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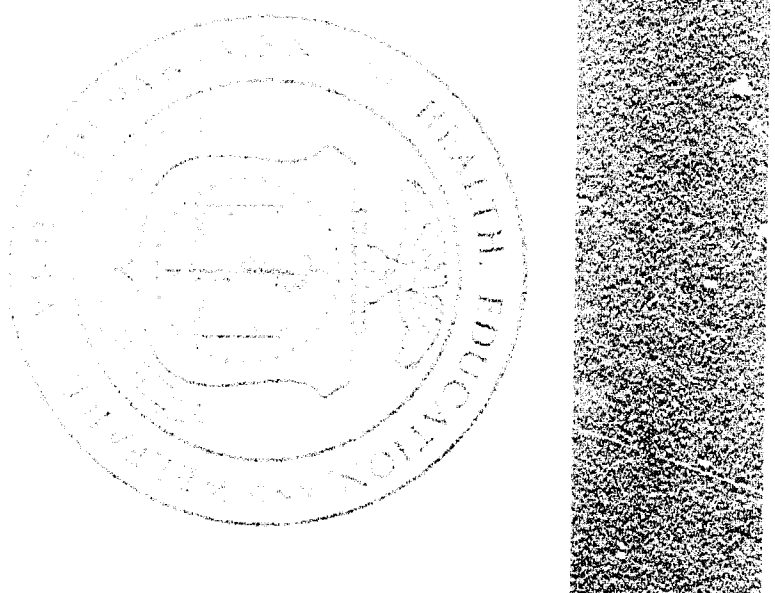
ABSTRACT

At present there is no comprehensive source of data regarding educational technology. Base-line statistical information on collections and equipment, as well as their unique impact on other institutional cost factors, must be established if there is to be adequate evaluation of their impact on instructional practices. This report defines the field of educational technology, outlines requirements for a relevant general information system--specifying goals, users, linkages, sources of data, and data collection procedures--and recommends procedures for development of such an information system. This publication also incorporates critiques of the conceptual scheme by 11 reviewers representing a range of educational and technology interest. (Author)



74-401

A GENERAL INFORMATION SYSTEM FOR EDUCATIONAL TECHNOLOGY (ETGIS) A CONCEPTUAL SCHEME

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U.S. DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE

Caspar W. Weinberger, Secretary
Charles B. Saunders, Jr., Acting Assistant Secretary for Educatior

Office of Education

John Ottina, Commissioner

"The purpose and duties of the Office of Education shall be to collect statistics and facts showing the condition and progress of education in the United States, and to disseminate such information respecting the organization and management of schools and school systems, and methods of teaching, as shall aid the people of the United States in the establishment and maintenance of efficient school systems, and otherwise promote the cause of education throughout the country." --General Education Provisions Act, sec. 403a (20 U.S.C. 1221c).

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FOREWORD

The methods used in education, at all levels, are changing, becoming more diversified, and increasingly involve equipment, materials, and technical processes - both in instruction and in other aspects of education.

Various predictive studies foresee use of advanced technology in postsecondary education by 1980 in some 20 percent of resident-campus institutions, and in 80 percent of nonresident, external-degree-type programs. Large numbers of educators and educational materials specialists, as well as engineers and scientists, will become involved in new learning activities in the course of such impressive growth. Such rapid and dramatic change in educational practice can be justified only by significant gains in effectiveness and/or costs.

There is, then, imminent need for systematic, standardized information on educational technology. This report defines the field, outlines requirements for a relevant general information system, and recommends procedures for development of such a system. This publication incorporates also critiques of the conceptual scheme by 11 reviewers representing a range of educational and technology interest. The goal of this report is to expedite initial consensus on standard definitions of concepts throughout the many aspects of educational technology, and establishing needed basic series of data on educational technology and its uses.

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Assistant Director for
Statistical Development

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Assistant Commissioner for
Educational Statistics

TABLE OF CONTENTS

THE NEED

Schools have long been aware of the uses of educational technology as a supplement and alternative to traditional, conventional modes of instruction. In the early 1960's, audiovisual instruction in the schools was organized around the 16-mm projector, the slide-filmstrip projector, the record player, and the tape recorder--tools available to all but the very smallest school districts. Now, the increasing use of technology in education raises several questions regarding technology's present and future magnitude and influence. A recent Carnegie Commission report [1/] predicts that, by 1980, about 20 percent of resident campus instruction will involve some aspects of educational technology. The figure increases to 80 percent for nonresident, external degree-type programs. The report projects a need, by 1985, for 45,000 "information technologists." Similar projections are being made for public schools.

While the basis for the Carnegie estimate is a reasonable "educated guess," it is essential, as with any perceived trend, to have hard data upon which to document base requirements for professional training programs. In doing so, more intelligent decisions can be made, with the student the ultimate benefactor.

A common concern expressed in educational circles, and confirmed in the Carnegie report, is the lack of "software" or systems of materials often used in conjunction with certain "hardware" or equipment. Do schools and colleges currently possess sufficient amounts of "hardware?" If so, decisions to develop software could be made by educators and commercial producers. Lack of data evokes speculation with respect to both hardware and software development.

At present there is no comprehensive source of data regarding educational technology. Dorothy McKinney, of the Educational Policy Research Center (EPRC) at Stanford, is attempting to assess emerging trends in educational technology for the Office of Program Planning and Evaluation of the Office of Education. Although unable to obtain an overall picture of what is going on (there are no data on the number of people in the field, the purchase and use of

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1/ Carnegie Commission on Higher Education, The Fourth Revolution: Instructional Technology in Higher Education (New York: McGraw Hill, 1972).

instructional media, the rate of innovation, and how much Federal money goes into the educational technology effort), she has posed the following specific questions related to data needs, which could be answered through national survey efforts:

Quantitative Data

1. Who is buying what education technology from whom with money from which sources and with what true perspective?
2. What are the true patterns of purchase and accumulation of educational technology?

Use

3. In the teaching of what subject areas is educational technology used most often and most fruitfully?
4. Do other innovations accompany the use of educational technology?
5. For what is educational technology used (e.g., teacher supplementation or replacement)?

Training

6. To what extent have teachers been trained to use educational technology?
7. How are media specialists trained and how do they function?

Attitudes

8. What are the attitudes of the producers, consumers, and public toward educational technology?

Cooperation

9. What cooperative ventures to purchase/use educational technology exist between what institutions (schools, school and community, schools and business, etc.)?

In addition to quantitative information, the EPRC wants to know how effectively educational technology is servicing its users--are they getting what they expect from it? Impact data are difficult to obtain but probably offer the most useful information in evaluating the effectiveness of educational technology

in the teaching/learning context. There are additional information needs regarding educational technology in peripheral education (training programs in business, industry, the military, and educational television), but this sector is beyond the scope of an institution-based general information system.

Associate Commissioner Robert Filep, then head of the National Center for Educational Technology (NCET), felt that impact data were needed, but that quantitative data were also required. Isolated studies report on specific results of one medium or one project (e.g., The Electric Company or Sesame Street), but there is no overall assessment of television's impact on children. Thus, if it were determined that instructional television is not used in some schools because no television receivers are available, then decisions could be based on this fact.

The urgent need for information on educational technology has been expressed by Dr. Frank Schick (Library Surveys Branch), Mr. Roy Nehrt (Elementary-Secondary Surveys Branch), and Dr. Robert Calvert (Adult Vocational Surveys Branch) of the Office of Education's National Center for Educational Statistics (NCES). Richard Nibeck, Deputy Executive Director of the Association for Educational Communication and Technology, cites--as further justification for better statistical information regarding the need--a recent Standard and Poor's analysis of educational technology which lists expenditures for specific materials. The article points out that the $90.5 billion expenditure for schools includes over $1 billion for textbooks and approximately $500 million for audiovisual equipment and hardware. Mr. Nibeck amplifies the problem of statistical-data inadequacy by indicating that market data, although impressive, are considered understated by analysts. This is so because audiovisual production and distribution are affected by these factors:

1. Many products not originally designed for education (and therefore not part of the educational data bank) are, nevertheless, purchased and used by schools.
2. Materials sold through consumer outlets are sometimes listed as "trade" sales.
3. Hardware/software combinations are often listed as hardware sales.
4. Products of a large number of small producers are not represented in industry surveys.

Most market studies, such as Hope Reports, Venture Markets, the Annual Survey and Analysis of Educational Materials Producers' Sales, and others, suffer from the same data deficiencies as do the Standard and Poor's annual data. While we continue to receive information on students, faculty,

noninstructional personnel, facilities, and gross economic factors in education from current survey reports, those components related to the prime mission of schools other than teachers--namely, instructional resource materials--remain obscure. Although they currently represent less than 2 percent of national education expenditure, they are unquestionably increasing in significance. There are signs that these media are emerging as a major dimension of the instructional budget when new dimensions, such as instructional design, are considered.

Base-line statistical information on collections of equipment and materials, as well as their unique impact on other institutional cost factors, must be established if we are to evaluate adequately their impact on instructional practices. What information is available today is provided from outside the education community and, therefore, is judged by criteria which may or may not have relevance for educational decisionmaking.

A case can be made for the collection of educational technology information in this field for the purpose of decisionmaking.

