THE EDUCATIONAL AND SOCIAL USE OF COMMUNICATIONS SATELLITES

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Compiled by
Katherine Shervis
EDSAT Librarian

Computer Programming
by
Richard G. Wolfe and Roger Voytecki

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EDSAT Program
The University of Wisconsin
Madison, Wisconsin

May 1970
The Educational Diffusion and the Social Application of Satellite Telecommunications

Initiated in 1967, EDSAT is concerned with the educational and humanistic uses of satellite communications, particularly in the area of multicultural teaching and learning. EDSAT is also concerned with the technical design of educational satellite systems, but follows the principle that carefully determined criteria for utilization should precede technical design, and the technology of software should have equal weight with the technology of hardware in developing a total system.

EDSAT's primary substantive objectives:

A. To search out, analyze and define the possible applications of space telecommunications technology to education; and particularly the continuing education of adults in a multicultural context.

B. To establish, in collaboration with potential users, practical as well as optimum uses and purposes of systems of multicultural adult education via satellite telecommunications.

C. To determine by hypothesis, demonstration, test and evaluation the models for teaching and learning that will be effective in achieving the uses and purposes of multicultural adult education that will be consistent with the technology employed, and that will encourage teaching input and learning outcomes from all the points in the system.

D. To participate in the development, with potential users and appropriate international authorities, of a model agreement between countries which will preserve, protect and regulate a band of satellite telecommunications for multicultural adult education, and delineate the responsibilities of the signatories thereto.

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EDSAT Program
Space Science and Engineering Center
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Introduction to EDSAT

"Humanistically viewed, technology is not an end in itself but a means to an end, the end being determined by man himself in accordance with the laws prevailing in his society. . . . How in future to make wiser use of technology is perhaps the paramount public issue. . . ."

—Vice Admiral Hyman G. Rickover, 1969

Interdependence among the nations of the world is a modern imperative, yet meaningful cooperation is difficult among nations having diverse aims and greatly different levels of development. The effects of such pressing problems as hunger, disease, illiteracy, ignorance and social or political instability, while rooted in the historical, social and economic aspects of a particular culture and country, are no longer confined there, but spill over to affect every other nation and culture.

Concurrently, knowledge and technology advance at unprecedented rates in highly developed countries, while less-developed countries fall farther behind despite efforts to reduce disparities. There is need for an education-communication system that will accelerate the sharing of the world's knowledge resources at a rate more nearly approaching the speed by which knowledge and technology grow. Such a system could link researchers from different countries for the person-to-person spreading of available knowledge and energizing of knowledge-seeking behaviors in countries where knowledge and technology grow slowly.

Communication by satellite offers the best hope for achieving rapid, person-to-person interaction between scholars, educators and researchers of many countries simultaneously, so that the world's knowledge resources can be shared rapidly enough to halt, and perhaps eventually reduce, the widening education disparities among nations.

Many of the nations most in need of opportunities to share in the spread of knowledge and technology do not have adequate terrestrial communication systems. Hence, any communication system that diffuses education across nations or cultures can be effective only if it provides equal access to all who wish to use it at low cost and at a minimal level of user technology. Therefore, it is proposed that satellites, such as the NASA ATS vehicles, which offer small terminal access capability, be employed in a series of experiments in multicultural education.

EDSAT is working towards its objectives through the following activities:

A. To organize at The University of Wisconsin a multidisciplinary agency focused on studying multicultural systems for education and communications whose function it will be to carry on short- and long-range studies, research, teaching and service operating activities, including the formation of a consortium of universities.

B. To develop and test a system (or systems) of small terminal, points-to-points communication via satellite that will function satisfactorily first between universities in various parts of the world, and later between learners more remote from centers of learning; and to aid in the development of information networks using the capabilities of the satellite in systematic connection with other media.

C. To develop bibliographic services for the use of specialists, students and others who are seeking relevant information on multicultural education (for domestic or foreign application) and the potential uses of satellites in education for adults.

D. To carry out an experimental series of conferences held via satellite:
   1. To determine, with the help of professionals in many countries (anthropologists, sociologists, educators, scientists, political scientists, lawyers, humanists, economists, psychologists), the uses and purposes of satellite-transmitted continuing education for adults.
   2. To determine the technical parameters of the satellite communications system, involving specialists from many countries in broadcasting, engineering, economics, space science and telecommunications.

