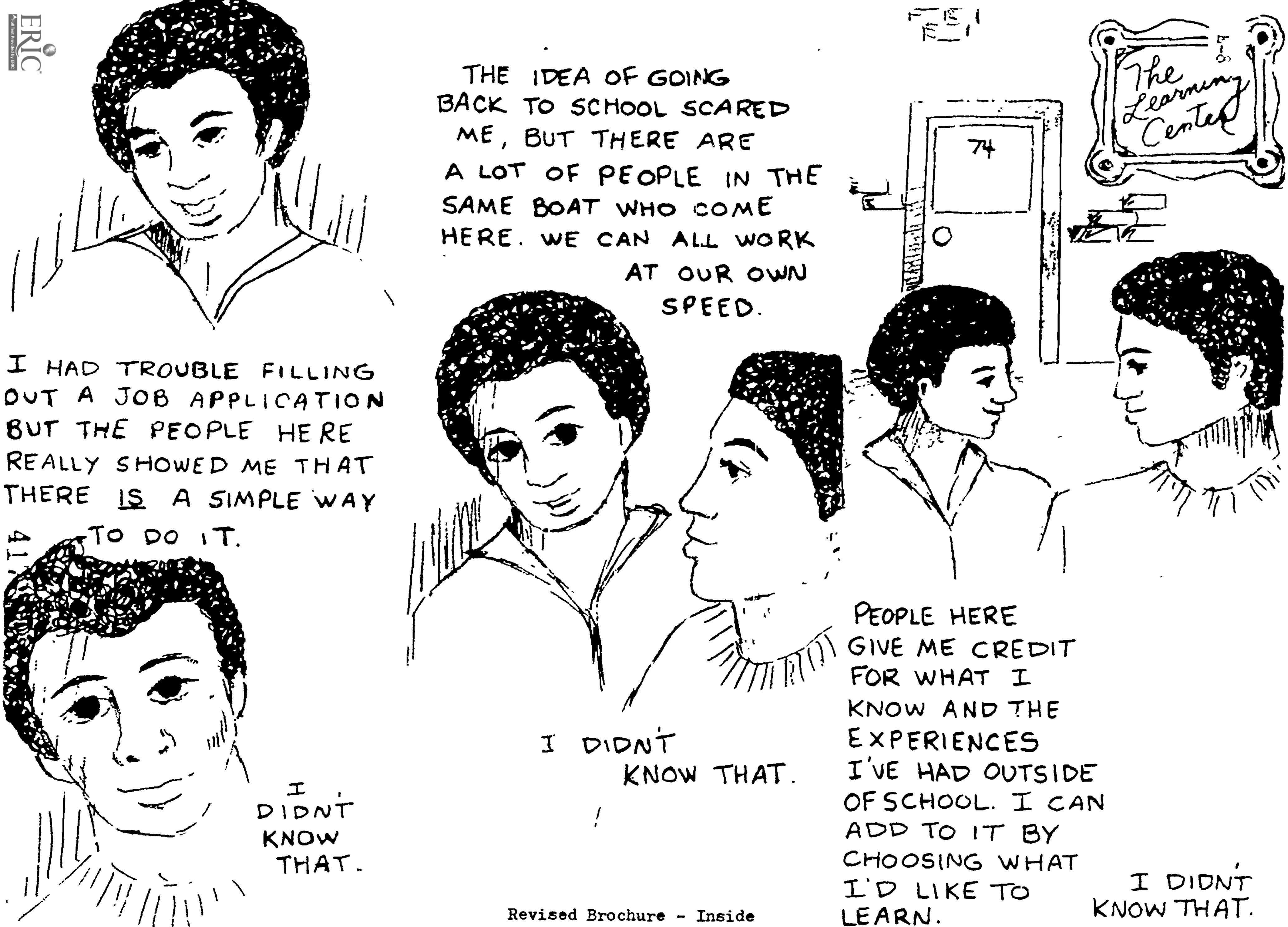
NOW THAT YOU KNOW,
WHY NOT VISIT
THE LEARNING
CENTER

74 SPRING STREET
SPRINGFIELD

TELEPHONE : 227-8393

E-7

Revised Brochure - Outside
E-2



Revised Brochure - Inside

Appendix F

BIBLIOGRAPHY

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