EDUCATIONAL TECHNOLOGY: A DEFINITION

The term educational technology is relatively new and, like all new terms, is often used to describe old practices. It is defined, generally, in one of two ways: (1) the audiovisual materials and equipment used by teachers to supplement traditional instruction (e.g., films, records, television, computers, and overhead projectors); (2) a systematic approach to instruction. The second definition, which has been approved by the Commission on Instructional Technology and should be adopted for the proposed Educational Technology General Information System (ETGIS), is spelled out as follows:

> Instructional (educational) technology is a systematic way of designing, carrying out, and evaluating the total process of learning and teaching in terms of specific objectives, based on research in human learning and communication, and employing a combination of human and nonhuman resources to bring about more effective instruction. 2/

Educational technology is not "hardware" alone, although it does often include "hardware." Nor is it the same as media; media are the means by which information is made available to the learner. Educational technology incorporates media, and usually involves hardware, materials, and methods of teaching.

Although the systems definition is more sophisticated, it is not widely accepted. Thus, in the initial stages of designing a general information system, it would seem wise to embrace a definition which is future-oriented. The consensus of informed educators and leaders in the field of educational technology would confirm the necessity of looking at the use of technology in education in a systemic fashion and thus lend credibility to the broader definition. The "hardware/software" definition of educational technology does not seem sufficiently inclusive.

2/ Report of the Commission on Instructional Technology To the President and Congress of the United States (Washington, D.C., Government Printing Office, 1970).

The test of the definition comes in specifying and measuring the terms to be included within the general information system itself. The definition of the field provides a broad perspective. The terms used in the instrumentation, however, must be defined with specificity to facilitate uniform data collection. In addition, quantification problems must be resolved to insure consistency of reporting. Currently, there is no accepted glossary of terms which fulfills this need.

SYSTEM PARAMETERS

The Goal

The ETGIS goal is to provide quantitative information regarding the status and magnitude of educational technology in elementary, secondary, and higher education; postsecondary education; career education; public broadcasting; and libraries. It seeks also to build a data base for short- and long-range planning.

Clients To Be Served

An information system, ideally, is derived from the needs of the population it is intended to serve, and must be designed for its primary clients. An information-needs assessment of primary clients (recommended in a later section) often meets the needs of secondary or unintended clients.

Primary clients include:

1. Federal and State Government Officers.--Administrators of Federal programs with specific reference to educational technology (within the U.S. Office of Education) and other agencies, such as the National Institute for Education, which have related interests in educational technology; members and staff of the Senate and House Committees on Education and Labor; State Education agencies who administer Federal programs in educational technology.

2. Administrators.--Academic vice-presidents, deans of education, directors of institutional research, directors of Federal programs, assistant superintendents for instruction, curriculum directors.

3. Instructional Services Personnel.--Directors of educational technology, specialists in instructional television, specialists in computer-based instruction, instructional development specialists, staff and officers of professional associations

relating to the field (Association for Educational Communications and Technology [AECT], American Library Association [ALA], National Association of Educational Broadcasters [NAEB], etc.), librarians.

4. Producers of Materials and Equipment Manufacturers.--Staff and members of the National Audio Visual Association (NAVA), staff of national curriculum development projects, staff of regional educational laboratories.

5. Educational Planners.--Developers of external degree and non-residential programs, staff of Educational Policy Research Centers, planners of education (information systems for new towns).

6. Curriculum Developers in Educational Technology.--Department chairmen and professors of professional programs which prepare educational technologists.

The Relationships of Quantitative Data to Qualitative Interpretation

It would be generally agreed that collection of data concerning the quantity of audiovisual materials and equipment and frequency of use would not yield a valid indicator of the value of these resources. However, a quantitative data base is needed to answer fundamental questions of magnitude (such as, How many schools own how many units of specific types of equipment?), and to assess the magnitude of development in any given area, particularly in reference to the potential for developing materials and systems of instruction. For example, there would be no sense to encourage development of Electronic Video Recording (EVR) if sufficient equipment were not available in schools and colleges.

Basic quantitative data are necessary for all planning. When distributed by grade levels, subject areas, size, and location of school districts, they help show where the activity is concentrated and lead to further explorations regarding the potential for development. They are useful also to educational planners who note the acceptance of certain new media and technologies and thus are able to extrapolate projections for the future from the current trends.

The best information which could come from an ETGIS would relate to the impact of educational technology on learners. Certain information can be gained from the quantitative data. For example, if a large number of secondary science teachers are using 16-mm films, it could be hypothesized that: (1) There are many films available in this area, (2) these teachers have been especially well-motivated to use films, or (3) new curricula have created films

as a part of the science program. If learners demonstrated their knowledge by higher test scores under these learning conditions, then this could be a gross measure of impact.

For more particular indicators of impact, direct questions would have to be developed to accompany the quantitative requests. It would also be necessary to query teachers (often omitted in other general information systems) as well as administrators and educational technology supervisors. A question for teachers, for example, might list 10 purposes for which media might be used, with a request to check the relative frequency of media use for each purpose.

A balance between quantitative and qualitative information requests must be worked out in the data-collection instruments. Both components are necessary and can be developed.

Questions To Be Answered

Questions which need answering include straightforward counts of equipment, materials, facilities, and personnel. These data are essential, but are not of themselves sufficient for answering the needs outlined earlier. Such questions relate to five major areas: administration, materials and equipment, finance, facilities, and services. These questions may differ according to educational level. The five groups of questions, with explanatory notes and comments, follow:

1. Administration

   a. Higher Education:

      (1) How many colleges and universities have organized educational technology programs?

      This question could be answered according to varying levels of sophistication. Some universities might have complete instructional design facilities and complete systems implemented, others might have support and production services, while still others might provide services related only to the showing of films.

      (2) What are the loci of these programs?

      Some universities might have complete educational technology departments which function independently and report directly to the chief administrative officer of the institution, while others might be a department

in the college of education or even a small section in the extension division. The location of the programs often determines their current strength and potential for growth.

(3) Who administers the programs and what staff serves them?

The staffing patterns in educational technology are so diverse that persons with virtually every kind of training might be serving in an administrative capacity. The possibilities include persons with training in television or photography, and persons with library training. Staffing might include technicians, clerks, paraprofessionals, students, and aides of various kinds. These data would provide information on personnel needs and educational requirements.

(4) What is the professional preparation of the chief administrative educational technology officer?

This question, too, might provide a wide range of answers and data on which to base future educational preservice and inservice training programs.

b. Elementary and Secondary Education

(1) What are the staffing and administrative patterns?

Some elementary and secondary media centers might comprise a combination of print and nonprint media, while other centers might be organized separately.

(2) What is the professional preparation of each staff member?

The staff in elementary and secondary school programs would usually be limited in number, so the data collected would have implications for educational training and certification standards.

2. Materials and Equipment

a. Higher Education:

(1) How many units of each type of audiovisual equipment are owned?

These quantitative data--necessary in determining program comprehensiveness--would be of use to

equipment and materials producers. In addition, there are qualitative implications related to program development which are dependent upon amount of materials and equipment available.

(2) Which equipment systems exist at each institution (e.g., T.V., computer, dial access, remote access, etc.)?

(3) Are these units and systems devoted to instruction?

This question, which verges toward the qualitative, in no way answers the real question of impact, but it must asked.

(4) How many units of each type of audiovisual materials are owned?

This information would be of value to producers of materials and to curriculum planners.

(5) What is the circulation of the materials? Who uses them, and how often?

These questions have always been controversial, as circulation does not always guarantee use. Other assessment measures, such as timed checks of actual student and faculty use, may be more effective in determining actual use. However, in some way, use should be determined as an initial step in measuring impact.

b. Elementary and Secondary Education

Questions are similar to those for higher education.

3. Finance

a. Higher Education:

(1) What is the total operating budget for the program in educational technology for the current year?

Within this broad question, it would be important to indicate how much is allocated for equipment, for materials, and for salaries.

(2) What is the capital budget?

(3) What is the value of the current inventory?

(4) What amounts of Federal funds have been used to purchase equipment? Under what titles have these funds been granted?

These, again, would be initial questions for eventual determination of effectiveness as related to amount of Federal funds spent.

(5) What amounts of matching funds have been used?

b. Elementary and Secondary Education

Questions are similar to those for higher education.

4. Facilities

a. Higher Education:

(1) What space is available and used for administration?

(2) What space is available and used for production?

(3) What space is available and used for storage of materials?

(4) What space is available and used for listening and viewing?

(5) What space is available and used for conference rooms?

This information has implications for facility planning and producers of storage equipment.

b. Elementary and Secondary Education

Questions are similar to those for higher education. In addition,

What seating capacity is available in the school media center?

This factor often determines use by classes and by individuals.

5. Services

a. Higher Education:

What programs and services are available to students and faculty?

As a subcategory there could be a rather extensive listing of possible services and programs. These data would help move

toward the qualitative aspect of the variety of ways in which media are used.

b. Elementary and Secondary Education

The major questions are similar to those for higher education. The subcategories might include the following:

(1) Are equipment and materials available for out-of-school use?

(2) Is equipment available for listening and viewing for all types of audiovisual materials

(3) Can students and faculty produce their own materials?

The assessment of program and services, and of their value to the user, is the ultimate goal.

Configurations and Linkages

The emerging sophistication of educational technology is best demonstrated through the placement of media in an instructional-systems context. Media are becoming integral components of new curriculum designs as well as of new teaching-learning strategies.

There are endless varieties of configurations and linkages of materials, equipment, methods, and people which, when combined, create many new systems for learning. The goal of ETGIS is to measure these systems comprised of many linkages and configurations and ultimately to assess their impact on learners.