E. To participate in face-to-face conferences for the drafting of reports and recommendations to the UN, UNESCO, and other appropriate agencies.

F. To publish background, informational, bibliographic and research materials regarding education via satellite.

G. Through the center for studies of multicultural systems for education and communication to institute courses, curricula, research studies and experimental activities for the preparation of graduate students in several related fields for work in the field of multicultural adult education and communication.

H. To develop a technology of software teaching-learning materials and processes that will function in multicultural education, domestic or foreign.

This first bibliography is therefore only a small beginning in the effort to bring the humanism, and the academic resources of The University of Wisconsin, and of other institutions in other cultures, to bear upon the problems of using a great technological tool—the communication satellite—as a means to those larger ends whose pursuit may begin to bring men and cultures closer together in understanding instead of separating them in ignorance and fear of exploitation.

EDSAT Executive Committee
February, 1970
Madison, Wisconsin
INTRODUCTION

During EDSAT's formative stages, the co-principal investigators, Charles A. Wedemeyer and Richard G. Lawson, with the help of a librarian, Mary Thoenig, began a large-scale search of the published literature. The original bibliographic search was intended to turn up and define the scope and diversity of the issues, problems and ideas that bear upon the educational and social uses of telecommunication satellites. The present bibliography developed from this massive search of the periodical literature as it is represented in the major social science and aerospace science secondary sources.

Nearly all of man's social and much of his engineering knowledge relates to the potential revolution presented by this new communication technology. With such diverse information available and relevant, it proved best to create a more widely useful bibliographic source, by proceeding topic by topic, using a storage/retrieval procedure which would later allow us to remesh the disassociated parts into something resembling the original body of thought.

This, EDSAT's first bibliography, deals with a topic limited to only those books, journal articles, newspaper clippings and conference papers that concern themselves specifically with the social and educational uses and implications of satellite communications. It does not include basic educational and social science background materials that bear heavily upon the problem, but that do not specifically discuss their relation to the use of satellites; nor does it include basic technological background materials that do not treat the educational or social uses of the satellites.

This bibliography is not yet complete, either in its content, or in its use of the potential of EDSAT's bibliographic operation and storage/retrieval procedures.

From the very beginning of the bibliographic project, articles of special interest have been abstracted and categorized, making use of the various University of Wisconsin libraries for materials.

The recent introduction of machine and computer processing to the EDSAT bibliographic operation is turning the manually kept record into an information retrieval system of some flexibility. The technique selected involves computer permutation of the words represented in the title of the reference. These words then form a subject index. Permutated indexing is limited by the choice of words within the title and is often meaningless, especially in the humanities and social sciences, where precise, descriptive titles are not always used. The procedure that EDSAT is using allows for the supplementation of these imprecise or inadequate titles through the use of key words. These words function both as a telegraphic rewriting of the title for indexing purposes and as a supplement to the abstract. For further in-depth retrieval, the program allows for subject categorization—the thesaurus approach—and the scanning of the abstract itself.

None of these potentials, except the permuted indexing of the unmodified titles, has been attempted in the first bibliography. Hopefully, its publication and dissemination will stimulate an influx of information and materials which will lead to a more complete and timely record.

This bibliography is the first in a series. The second bibliography, presently being compiled and abstracted, will bring together works on conferencing, with a special attempt to identify works on teleconferencing and the difficulties of the non-face-to-face situation and of its implications for cross-cultural communication. The conferencing bibliography will make full use of machine processing potential, as will the third in the series—the updating and expanding of this bibliography.

Since any bibliography that has been delayed in publication is by that fact out-of-date, a record of the bibliographic search appears at the back.

EDSAT gratefully acknowledges the cooperation and financial assistance of the United States National Aeronautics and Space Administration, the Johnson Foundation, The University of Wisconsin Graduate School, University Extension, and Space Science and Engineering Center.

EDSAT is indebted to Richard G. Wolfe and Roger Voytecki who, in collaboration with Donald Miller, made available their General Indexing System for production of the indexes printed. Mr. Wolfe originated the design of the index system and Mr. Voytecki made refinements and additions suited to the needs of EDSAT.
GUIDE TO THE USE OF THE BIBLIOGRAPHY

The bibliography is made up of three parts, the Record Identification Index, the Author Index and the Permuted Index.