When media are viewed as parts of a larger system, it is increasingly difficult to quantify their existence and to assess their unique impact. Thus, as combinations of slides, tapes, and printed programmed instruction are used in an independent learning laboratory, the discrete contributions of each medium are difficult to distinguish. Counts of material and equipment units have almost no relationship to use patterns. This is also true in a closed-circuit television or broadcast television resource in a school or school system that incorporates a variety of media (films, slides, objects, people) into a total design for teaching and learning. Eventually these items have to be counted and their impact assessed.

The development of these new configurations and linkages has not occurred evenly across the country. Some areas would have no knowledge of complex teaching-learning systems, while others provide many sophisticated alternatives to learning which incorporate educational technology and instructional design systems. This is illustrated in the installation and use of dial-access

audio (and video) retrieval systems in some schools and colleges. Even within these systems there are degrees of complexity from 10 dial stations in one location to several hundred across several miles. Some systems, for example, permit dialing from outside through commercial telephones.

The point is that the sophistication of educational technology is increasing and any survey which is developed must take into account the number and impact of all configurations if a comprehensive picture is to be obtained.

CURRENT DATA - COLLECTION EFFORTS IN EDUCATIONAL TECHNOLOGY

There are several established programs which attempt to gather statistical information regarding educational technology, but none are comprehensive. Isolated efforts within the National Center for Educational Statistics to collect data on several aspects of educational technology include the following:

-HEGIS V (1970-71) included an instrument to collect data on Adult/Continuing Education Activities in Institutions of Higher Education. One section dealt with type of instruction and listed closed-circuit TV, broadcast TV, closed-circuit audio, and broadcast audio. Another section dealt with innovative practices which might include the application of educational technology.

-HEGIS VI (1971-72) included the College and University Library Survey for 1971 which asked several questions about quantities of audiovisual materials in higher education institutions.

-ELSEGIS III (1970) incorporated a section on school media centers with questions focused on personnel, expenditures, and holdings.

-ELSEGIS VI (projected for 1974) is being developed by an outside contractor. One component is development and testing of an Educational Technology General Information System.

-U.S. Department of Commerce, Social and Economic Statistics Administration, Bureau of the Census, conducts an Adult Education Survey from time to time with help from the Adult and Vocational Education Surveys personnel. This survey attempts to elicit responses regarding the way in which courses are offered (e.g., by radio or TV).

Hope Reports, a private information service, provides factual annual reports on the audiovisual industry, emphasizing marketing products in business, government, and education. A general report provides such information as sales of equipment and materials, amount of film processing, and numbers of 16-mm films produced and rented. Hope, an experienced collector and analyzer of data on the audiovisual industry, derives his data from his survey of over 500 companies, interviews with major corporation executives, and other surveys. The information appears comprehensive and is presented in a format particularly useful for marketing managers; some of the information would be useful in meeting the goals of an ETGIS, but only in a selective basis.

Other relevant items include an annual report on expenditures for audiovisual materials and equipment published by School Management, and The State of Audiovisual Technology: 1961-1966, a study by Eleanor P. Godfrey of the Bureau of Social Science Research, published in 1967. The latter study, probably one of the most comprehensive and cogently reported of its type ever done, was conducted in 2,927 public school districts, with respondents from the administration and faculty of elementary and secondary schools. Presenting data on quantities of materials and equipment, and on uses and adequacy of the media, the study has a longitudinal dimension that is particularly useful, and a framework for considering instruments or questions that might be used for ETGIS.

An analysis of existing data-collection efforts would lead to the conclusion that there is, in the United States, information available about various aspects of educational technology, but limited in content and scope. Although some elements from existing sources might serve as a temporary expedient in locating mostly factual information, there is no comprehensive data base or collection system upon which to build an ETGIS. Present information needs, apparently, can be met only through such a system.

SYSTEM REQUIREMENTS

General Requirements

It is essential to define an ideal system for gathering data on educational technology. Fulfilling all data needs of all users most efficiently, such a system would have the following characteristics:

-Evolvement in direct response to user needs.

-Coordination with all local, State, regional, national, and international efforts.

-Nonduplication of existing efforts, but coordination.

-Serving a multiplicity and diversity of users, including directors of research, funding agencies, accreditation authorities, equipment suppliers, educational designers, facility planners.

-Internal consistency and compatibility with other existing data-collecting systems, including LIBEGIS, ELSEGIS, HEGIS.

-Not sporadic, but following a justifiable schedule.

-Terminology acceptable to producers and users of the data, and consistent enough to facilitate collection, analysis, and interpretation.

-Coverage that includes elementary, secondary, and higher education.

-Coordination with postsecondary programs covered in proprietary, military, adult, vocational, and industrial education.

-Adequate techniques (including analytic-trend studies, summary reports, lists, projections, access to computer tapes to fulfill requests for unpublished data) for collection, analysis, and dissemination of data.

-Survey instruments to encompass the required range of information and degree of specificity.

-Feedback or review to revise the system as required.

-A format compatible with information on pupil enrollments, facilities, financial data, library book collections.

-Provision for collecting both quantitative and qualitative data.

-An advisory panel to advise NCES on special aspects of educational technology.

-Provision for collecting longitudinal statistics.

-A potential for international scope and compatibility.

Objectives

Objectives, derived from system requirements, provide a base for developing data-collection instruments. ETGIS objectives would be to:

1. Provide comprehensive statistical information on educational technology in the United States, and create a data base for continuing data compilation.
2. Create a data base in the field of educational technology which will serve as a reference point for future data-gathering efforts.
3. Determine the administrative patterns of educational technology programs in schools and colleges.
4. Assess the professional preparation of educational technology staff.
5. Collate the functions performed by educational technology personnel in educational settings.
6. Determine the extent to which staffs are differentiated in their professional roles and/or responsibilities.
7. Determine space allocations of the various functions of the educational technology program.
8. Determine the relationship of educational technology facilities to other facilities.
9. Collect data describing the quantity of audio and visual media currently owned, borrowed, and rented.
10. Collect data describing the quantity of audio and visual equipment currently owned and rented.
11. Determine the extent to which new technologies are being adopted, such as computers, video tapes, recorders, cable distribution systems.
12. Determine the overall expenditures for each type of media and equipment.

13. Determine the amount of Federal money being used for purchase of educational technology materials, equipment and services and legislative source of the funding.

14. Determine the overall amount invested (capital outlay) in educational technology.

15. Collect projections of future budget allocations for educational technology.

16. Document case studies of media used in instructional contexts.

17. Identify specific barriers to the adoption of educational technology.

Data-Collection Procedures

Data for ETGIS would be collected through newly developed and field-tested instruments. There are three possible data-collection approaches: (1) A separate instrument. (2) A self-contained schedule included as one component of the existing packages of instruments. (3) Sections or questions to be inserted in existing instruments.

One plan would be to develop an instrument that would be discrete and would be sent to all institutions utilizing educational technology. These would include elementary and secondary schools, institutions of higher education, postsecondary and career schools, proprietary schools, educational radio and TV broadcasting, libraries (media centers and learning resource centers), and museums. As alternative methods of education develop, these data sources might include community learning centers, store-front schools, and other emerging forms of educational systems. This approach would probably be most comprehensive, most complex to implement, and most costly.

A self-contained schedule which could be sent to the same sources as now supply data to HEGIS, ELSEGIS, LIBGIS, and the Vocational Education Survey, would be relatively comprehensive in scope and self-contained for processing and analysis.

The third approach may be the most feasible to implement on a less-comprehensive scale, since a small number of questions relating to audiovisual materials, equipment, personnel, and programs have already been included in the HEGIS, ELSEGIS, LIBGIS, and Vocational Educational Survey. These questions, although not used consistently in every survey, have appeared in each form. This plan would need articulation of data gathering and extrapolation of data for processing and analysis. A comprehensive picture would require synthesis of the findings.

The kinds of data to be collected can be inferred from the sections of this

paper entitled "Objectives" and "Questions To Be Asked." Necessary instrumentation would have to be created to complete each objective and to make each question more definitive.

Alternative survey techniques (such as selected samples, case studies, in-depth studies, inferential statistics) would be needed to satisfy the current emphasis on cost effectiveness, accountability, and program adequacy and impact. Information of this kind, although difficult to obtain, is of great value.

One stategy which could facilitate data collection is the use of State cost sharing where a share of the responsibility is born by the State and the data are submitted to a central collection point.

Financial considerations, undoubtedly, will be a prime factor in deciding among the alternative plans for data collection. In any case, decisions would be made on the priority ranking of data items. If ETGIS can be established as a separate instrument, it could be very comprehensive; if it is to be included as part of other existing formats, then it might have to be a relatively abbreviated form. In the latter case, careful decisions would be needed in assigning priorities for data to be collected.

Sources of Data

Initially, data sources might have to be the same as those for ELSEGIS, LIBGIS, HEGIS, and the Vocational Education Survey. As the system develops it would be expected to include comprehensive coverage of postsecondary education, such as military, industry, community educational programs; technical and vocational education; external degree programs; and education by radio and television.

A major problem to be resolved at each level is to identify the persons most appropriate to provide the data. This might be an administrator in higher education and/or a media center director at the elementary/secondary level.

RECOMMENDED STEPS FOR IMPLEMENTATION

Analysis of Data Needs

Since time and money limitations permitted only minimal needs analysis for this study, a more detailed and systematic analysis is required of the information needs of the various audiences to be served by ETGIS. A more comprehensive and diverse cross section of individuals such as government officials, institutional administrators, institutional researchers, representatives of industry, and instructional development personnel should be interviewed. A simulated data base might be used to assess the system's potential effectiveness. In a word, a more thorough information needs assessment must be made.

Assessment of Relationships With Other Information Systems

For individuals responsible for filling out the instruments, it would be helpful, in designing data-collection devices, to follow the format of existing instruments. A discrete instrument, for articulation purposes, will definitely need to be coordinated with existing general information systems. When schedules or items are to be incorporated into existing instruments, optimum coordination would be essential, if analysis and synthesis are to achieve a comprehensive perspective.

Development and Field Testing of Data-Collection Instrument

A thorough analysis of existing data-collection systems should be made, since existing data upon which the emerging ETGIS might be based would enhance opportunities for deriving longitudinal data. The Godfrey Study of 1967 offers a potentially useful case in point.

In any case, an instrument would have to be developed which addresses itself to the questions posed earlier and which meets the system's general requirements. These requirements become the criteria for evaluating the worth of the instrument. Once a tentative instrument is developed, it will go through the normal field-testing procedures prior to actual use.

Testing Utility of Data With a Sample of Potential Users

One of the more creative approaches to evaluation of an instrument before use is to create a simulated data base and then to permit potential users to ask questions of the data to determine the latter's usefulness. The questions to be answered, outlined earlier, would be a good starting point. This simulated activity helps point up the voids and smooth out the rough edges of the prototype system.

Appointment of an Advisory Committee

During the stages of development, an advisory committee should be appointed to assist and evaluate the proposed ETGIS to insure full acceptability by practitioners and other users of the system. Representatives from the following organizations and agencies are suggested: ALA, AECT, NAEB, ASIS, USOE-NCES, USOE-Office of the Commissioner, USOE-Division of Environmental and Educational Technology, and NIE. Practitioners representing elementary and secondary education and higher education should also be included.

GENERAL RECOMMENDATIONS

1. Since the disparate components of educational technology require very specific definitions to insure consistency, and since there is no current glossary for the field, there is an acute need for a volume similar to Library Statistics: A Handbook of Concepts, Definitions, and Terminology. Development of this glossary should involve representatives of major organizations and institutions such as AECT, ALA, NAVA, and NCES. Later, approval should be secured from recognized national and international organizations and committees which represent this field of interest.

2. Closely related to the development of a glossary is the establishment of standards of measure and units for quantification for each item defined. Again, with uniform units of measure, the possibility of consistency is enhanced. Final approval of these recommendations should be made by the Z-39 Committee.

3. There are many instruments now used to gather data concerning various facets of educational technology. There should be a thorough assessment of these instruments to determine their potential utility, in whole or in part, for an ETGIS.

4. If it is necessary to postpone the final development of ETGIS, plans should be developed to incorporate certain elements of the system in current general information systems. This is a second priority to full development of ETGIS, but it would help to begin the effort. If it is approached in this fashion, there should be coordination.

5. NCES should immediately take these concrete steps toward total implementation:

   A. Funding a project to develop a glossary relating to educational technology.

   B. Funding a project to develop recommended standards of measurement of units and quantification.

   C. Solicitation of national and international acceptance of this glossary and standard of measurement.

D. Publication and dissemination of the conceptual model to key individuals and organizations to provide feedback and initial acceptance.

SELECTED LIST OF REFERENCE WORKS

"Audiovisual - 1970-71, A Report on Multimedia Technology in Higher Education," College Management, October, 1970.

Carnegie Commission on Higher Education. The Fourth Revolution: Instructional Technology in Higher Education. New York: McGraw-Hill, 1971.

Godfrey, Eleanor. State of Audiovisual Technology, 1961-1966. Monograph 3, "Association of Educational Communication and Technology," 1967.

Herner, Saul. Study of Library and Information Center Statistics and Data Collection Practices at National, State and Local Levels. Washington, D.C.: Herner & Co., 1972.

Hope Reports, Audiovisual - USA, 1972. 58 Carverdale Drive, Rochester, New York 14618.

Hope Reports, Education and Media, 1972.

Hope Reports, Industry Audiovisual and Training.

Moore, George A.B. The Development of Educational Technology in Canadian Higher Education Universities. Syracuse University, 1972. (Ph.D Dissertation).

Palmer, David C. Planning for a Nationwide System of Library Statistics (OE-15070).

Report of the Commission on Instructional Technology to the President and Congress of the United States. Washington, D.C.: Government Printing Office, 1970.

APPENDIX

[The comments herein contained express the views of persons who reviewed this document in manuscript and are offered, without editing, as received by the authors.]

A Review of "A General Information System for Educational Technology (ETGIS), A Conceptual Scheme"

by

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It appears to me that the proposed General Information System for Educational Technology is a much-needed resource in American education and could be particularly useful in encouraging the spread of instructional innovation. I would certainly like to see a project like this funded. I would even like to participate, at least in the phase concerned with the establishment of terminology.

I mention terminology particularly because I had many problems with this paper that were due to ambiguous terms or wording. Good grantsmanship, I suppose, requires that one use terms that are broad enough that the prospective grantor can read into them whatever his own particular point of view may be. However, ambiguity is not a problem of proposals alone, and certainly is not limited to this paper--it is a basic problem in the education field. Hence my enthusiasm for the suggestion that NCES fund a project to develop a glossary relating to educational technology. The place to begin is on the term Instructional (or Educational) Technology itself. The ambiguity of this term weakens the conceptual scheme throughout.

One of the problems that result is that it is not clear whether the authors intend to include printed materials and reproduction equipment as part of instructional technology or not. The first paragraph on p. 23 implies very strongly that they do not. We have, I think, a case of accepting one definition for the term (a very broad sense) and yet using the term in another sense which is very much more limited. Either we must bring the definition into line with the way we are actually using the term, or change our usage to fit the definition. Past experience with words, I am told, is that their meanings seem to gravitate toward general usage, even when this is out of line with dictionary definitions. To most educators "instructional technology" means "hardware and software," and it would seem that the authors of this paper are really no exception, in spite of the broad definition that they accept.

A few examples taken from the paper are listed below:

p. 2. Dorothy McKinney considers educational technology as
(1) something to be purchased and accumulated (hardware and software)
(5) something that can supplement or replace teachers (communicatio media)
(6) something teachers must be trained to use (hardware)
(9) something to be purchased and used (hardware and software)

p. 3. Robert Filep, it is implied, refers to media and projects, specifically television and television receivers.

p. 3. Richard Nibeck refers to (1) products, (2) materials, (3) hardware/software, and again (4) products. At the bottom of the page "instructional resource materials" is the subject of concern. A sentence later they are referred to as "these media."

p. 4. Collections of equipment and materials are discussed and instructional practices are considered only as the equipment and materials may impact upon them.

p. 5. Here the authors give the accepted definition and add that E.T. includes hardware and software (presumably) but is not synonymous with media. "Educational technology incorporates media and usually involves hardware, materials, and methods of teaching." However, the authors imply that the broad definition is more "future-oriented" and that the "hardware/software" definition of instructional technology does not seem sufficiently inclusive.

p. 6. Here the authors state that "the test of the definition will come in specifying and measuring the terms to be included." I think it has come sooner than that--the test is whether the authors themselves use the broad definition or whether they follow the "hardware/software" definition of current usage.

Many examples can be found throughout the paper where "instructional technology" is used to mean only hardware/software. I have found only a few where it is clearly used to refer to instructional design, and none where it is definitely used to mean specification of objectives, methods of teaching, evaluation, or to refer to the application of research on learning and communication. On p. 7 under "Goals" the status and magnitude of educational technology in libraries are mentioned, but a later comment (top of p. 23) very clearly indicates that libraries in their conventional function are a separate field from the field of educational technology.

This then indicates that educational technology in libraries must refer to nonprint materials. Print is excluded. The term is thus being used as a synonym for "new media." On p. 19, the word libraries is followed by a parenthesis that includes "media centers and learning resource centers."

p. 9. Exception: "Instructional design facilities and complete systems" are mentioned in connection with universities.

p. 10. Exception: Media centers that would be "a combination of print and non-print media" are mentioned.

pp. 10, 11, 12, 13. Questions under materials and equipment, finance, facilities and services all seem to be hardware/software-oriented.

p. 13. Exception: "Configuration and linkages of materials, equipment, methods and people which, when combined, create many new systems for learning." However, in the last paragraph on that page the authors talk about "sophisticated alternatives to learning which incorporate educational technology and instructional design systems." Obviously, here if educational technology and instructional design are both incorporated into something larger, educational technology is not intended to include instructional design.

p. 17. Exception: The ETGIS is to serve, among others, educational designers.

As a general rule it appears that the ETGIS will be concerned mainly with those aspects of instructional technology (as defined on p. 5) that contain units of hardware or software that can be counted, accounted, added, incorporated into instruction, and used by teachers and learners. A secondary concern will be with the implications of this hardware/software incorporation on the administration and functioning of instruction, and to the extent that it is possible, on the effectiveness of such use in terms of higher test scores or other data. Technology used by educational institutions for strictly administrative or operational purposes, such as computers for scheduling and other data processing, communication systems, and the like, are not part of the plan.