The Record Identification Index, noted on the print-out as the RECID INDEX, is a basic list of 147 references to books, parts of books, journal articles, conference papers, news items and unpublished papers. They appear in the order of accession, with the accession number—the record identification number—printed out at left and right of each citation. Each citation is in turn made up of three parts, the author, the title and the source.

The Author Index relists the entire record alphabetically by author's surname or by the corporate body of authorship. News items with no stated authorship are listed as 'No Author' and appear among the N's.

The Permuted Index serves as the subject index. It is a KWOC (Key Word Out of Context) index which is generated by the computer permutation of the words within the titles. A KWOC index is based on the same principles as is a KWIC (Key Word In Context) index, but is printed out in a more readable format. While a KWIC index prints out only one line of the title, focusing upon the word being permuted within the context of the phrase, the KWOC index prints out the word to the left, repeating the entire title and the record identification number to the right. Each word of the title then serves as a subject heading after which all titles containing that word are listed.

The full reference in the examples below appears in the Recid Index in its numeric position between 0671 and 0673, is repeated fully in the Author Index listed under JAMISON, DEAN, and finally, its title and record identification number appear under the subject headings, SATELLITE, RADIO and ETV. The title does not appear under the headings, BETTER and THAN because these and other trivial words such as articles, prepositions, adverbs and verbs are programmed to be rejected by the computer for permutation. In consulting the Permuted Index, the user will find only the title and the record identification number, and with the help of this number, will have to refer back to the Recid Index for full identification of the citation.

The citations themselves are divided into the three categories of author, title and source.

The author statement is simply the identification of the individual, individuals or corporate bodies responsible for the work's intellectual content. The authors can be listed in such a way that the computer program will list the citation in the Author Index under more than one author. We have made use of this capacity to enrich the Author}

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**RECID INDEX**

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**PERMUTED INDEX**

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  - ***SATELLITE RADIO, BETTER THAN ETV 0672
  - ***ETV BY SATELLITE, FORD FOUNDATION PLAN 0682
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  - ***MULTIPLE CHANNEL EDUCATIONAL TELEVISION SATELLITE SYSTEM 0657
  - ***SATELLITE SYSTEM FOR EDUCATIONAL TELEVISION 3037
The titles are altered in several ways to suit computerization. First, commas and periods are substituted where colons, semicolons and question marks had occurred, since these marks are not represented on key punching equipment. Second, hyphens are used as a device to link two or more words so that they will be treated as a one-word unit for permutation by the computer. This is done simply to limit the occurrence of less meaningful subject headings. The phrases DEVELOPING AREAS, DEVELOPING NATIONS and DEVELOPING STATES are adequately represented by their appearance under the heading DEVELOPING, and the headings AREAS, NATIONS and STATES need not occur. The third alteration is more substantive in that the title is changed. Citation 0696 should most properly be divided as follows: author, UNESCO. Meeting of Experts on the Use of Space Communication for Broadcasting; title, Report of the Meeting; source, UNESCO Document COM/CS/68/1/7, March 25, 1968. However, where the title is merely Report of the Meeting or Final Report, it has been relegated to the initial position in the source and has been replaced by the name of the group presenting the report. The statement contains the key words which will then generate adequate subject coverage.

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The sources vary from the simple imprint, containing the publishing information of place, publisher, date, such as in citation 0772, LEYDEN, A. W. SIUTHOFF, 1969, to statements contrived to explain the availability of the work as best we can. Somewhere in between fall journal articles. The style used for these sources shows the title, volume, paging and date.

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Some of the citations are analytics, with each chapter listed separately. The source shows the paging for the chapter or article, and the full citation of the book in which it appears.

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The source for papers presented at conferences states at least the conference title, place, and date, and offers the paging and imprint when the proceedings have been published. The source for the papers presented at the United Nations Conference on the Exploration and Peaceful Uses of Outer Space, Vienna, 1968 (citations 3034–3119), states the title of the conference, the document coding used by the U.N. and the date of presentation. These materials are not available as a published record of the proceedings, but are beginning to appear in the periodical literature as separately published articles. Reference to them should be made in International Aerospace Abstracts as they appear in the published literature.