This is not necessarily bad; my only reason for bringing all of this up is to question whether the title of the project might not be pretentious. The proposed procedure for data collection on p. 19 "an instrument... sent to all institutions utilizing educational technology," implies that some institutions do not use educational technology and hence would not receive the questionnaire (if that is what the instrument actually is). But, according to the definition on p. 5, any institution that attempts instruction uses some technology. Instruction of any kind is systematic to some degree, or at least intends to be.

I sometimes think we should just give up on trying to define instructional technology. Don Ely's article in the March 1973, Audiovisual Instruction, magazine is highly inclusive. The broader the definitions get, the more they resemble definitions of instruction--and thus the more they become circular. Maybe we just better admit that any instruction is systematic, by its nature, and very rarely, if ever, fails to incorporate some kind of nonhuman resources as well as human.* As for evaluation and the application of research findings, this also should be a part of any instruction, and that's all that can be said in using it as a criterion for defining instructional technology. Is a CCTV system that is not evaluated not an example of instructional technology? Of course it is. And, according to the Commission on Instructional Technology's definition, a carefully planned curriculum, with all objectives spelled out in measurable behavioral terms, following the findings of research (whatever findings can be found), evaluated rigorously to determine the extent to which the intended teaching and learning actually took place, is instructional technology. But all this could apply to a group of African children in a mud and wattle hut, seated on the bare ground, doing their sums and taking their tests by scratching in the sand with a stick. I think it's impossible to distinguish instructional technology from instruction and we may as well give up and use the terms interchangeably, or simply say that I.T. is instruction in the age of technology. (Finally catching up with the 19th century?)

If we want to imply nonhuman resources of mechanical, optical, or electronic nature, the term instructional technology is too broad; we will have to say "instructional media" or get even more specific and refer to (1) instructional aids (resources used by a teacher in face-to-face presentation), (2) communication media (self-contained systems of hardware and software for transmitting and/or transporting presentations), (3) learner aids (devices, tools, simulated systems, etc., which the learner uses or interacts with during drill, practice, and problem solving), (4) adaptive programs, and the like. ETGIS should not be called "A General Information System for Educational Technology" if it is only a data base on media, materials, mechanical, optical, electrical and electronic devices--unless a more limited definition of the term is to be used. On p. 18, for instance, in item 2, E.T. might be replaced by "instructional materials and devices," in item 4 by "media directors, coordinators, etc.," or simply "non-teacher instructional personnel."

And how can one such project, alone in a confused world, use the term in its own grubby little precise way when all the rest of us at least want to imply that we are thinking of a grand new concept, an innovative approach, a new way of thinking. Maybe you have no choice. Maybe going along with the current ambiguity is the best way. After the ETGIS is completed, however, and looked back on as a milestone on the route of educational development, it would be nice

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* See the History of Instructional Technology.

for it to be called what it is, or to be what it is called, lest it is simply called pretentious.

Back to the paper--sorry for this long digression. A very good list is given on pp. 7 and 8 of the target audience for this information system. What is missing, and I think essential for a complete conceptual scheme, is a clear analysis of just how and for what purpose each of these kinds of people will use the new resource, what needs do they each have that are not met by existing information resources. I think this is a basic deficiency in the whole argument. The kind of information that is collected, the form in which it is tabulated, and the analysis that is performed on it must be directly related to these specific needs. I happen to believe that the kinds of people listed do have needs that are not being met, and that they each could, maybe even would, use such a resource were it available in the right form. Let me give an example from my own work.

For the past 3 or 4 years Polly Carpenter, myself, and certain resource analysis people here at Rand have been working on a tool for instructional designers that we call MODIA (Method Of Designing Instructional Alternatives). A Rand Report giving an overview of this system is enclosed, so I will simply refer to that document at this point rather than trying to explain briefly what MODIA is. If you would take a quick glance at the nature of MODIA at this point, you will understand better what I am about to say next.

The successful use of MODIA depends on the ready availability of a lot of information of exactly the type that ETGIS proposes to collect (if I understand the intent correctly). The reason for this, not stated in the report, is that MODIA is to be a universal tool, by no means limited to Air Force technical training conditions. It is to apply equally to medical education in a large teaching hospital, elementary schooling in a developing country, executive training, individualized continuing education, or the instruction of police and firemen. The only limitation is that it will be applied only to an instructional system in which design is separated from implementation. It would be most unlikely to be used in conventional instruction where courses are entirely controlled by their instructors, for instance, since it is a tool for designers, and conventional instructors generally do a minimum of designing.

By making the process very rapid, MODIA encourages the designer to cost out a large number of alternative instructional systems and compare them in resource requirements. Many of these, hopefully, will be innovative systems with which the designer is only minimally familiar. MODIA will make certain he realizes the logical consequences of any design decisions that he makes, but it cannot tell him his local costs for resources, which resources are in short supply, or such things as the average expected lifetime of various kinds of equipment, or the average current ratio between instructional time and man-hours of preparation time for various presentation media. This kind of data is required so the computer may have the right cost-estimating relationships with

which to calculate necessary costs and other resources. The same need exists for designers who use manual methods, but is not felt strongly when designers plan only one alternative at a time and limit this to methods with which they are familiar.

As semiautomated systems for the design of instruction, such as MODIA, come into use, there will be an increasing demand for cost and resource data with which to calculate the comparative costs of all possible combinations of methods and media. If a data base such as ETGIS is not readily available, each designer will have to collect such data for himself, and a bottleneck in the expansion of instructional innovation may result.

Here is another reason why I would like to see myself or some member of our Rand team play some minor role in the development of ETGIS, if the project should become funded. I would like to make sure that the right kind of information is collected in the right form. Note that the kind of information that instructional designers need is not included in the list from Dorothy McKinney on p. 2. Her list includes data of primary interest to administrators, policymakers, and audiovisual media manufacturers and producers. In addition to instructional design there are other large areas of potential usefulness, as, for example, instructional implementation (teaching). The McKinney list constitutes the only such list in the paper, and hence is the only source of a specific, concrete picture of what the ETGIS will actually be. The reader (and I think also the authors) must apply this picture throughout the paper where general or ambiguous statements are made. Thus the ETGIS, as currently conceived, would really be only an administrative tool.

Also, the McKinney list is past- and present-oriented. It asks for data about what is now being done. It puts little or no emphasis on projects that have shown particular success, and there is no concern with knowledge arising from educational research. This is recognized, of course, in the next paragraph on pp. 3 and 4, but in a very general way and this does not contribute to a mental picture of what ETGIS would be.

An important question is whether ETGIS would include information, or only data. A data base is one thing with one set of storage and retrieval problems. An information base can be a far more complicated system. Yet analysis of data, qualitative information, impact in the sense of effectiveness, impact in the sense of consequences to various aspects of an instructional system, is all in the realm of information. All of these have been mentioned in the paper. I would add "techniques" to this. What is done, what is used is often of less significance than how it is done, how it is used. This applies all the way from the techniques of the design and production of materials to the techniques of their use in the learning situation. The design of ways and means to store and retrieve these kinds of information will be quite a different problem from storage and retrieval of simple quantitative and cost data.

I am a little shocked at the last sentence of the first paragraph at the top of p. 3, dealing with what is called "peripheral" education. There are many responsible people today who would gladly encourage more of these peripheral opportunities at the expense of the big mandatory educational establishment. And these areas are strong in instructional technology. I think is was 2 or 3 years ago now that the industrial training field exceeded the schools in the purchase of audiovisual materials and devices. What do the authors mean by the final phrase: "but this sector is beyond the scope of an institution-based general information system?" Are they refering to ETGIS? Is ETGIS intended only for the schools? "Schools" is the first word on p. 1; their need is the first point to be made.

Even if this is so, have the schools no interest in industrial or military training experience? Are data on instructional media not wanted from the sector where the most use of it is going on? This may be true, of course, but it doesn't make sense. But perhaps this is not what the sentence means.

In summary, I must say of this conceptual scheme that it is too broad in definition, too narrow in actual scope. It should be limited to "instructional media" and perhaps called EMGIS or IMGIS instead of ETGIS. It should be much more clearly defined in terms of what it will actually contain, and how it will be used. If these needs are met, it will be a very valuable resource and deserves strong support.

The Challenge of Collecting Educational Technology Data: Comments on the Chisholm and Ely Paper

by

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Projected needs suffer from a number of threats to their validity. For one thing, there is no logical imperative forcing the future to conform to trends that have been documented up to the present. For another, there is no way beyond guesswork (however "educated") to predict the location and magnitude of significant new ideas. With these problems impossible to overcome, people concerned with the future of educational technology should not compound their difficulties by relying upon data that are less than fair estimates of past and present parameters.

There can be little doubt among those even remotely familiar with the study of educational technology that there is a pressing need for useful documentation of current trends and patterns of use. As Chisholm and Ely point out, there is no current source of comprehensive data in this field; and the lack of data reduces key decision-makers to a level of speculation and conjecture. In order to realistically and rationally plan for the future of education in this country, the people who make the decisions--administrators, law-makers, and others--must have useful and valid information from which to understand cost, effectiveness, and future needs.

It should be emphasized that the need for data covers a broad spectrum of unknown parameters: ownership of machines, ownership of materials for the machines, use of the machines and materials, attitudes toward them, effectiveness, costs, levels of knowledge about new technology, levels of competence with current technology, etc. Three key sets of data seem most important for the start of a data base:

1. Possession and needs

   How much educational technology is currently held by which institutions? What do institutions need to meet their goals?

2. Use and effectiveness

How frequently are machines and materials used? In what circumstances are they used? How effective are such systems under different circumstances?

3. Attitudes and competence

What are the feelings of potential users toward educational systems? How well are such systems used? How can they be better used?

From a slightly different vantage, we can note that the problem requires three distinct methodologies. First, there is a need for a census-like survey of frequency data. Second, there is the need for experimental research on effectiveness--including both laboratory research on short-term effects and field experiments on long-term impact. Third, there is a need for attitude research among people who use educational technology systems. It is probably safe to assume that users with unfavorable attitudes will derive minimal effects.

Two closing comments can be made regarding the need for these data. They should provide evidence against those who assume that nothing is better than the live teacher, and thus squander tax dollars on relatively inefficient methods. And they should provide evidence against those who assume that all technology is good, and thus squander tax dollars on relatively inefficient machines and materials. In the long run, such data will help to choose the best methods of educating people at given funding levels.

It is important to note that Chisholm and Ely have adopted the definition of educational technology proposed by the President's Commission on Instructional Technology. The concern is with educational systems. Both effectiveness and attitudes are determined by the power of complete systems. Hardware is of no use without material that is worthy of presentation. Worthy material is often of little use without coherent integration into an overall educational pattern of discussion and review. Thus, a data base that can provide valuable insights must include and go beyond a count of machines and facilities; it must include and go beyond a count of "software" such as films and tapes; it must attempt to document how these machines and materials are used in the educational context; and it must attempt to document how well educational systems achieve their goals.

Perhaps a slight modification of the goal and test of the the definition used for ETGIS will help develop a more valid research program. Where Chisholm and Ely rightly observe that the goal "is to provide quantitative information... and to build a data base for short and long range planning," we might insist that the goal is to provide a useful data base. Although utility is implied, it should be emphasized. Data are not collected "to provide a data base." They are

collected to provide the best possible foundation for meeting needs. Hence, the test of the definition comes not only in its ability to generate reliable and uniform techniques of data collection. There is the added need that the reliable data have pragmatic value. Just because it "would be interesting to know" something does not mean that the expense of collecting information is justified; the ETGIS should attempt to collect information that has theoretical (i.e. potential long-range) and practical utility.

The relationship between data and interpretation is an important contribution of the paper and deserves emphasis. One point of importance must be added to the brief discussion of the need to query teachers and administrators. Before such interviews are undertaken they should be reviewed and evaluated by someone highly competent at the art of questionnaire design. Like many professions, education is riddled with jargon, cliches and assumed wisdom. Unless much care is given to the design of interviews, there is a clear danger that respondents will be giving simply reflex answers that do not discriminate between actual behavior patterns. It is one thing to say that technological systems are "valuable" and that you use them "a great deal." It is quite another thing to use them for 25% of all classroom time and have evidence that students are doing better on standard tests.

Pages 9 through 13 elaborate some of the questions that might be asked by ETGIS. Without responding to each in detail (which would be unfair, since they are speculative), it can be noted that some of the questions are clearly the heart of a data base while others are open to the question: What good will it do anybody to know that? I suspect, for example, that personality factors and IQ may have a clearer relationship to effective use of media systems than professional preparation. Can such information be used? Might it be politically possible to require teaching exams instead of credential requirements? Or is there an intrenched education lobby ready to fight for the need for credentials rather than proven effectiveness? An additional point is that financial and frequency figures should be collected and interpreted with great care. It will probably be more useful to know dollars per pupil and machines per pupil figures than total dollars or machines.

The description of ETGIS proceeds from several assumptions that imply important courses of action. There is no data base assumed adequate for a pre-ETGIS background, and there is the assumption that new configurations of educational technology systems are continually developing and spreading. These seem to be fair assumptions. Based on them, we may conclude that:

1. There is no need for the ETGIS data collection techniques to be tied to existing instruments.

2. ETGIS techniques must be flexible enough to allow for unforseen changes in technological systems.

These are both good things for people in the position of planning for a data collection system. Such planners can learn from the past without being bound to old mistakes; and they have the chance to develop techniques that will allow the data base to maintain utility as time passes.

There seems to be an unfortunate omission in the "Objectives" section of SYSTEM REQUIREMENTS. Despite significant discussion in earlier portions of the paper, Chisholm and Ely list only media and equipment data among their 17 objectives. Too much emphasis cannot be placed on the objective of obtaining adequate quantitative data on techniques and content. The number of films owned or rented is probably a more important figure than the number of 16 milimeter projectors in a school. The number of documentary or demonstration programs shown tells us something when compared with the number of lecture programs on an instructional television system; the total number of broadcasts tells much less. It is tempting to count machines and locate sources of funds. Such data are useful to a degree, and they are easy to obtain. However, ease of data collection is not a significant criterion in deciding what information to gather. It is cheaper not to collect something, no matter how cheap, than to collect it; so preliminary plans should be founded on utility, not difficulty or cost. Only after a comprehensive set of useful objectives has been set should the reality of cost and unavailability restrict data collection.

Procedures for data collection on the scale being contemplated can learn a great deal from Federal agencies already collecting data of the same magnitude. Thus, there are probably people in the Department of Commerce and the Department of Agriculture, as well as the Census Bureau, who have years of experience with similar data-base projects. NCES can probably learn a good deal from their failures and successes.

Given the assumption that there are currently no adequate data-collection efforts, it is hard to seriously consider the alternatives of including some ETGIS schedules within existing data collection devices. On the other hand, coordination is desirable for two reasons: to eliminate redundant surveys, and to control the quantity of overall data collection (with attention to unnecessary material). After the establishment of ETGIS, it will probably be wise for NCES to review other efforts and eliminate (where possible) those that will no longer be needed.

Let us ignore, for the moment, the problems of experimental research, since it is not considered by the paper. We are left with the need for a comprehensive survey of educational technology. There is no inherent reason for such a survey to cover all institutions using educational technology. If it is possible to draw up a master list from which such a complete survey would be conducted, it will also be possible to consider this list to be a description of a sampling "universe" from which a sample of institutions can be drawn. A sample of 25% or less of all educational institutions in the United States would

probably provide a valid data base at significantly reduced cost. Again, the experiences of commerce, agriculture and census research can probably provide useful insights into efficient data base techniques.

Chisholm and Ely point out that, for some information, smaller samples can be surveyed and case studies can be usefully developed. In fact, the broad scope of ETGIS seems to require quite a variety of research techniques and designs. An appropriate design may prove to include a coordinating center, under which there are several branches of interrelated research conducted by different parties. If a design of this sort is attempted, however, great care must be taken to insure uniformity of concepts and a clear understanding of overall goals among all researchers. It is easier to say that such a thing will be done than to do it. One approach may be to allow potential researchers to propose packages of research--including specified components from all participating organizations--rather than individual projects. Another approach might be to have a coordinating organization design the complete approach to ETGIS and then

Steps must be taken to insure that the quantitative data base is supplemented by sufficient evaluative research. It makes no sense to count things unless their use and effectiveness is known. In addition, evaluative research--both experiments and field studies--should be used to help develop categories for the more extensive quantitative data base. Thus, if two techniques (or technologies) are found to be used in the same ways to the same effects, they can be classified under one label; and if two similar techniques (or technologies) are found to have different uses and/or effects they can be distinguished in the data base.

Before considering the recommendations for the implementation of ETGIS, a few points deserve reemphasis. The ETGIS project will become more and more useful as it continues to gather data over time. It should be designed from the first to be a continuing project that looks for trends and patterns as well as short-term consumption. Such a project should deal with data broader than a simple count of machines. There are three overlapping areas in which "technology" or "method" affect human interaction:

1. Machinery or hardware.
2. Techniques, formats, or software.
3. Content or subject matter.

A useful data base will have to include all three areas. It will be necessary to know how many projectors and films there are, how many times they are used in the classroom to supplement a teacher, and how many times they were

The implementation of ETGIS must strike a balance between the needs for thorough examination of plans and maximum speed. It seems probable that a case for data needs can be developed that will be intuitively acceptable: these needed data do not exist. It will be more difficult to assess relationships between ETGIS proposals and other information systems. The field of educational research is wide; and a large number of institutions justify their existence by research and by turning out a large number of people with advanced degrees who must conduct "research" for thesis data. Perhaps one side effect of a successful ETGIS program would be the provision of data for scholarly use. Then some educational researchers might deal with analysis problems rather than primary data collection. (A model for this might be the way in which economists rarely collect their own data; but rely on figures provided by various government agencies.) At any rate, the goal of coordination of data gathering efforts must never be lost. It is not the job of educators to fill out forms.

The concept of an advisory committee to review proposals and activities under ETGIS is excellent. To the reasoning that such a committee can enhance acceptability of the data gathering, we must add the use of such a committee to oversee the potential utility and the methodological validity of the research. Such a committee should ideally blend a cross section of practitioners, potential users of the data, and research specialists. It should insure both

The final section of the Chisholm and Ely paper deals with recommendations for action. There can be no objection to the call for standardized vocabulary and units of analysis. However, it should be emphasized that what we really need is agreement on conceptualization rather than agreement on language. It is easy to use the same words, and difficult to be sure we are talking about the same things. Thus, the goal of a glossary relating to educational technology should be to educate rather than to systematize. It should try to explain what there is to discuss, and then provide the language with which to conduct discussions. The area of educational technology is full of concepts that are not mutually exclusive or have fuzzy definitional boundaries. It will be a difficult task to simply describe these concepts; and it will probably not be fruitful to attempt to force new and sometimes vague systems into rigid definitional categories.