Unfortunately, it is impossible for EDSAT to provide reprints of these and other papers. We urge the user of EDSAT's bibliographies to seek out materials through arrangements with regular library and information facilities.
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SEARCH RECORD

Until we break into the invisible college of persons seeking to investigate the potential of communication satellites for social and educational use, and then change to a clearinghouse approach, we are relying on the published literature to identify and unify that invisible college and to document its development.

This bibliography was collected primarily from secondary sources, that is, the indexing and abstracting services that promised to contain the type of reference for which we were searching. Therefore, it lags nine to eighteen months behind the actual writing or presentation of these papers. Since we have not yet begun a full-scale search of recent periodicals, and since very recent engineering conference proceedings are not yet available to us, our only sources of truly current literature are a chance journal article with adequate bibliography or the receipt of recent papers from the authors themselves.

Two groups in particular seem to be working diligently toward the educational and social use of satellite communications. The Institute of Electrical and Electronics Engineers has, since 1965, been convening the IEEE International Conference on Communications each spring in Boulder, Colorado. While most of the nearly 50 sessions are devoted to highly technical and nonsatellite communications, several do provide for discussion of satellite communication systems. Much of the work in designing communication systems for education has been done by this community of engineers. Many of the papers presented at these conferences are not adequately represented in our bibliography because of difficulties of obtaining the Conference Record. The University of Wisconsin Engineering Library has not received the Record for 1966, 1967 or 1968.

UNESCO is a major focus of activity aimed at developing an expertise in the use of satellite communications for the social well-being of the global community. The UNESCO Meeting of Experts on the Use of Space Communication by the Mass Media published the report of its 1965 meeting in 1968. Many of these same men met again in December of 1969 at the UNESCO Meeting of Governmental Experts on International Arrangements in the Space Communication Field. At the United Nations Conference on the Exploration and Peaceful Uses of Outer Space, Vienna, August, 1968, much attention was paid the educational and social use of communication satellites, with special regard for the needs of developing countries.

For the convenience of other researchers, listed below is a record of the secondary sources searched, with some indication of the approach to these services.

The subject headings vary greatly from index to index, both in choice of terms and in their approach to the topic. For example, Bibliographic Index uses ASTRONAUTICS-COMMUNICATION SYSTEMS, a heading which could easily be overlooked by the bibliographic searcher accustomed to the more common headings—SATELLITES, ARTIFICIAL-COMMUNICATION USES (Public Affairs Information Service Bulletin) and COMMUNICATIONS SATELLITES (Readers’ Guide). The variety in approach is even more likely to cause omissions. International Aerospace Abstracts tends to place entries under headings indicating the medium involved, such as EDUCATIONAL TELEVISION and RADIO COMMUNICATION, seemingly regarding the satellite merely as a means of transmission. Many of the general indexes, Readers’ Guide, Social Science and Humanities Index, Applied Science and Technology Index, regard the satellite as the focal point and index accordingly. Most of the more discipline-oriented indexes in the social sciences are so diffuse in their listing of the topic, as we define it here, that a thorough and often not too rewarding search must be made.
Applied Science and Technology Index
Satellites, Artificial - Communication Uses
1960 - September 1969

Bibliographic Index
Astronautics - Communication Systems
Satellites, Artificial - Communication Application
1960 - June 1969

Business Periodicals Index
Satellites, Communication
1960 - June 1969

Education Index
Artificial Satellites - Communication
1960 - October 1969

ERIC Research in Education
Communication Satellites
1967 - September 1969

International Aerospace Abstracts
Variety of inconsistently used subject headings
Broadcasting
Communication Satellites
Educational Television
Radio Communication
Satellite TV
1966 - October 15, 1969

Library of Congress Subject Catalog
Artificial Satellites in Telecommunication
1950 - 1967
January-September 1968 (Library missing September-December)
January-June 1969

Public Affairs Information Service Bulletin
Satellites, Artificial - Communication Uses
1960 - May 3, 1969

Rand Corporation Selected Abstracts
No consistent subject heading
1963 - March 1969

Readers' Guide to Periodical Literature
Communications Satellites
1967 - May 25, 1969

Social Science and Humanities Index
Communications Satellites
Artificial Satellites
1960 - June 1969

Scientific and Technical Aerospace Reports
No consistent subject heading
1968 - July 23, 1969