In addition to the proposals for development of standard language and measurements, and their distribution, it is critical that NCES support a further undertaking among its first projects toward ETGIS. There must be a clear statement of objectives and goals for ETGIS written at a concrete level. It should detail specific areas of concern, propose specific research approaches, and justify the need, utility, and validity of these methods. Without such a statement there is a grave danger that the project will wander aimlessly among fine sounding

In sum, I think the Chisholm and Ely paper is a good beginning of a beginning. It discusses the problem and the potential in fairly clear terms with fairly comprehensible proposals. Yet it is at a high level of abstraction; and in the end a data-base project will be only as good as the operations used to obtain the data. The next step in the beginning will have to be a discussion of specific needs and an evaluation of the specific problems associated with various data collection techniques for ETGIS.

Review of: A General Information System for Educational Technology (ETGIS)

by

Albert Storm

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National Center for Educational Statistics

The reviewer interprets this report tc be expressing the following major points:

1. There is a need for decision-oriented data in the field of educational technology.

2. The potential clients for this data have been identified but their specific needs have not been identified.

3. There are ongoing ad hoc efforts to identify needs and collect further data on educational technology but these efforts are not comprehensive enough to satisfy the specific needs of potential client groups or to reveal the nature of the theory or practice of educational technology in the United States.

4. The primary purposes of ETGIS would therefore be to (1) supply specific decision-oriented data to known client groups, (2) analyze the process of dissemination and utilization, including the organizational context, of the adoption and use of educational technology and (3) measure the impact of technology on the ultimate consumer, the learner.

5. In order to fulfill these three primary purposes, it is necessary to develop a comprehensive conceptual model based on the definition of the Commission on Instructional Technology which will encompass the four points above. A glossary of terms and standards of measurement is considered integral parts of this model.

6. An important part of the management of the ETGIS program is the acceptance by the national and international community.

7. Since there are activities now underway which have direct relationships with the purposes of ETGIS, it is necessary to act expeditiously in order to develop a coordinated national effort.

This report is valuable in that it identifies the major elements involved in planning for an Educational Technology General Information System. It deals with the what, why, where, who, when, and how of a ETGIS system. At the pragmatic level concerning advice on how to plan and implement an ETGIS (pp. 17-23), the information is rich and detailed. However, this report raises questions at the theoretical level dealing with goals of ETGIS (p. 7), the relationship between qualitative and quantitative data, the research design for determining the evidence of the impact of educational technology on the learner, and the planning theory.

The definition of the goal (p. 7) is not in question. However, the later references to the goal do raise questions. For example:

-p. 7. "The goal of an Educational Technology General Information System is to provide quantitative information regarding the status and magnitude of educational technology ... and to build a data base for short and long range planning."

-p. 9. "For more particular indicators of impact, direct questions would have to be developed to accompany the quantitative requests."

-p. 13. "The goal of ETGIS is to be able to measure these systems comprised of many linkages and configurations and ultimately to assess the impact of these systems on learners."

-p. 19. (Objective) "To identify specific barriers to the adoption of educational technology."

The compatibility among these references to the goal of ETGIS may not be difficult to reconcile; however, a reconciliation must be made explicitly in order to avoid confusion at a later stage of the planning. The relationship between quantitative and qualitative data shows this report at its weakest point. It is suggested at one point (p. 9) that quantitative data can be used to yield a gross measure of impact of the use of films in a science curriculum. There is no evidence known to this reviewer that such a design would yield more than "less than significant" results. The Keating Report, which triggered a long controversy in the field of foreign lanuages (impact of the language laboratory), illustrates the great complexity of deriving evidence of impact, using such a design. The recent study of the President's Commission on School Finance, a Rand study, entitled HOW EFFECTIVE IS SCHOOLING? by Averch et al, would also tend to deny the power of such a design to give valid evidence of the impact of technology.

The planning theory presented (pp. 17-23) spells out only in part the rationale for the optimal sequence of concrete steps recommended. Nor does it cope with the complexity of the relationships between the definition of educational technology and the goals of ETGIS and the intricate theoretical structure and planning mechanism required to carry out the project successfully.

Reactions to the ETGIS Conceptual Scheme

by

Gerald R. Brong

Washington State University

Pullman, Washington

For the most part, I am very positively impressed with the conceptual scheme presented by Chisholm and Ely. Let me offer, however, a few reactions.

PAGE 1 I am disturbed somewhat by the reference to the Educational Policies Research Center (possibly because I do not fully understand what they are all about) as a point of reference in attempting to determine the questions that might need to be answered concerning educational technology in our country. My only comment here is that the questions that EPRC may be asking may not be the same questions that need to be answered through the application of ETGIS.

PAGE 2 The EPRC is making reference to a research approach using indicators. As I understand what is expressed here we have yet to identify the indicators that can be used to either evaluate or even quantify the full range of educational technology services. I am in agreement that the identification of indicators that can be used to evaluate and quantify educational technology programs needs to be a high priority. Maybe as I read this section I keep asking myself--haven't they done more?

PAGE 5 The definition of educational technology presented by the National Commission on Instructional Technology, I feel, is very comprehensive and should be very acceptable. However, many of my colleagues do not yet accept educational technology as a systematic process--they are more of the thing oriented type individual. The use of the educational technology definition on page 5 may make the ETGIS a little more difficult of "sell."

PAGE 7 The goal statement is very complex--it might be possible to conceptually simplify it by just indicating that it is a goal of the ETGIS to gather quantitative data on the processes of educational technology. I do not think that educational technology is restricted to schools.

PAGE 7 #3 Here, in instructional services personnel, I am assuming we will be asking about in-school as well as out of school programs.

PAGE 9 Editorial comment here--for some reason, and I can't define why, but I find the transition from the discussion of indicators to analysis of questions to be answered abrupt and rather rough.

PAGE 12 I find three operational areas missing, which are: a) indication of quantity and types of transactions for obtaining of materials or information or information use. b) velocity of transactions, i.e. rate (frequency over a time period). c) existence of evaluative acts (evaluating materials, programs, or people affected by programs).

PAGE 17 Characteristic 1 I would agree that the collection system should relate in a direct way to identified user needs. I do not find in this document, however, a y indications of how the user needs will be defined.

PAGE 17 Characteristic 2 Coordination of the ETGIS system with all local, State, regional, and national efforts is essential but I don't know how such a thing could ever be accomplished.

PAGE 17 Characteristic 3 Interpreting the findings in a manner useful to the users of the ETGIS relates directly to characteristic 1, being responsive to user needs. I agree here but this is a redundancy.

PAGE 19 If I r ad correctly the paragraph at the bottom of this page, I find an indication that the ETGIS is to be an evaluative instrument--is this correct?

PAGE 21 In the first paragraph reference is made to the use of a simulated data base to assess the potential effectiveness of the ETGIS--I question whether we can simulate a data base since we claim to know so little about educational technology, as a process and the way its applied, in our country.

Comments on "A General System for Educational Technology"

by

Douglas Ferguson

Stanford University Libraries

Stanford, California

The strong points of this proposal are the extensive list of questions to be answered (pp. 9-13), the comprehersive client statement (pp. 7-8), and the description of alternate forms of data collection (pp. 19-20).

The area that seems to need the most development is the rationale for such a comprehensive information system. This is a fundamental question about any extensive data-collection system. I think the rationale centers around the relationship of an information-gathering system to the decisions it is supposed to affect. This is quite different from the questions to be answered (pp. 9-13). The questions focus the data-collection activity, the answers (data) presumably make an important contribution to the decisions. There are always many more questions than decisions. Hence the decisions are critical. The proposal does not answer for me the following question: What major decisions do you want to make that require additional data of this magnitude? One can then ask a series of subsequent questions that provide a rationale for the information system. How important are these decisions, in terms of dollars involved, number of people affected, frequency of occurrence, present educational priorities and future planning? What is the present decision-making process and how will its deficiencies be corrected by this information system? I can think of several decisions that might be facilitated by such data, e.g., identifying ET R&D that need to be federally supported, developing resource cookbooks for designers of instructional units, assessing usage trends to plan for trained personnel and supporting services, etc. A clear succinct statement in the proposal would help to evaluate the importance of this information system.

What is the importance of such a system to libraries and the newer library/learning center? I have several reservations here. For the most part academic library service involves ET only in the areas of micro-display and -print equipment, audio equipment (records and tapes) and films. For the most part film services are storage and circulation. There is some indication that Media/Learning Centers that are part of the library may be changing this but the change is very slow. Language laboratories, CAI units and media carrels

are either not part of academic libraries or even when in the same building are the responsibilities of academic departments. Academic libraries perhaps should be--but now are not--involved in decisions to develop or purchase ET. Such data as GISET might provide would be of marginal value to library administrators in planning to provide support services for ET. There is some evidence in the literature that audio-visual material has low priority in academic libraries (e.g., Boss, Richard W. "Audio Materials in Academic Research Libraries", College and Research Libraries, v33 n6 p463-66 Nov. 72) but the authors would have a broader perspective than I have.

One final doubt I have involves the relation of large-scale data collection such as is proposed to "the assessment of programs and services and their value to the user". (p. 13) Assessment and value analysis requires data as a basis but not necessarily all the data or all the data we would like to have. It is important to identify the minimum amount of data needed (and often this is based on experience and intuition) and if necessary expand data collection rather than shoot for all of the data first. The reason is that we don't want to exhaust personal and other resources on preparatory processes when the critical part is the analysis, inference thought and imagination that is crucial to evaluation. I think the authors recognize this to a certain extent in their suggestions for selective data gathering (p. 19).

Comments From the Field: Reactions to the ETGIS Conceptual Scheme

The comments which follow are taken from letters written in response to a request for a review by the authors. They are presented here to provide a sense of the reactions which professionals have expressed regarding the conceptual scheme.

" I am impressed with the logic of your conceptual scheme as well as the recommendations. The emphasis today for qualitative measures which as you rightly indicate are hard to determine with any degree of validity is understandable because of the current myth that accountability will solve all. However, your recognition that quantitative measures are essential is in my view a strong point in your paper. You cannot determine quality or the impact of service without some kind of quantitative support.

The definition of educational technology as a systematic approach to instruction is one which in many respects is theoretical and imprecise and hard for people to grasp. You recognize this, of course, and I think your suggestion on how to cope with developing acceptance of a more broad definition of educational technology is sound.

The importance of coordinating your study with LIBGIS study we are doing with ALA for NCES is essential. The newly funded statistics handbook project will have, as one of its emphasis, nonprint materials and the coordination of this project with yours is vital. Your recommendation concerning an Advisory Committee for ETGIS could be the vehicle for assuring coordination.

Another important recommendation you make is the need for a current and accepted glossary for educational technology and the related need for the establishment of standards of measure and units for quantification for items defined. Both of these points are basic if a valid and effective ETGIS is to be developed."

Alphonse F. Trezza
Director, Illinois State Library
Chairman, LAD Statistics Coordinating Committee

"Since I am working closely with the National Center for Educational Statistics in the development of the Library General Information Survey (LIBGIS), I have read your report in the context of the LIBGIS system and the role of educational technology in it. Your definition of the problem, statement of need for statistical data, and recommendations for means of meeting the needs are invaluable in the development of the LIBGIS system, because they provide the groundwork for beginning the very difficult task of measuring the diverse elements of educational technology.

The clear thinking you have applied to the problem of measuring the elements of educational technology has resulted in a paper that will be extremely useful in the development of the Library General Information Survey. Your definition of the need for collecting statistical data is clear and the evidence supporting your argument is convincing. The statement of the ultimate goal for the system (assessment of programs and services and their value to the user) provides the vital framework so necessary to this project. Especially pertinent is the specification of the users of the data and the anticipated uses they will make of it. The implementation plan has been laid out with care and appears to provide a viable means of reaching the stated goal.

My only criticism of the report is a very minor one, and it is the presentation of the system requirements. In my opinion, the presentation would be strengthened by putting related requirements together into groups, because I find it difficult to grasp and understand long lists of things. Categorized lists are much easier for me to deal with.

I will end my comments with a question. What is the relationship between your report and the AECT Proposal for the Development and Preparation of a Handbook of Terminology, Definitions, and Units of Measure in Educational Technology? Since the two pieces of work appear to be dealing with the same problem, it is essential that they be coordinated, but I am not quite sure about how they go together."

Barbara Slanker
Director, Office for Research
American Library Association

"I certainly appreciate the need for collecting educational technology information. As I read the first section, the term educational technology was confusing to me but then I read the definition. Would it be wise to define educational technology first before discussing the need for the system? In a statement which follows the definition of educational technology there is a statement which points out that ETGIS would adapt the second definition. However, as I read further I felt that the paper leaned toward the first definition rather than the second definition. When the program is implemented I would recommend

that the materials sent to various schools, organizations, etc., give a simplified definition of educational technology in order to have the correct sources reached."

Vivian L. Schrader
Acting Head, Audiovisual Section
Descriptive Cataloging Division
Library of Congress

"The conceptualization of a systematic process to confront the problem of developing a data base of educational technology information as the sine qua non for decision making is an intelligent and important first step towards reaching the goal of measuring the impact of educational technology on teaching and learning. The conceptual scheme is thorough.

The fact that qualitative data from which to infer impact is extremely difficult to obtain imposes a number of sensitive problems. It appears that just as they suggest the coordination of the work of other agencies on the same problem, the utilization of advisory personnel, and the borrowing of scientific data collection techniques from the social sciences are essential to the successful carrying out of this project. Methodological approaches such as longitudinal studies, incisive case studies, sophisticated use of inferential statistics must be carefully developed and carried out."

Mary B. Cassata
Assistant Director for Public Services
Lockwood Library
State University of New York
Buffalo, New York

"Much of the paper reflects a confused concept of educational technology and terms are used interchangeably in different contexts. Even when educational technology is defined as a systematic approach to instruction, it is not very clear just what is implied. Despite much elaboration in the first part of the paper on the definition of educational technology, the total paper is essentially a hardware document. If this is to be a scheme which reflects a more advanced concept of educational technology, then much of the present emphasis will need to be changed. I really have the impression that an old-fashioned survey of equipment, administrative procedures, utilization of equipment, budgets, personnel is being made rather than the development of an information system for educational technology. I am not denying that such a survey would not be useful, but it appears that a bright new term is being used to do what has been done repeatedly throughout the years. In other words, I don't see anything new or innovative in what is

being proposed nor do I see much relationship between this document and my conception of educational technology.

Obviously, this document, as I have said, is a hardware document. For example, such questions as "Who is buying what educational technology from whom, etc." or for what is educational technology used?" are meaningless to me because my conception of educational technology does not involve a purchase of it nor is it something to be used like a tape recorder or a film projector. If you want to make a survey of audiovisual equipment, administrative procedures, budgets, etc., then why do we have to distort the concept of educational technology in the process and help generate even more confusion than already exists?

If I were to redesign this document, I would establish a new set of categories which reflected my own conception of educational technology.

You stated that the development of an educational technology general information system could offer a major direction for our field in the future. I think you are correct in this assumption, but I do not see this document fulfilling this function. That is why I think it is extremely important to begin anew and develop a document which more accurately reflects a behavioral science or more sophisticated concept of educational technology."

Paul Saettler
Professor, Educational
Technology and Educational
Psychology
California State University
Sacramento, California

"The Conceptual Scheme for an Educational Technology General Information System is well conceived, justified, delineated and developed. Such a system is long overdue to support decision making and planning at the State level for an orderly, progressive prioritized effort to integrate educational technology into public school educational practices.

Areas of Concern:

1. In a recent Study of Public School Instructional Resources in Texas difficulties in data collection were attributed to

   - fragmented program components under various administrative units and organizational functions
   - impossibility of identifying a single contact person responsible for coordination of the fragmented program

- non-standard organizational schemes which classified software under a variety of terms
- lack of standard terminology
- partial reporting and duplicated reporting
- "broom closet" collections acquired through various means and frequently not inventoried on any master list

Perhaps, a comprehensive data collection system would assist in solving some of the existing problems and tend to facilitate more effective purchase and use of materials and equipment.

2. Use data would be extremely beneficial and standard collection documents seem to be very scarce at public school levels.

3. Consideration might be given to a comprehensive data collection instrument (at least at public school levels) with some data elements dropped at district, regional and State levels and only a core form information collected at the national level."

Mary R. Boyvey
Media Program Director
Instructional Media Division
Texas Education Agency
Austin, Texas

Comments by the Authors

We are grateful to the professionals who reviewed the initial draft of A General Information System for Educational Technology (ETGIS) A Conceptual Scheme. The comments and recommendations will be useful as planning for the system develops.

The comments regarding the overall concept are generally favorable and supportive. At no point did anyone question the need for an educational technology general information system. However, several reviewers expressed concerns which were also held by the authors regarding certain aspects of the plan.

One of the most frequently raised questions concerned the definition of educational technology. There are currently two distinct usages of the term. One focuses on the things of the instruction--the media which have recently emerged as products of the communications revolution. The second emphasizes the systematic process of instructional design. The second definition was selected for this paper since it reflects the future thrust of the field. The ambiguity developed when the two definitions were interpreted by the reviewers as being used interchangeably. The fact is that, when data are collected, it is easier to count things than processes. Much of the data has to be quantitative and thus the product definition appears to predominate. There is no easy resolution to the dilemma. Further explorations must be made until a satisfactory resolution of definition is achieved.

Another concern, closely related to the first and shared by the authors and reviewers, is the need for qualitative information. What difference is educational technology making in the schools and colleges of the nation? This type of impact information is undoubtedly of extreme value, but the procedures for obtaining it usually require highly sophisticated research methods which go beyond questionnaire studies. There were no specific recommendations from the reviewers as to how this type of information could be elicited.

Most of the reviewers realized that this scheme is a first step toward the development of a general information system for educational technology. As such, it seems to provide a point of departure for future developments. Of immediate note are the projects to develop a Library General Information System (LIBGIS) and to develop and prepare a Handbook of Terminology, Definitions, and Units of Measure in Educational Technology.

It is through the process of proposing, criticizing and reacting that ideas are formulated, tested and improved. All who have been involved in this process

for the educational technology general information system are making important contributions toward the eventual plan which will enhance the data gathering system and the maturity of the field.

Margaret E. Chisholm
Donald P. Ely

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