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AUTHOR Ely, Donald P.; And Others
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ABSTRACT

This synthesis paper provides a state-of-the-art analysis of the field of educational technology based on the results of a content analysis of its literature, including selected journals, conference proceedings, dissertations, and ERIC input. The study focuses on the personnel, tools, and applications of educational technology as it examines what the people in the field are doing and saying and the concerns they express. The 11 trends that are identified and discussed are related to: (1) the design, development, and evaluation of instructional materials and procedures; (2) professional education of teachers; (3) distance education; (4) the computer as the dominant medium in the field; (5) the emergence of telecommunications and video, including interactive video, as major media delivery systems; (6) changes in the role of the educational technologist; (7) the implementation of educational technology; (8) educational technology as a field; (9) the integration of educational technology principles, products, and practices into courses and curricula; (10) the relationship of educational technology to society and culture; and (11) research activities. Issues arising from these trends are then outlined, and a retrospective look at trends over the past 20 years concludes the study. A select bibliography is provided, and four appendixes contain a description by Alan Januszewski of the content analysis methodology used in the study, two forms used in the collection and analysis of data, and a table presenting the data on trends by topic and source. (BBM)

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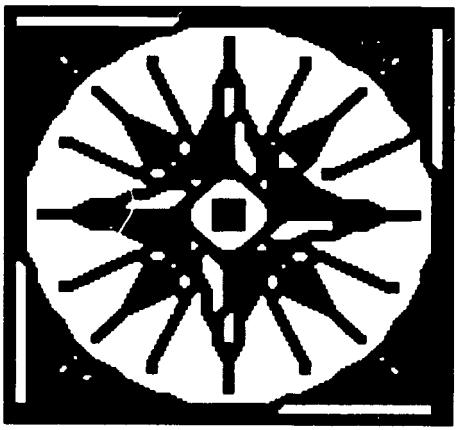
Donald P. Ely

with
Alan Januszewski
and
Glenn Le Blanc



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Syracuse University
Syracuse, New York 13244-2340

December 1988

Donald P. Ely is a Professor of Instructional Design, Development, and Evaluation in the School of Education at Syracuse University, and the Director of the ERIC Clearinghouse on Information Resources.

The primary reviewers of the literature for the content analysis on which this review is based were Alan Januszewski and Glenn LeBlanc, both doctoral candidates in Instructional Design, Development, and Evaluation at Syracuse University. Alan Januszewski is also the author of the description of the study methodology which is appended to this report.

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ERIC

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Preface

One of the questions most frequently asked by users of the ERIC Clearinghouse on Information Resources is, "Where is the field going?" The follow-up query usually asks about new developments and current practices. People seem to want to be on the "cutting edge," or at least to know the direction in which the field is moving. Such knowledge is often designated a trend. A *trend* is an indicator of activities or product development that shows direction. This monograph identifies trends in the field of educational technology.

As trends are identified, issues also emerge. An *issue* is a problem or question for which there are two or more points of view. Whether it is a challenge to the prevailing paradigm of the field or contention over a procedural matter, multiple points of view reflect healthy concern about the direction in which the field is moving. Several issues have arisen out of trends and are described separately.

As trends point directions and issues define points of view, their sum yields a contemporary perspective on the field. A trend is necessarily a continuum which began sometime in the past and carries on into the future. Current trends are today's snapshots of developments that have been, are, and will be underway. The issues are current contentions that will be resolved, one way or another, in the future. As conclusions were being drawn for this monograph, an earlier publication, *Trends in Instructional Technology* (Allen, 1970) was unearthed. Findings of that exploration can serve as a baseline from which to consider the findings of 1988, thus providing increased confidence in the trends that are located on a continuum. A comparison is made in the *Conclusions* chapter.

How trends are identified is sometimes as interesting as the trends themselves. The 1970 study used an open-ended questionnaire which was completed by 40 leaders in the field and followed up by a meeting of half a dozen specialists who discussed and clarified the data from the questionnaires. Later efforts, such as the *ERIC Yearbook* (Flaxman, 1987), which contained a chapter on trends in information resources, used expert opinions of a few leaders who had been observing developments in the field at that time. The present effort is focused on a more quantitative

approach by using content analysis in the tradition of Janowitz (1976) and Naisbitt (1982). The complete methodology for this publication is described in *Appendix A*.

Trends and issues offer a state-of-the-art analysis of a field. Educational technology as a field exists in the larger context of Education and Training and, therefore, its trends often parallel those of the broader field. These trends are often reported as contemporary issues, e.g., the use of drugs, the at-risk student, and cultural pluralism. However, this publication chooses to look specifically at educational technology itself; at its personnel, its tools, and its applications. It is an introspective study that attempts to discover what the people in the field are *doing* and *saying* and the concerns they express about the field.

This publication is the first effort by the ERIC Clearinghouse on Information Resources to review and disseminate the trends in educational technology on an annual basis. A parallel volume does the same for library and information science in the context of education.

Donald P. Ely
Director
ERIC Clearinghouse on
Information Resources
Syracuse University
Syracuse, New York
December 30, 1988

A Brief Word on Methodology

Sources for the content analysis used in this study were five leading professional journals in educational technology; programs from the annual meetings of three professional associations; dissertations from the five universities that prepare most of the professionals for the field at the doctoral level; and the educational technology input to the ERIC database. Reviews of each item were made independently by at least two reviewers who then compared their analyses and made decisions about classification. The author of the monograph used these findings as a major source and factored in major policy documents, contents of publications not analyzed, and conversations with leaders from the field. The

Content Sources

Journals:

British Journal of Educational Technology
Educational Communication and Technology Journal
Educational Technology
Journal of Instructional Development
TechTrends

Dissertations:

Arizona State University
Florida State University
Indiana University
Syracuse University
University of Southern California

Conferences:

Association for Educational Communications and Technology
Educational Technology International Conference
National Society for Performance and Instruction

ERIC Input:

All documents submitted by the ERIC Clearinghouse on Information Resources in the area of educational technology from October 1, 1987 to September 31, 1988.

period of analysis was from October 1, 1987, through September 30, 1988. The limitations of this procedure should be recognized, but the advantages of systematic review of the current literature should provide some confidence in the trends identified.

A complete description of the methodology is provided in *Appendix A*. The forms used to collect data are in *Appendices B* and *C*, and *Appendix D* reports the quantitative results of the content analysis. The primary reviewers of the literature were Alan Januszewski and Glenn LeBlanc, whose work provided the basic data for this publication.

Trends

The trends are listed according to the frequency with which they appear in the literature reviewed. The quantitative findings of the content analysis are given in *Appendix D*.

TREND #1. Design, development, and evaluation of instructional materials and procedures are primary concerns among practitioners in the field of educational technology.

For practitioners, this trend may seem obvious. With the relative sufficiency of hardware, educators are concerned about the quality of software. Much of the concern focuses on computer software although other materials are not exempt. The literature is beginning to emphasize the use of artificial intelligence and expert systems as vehicles for software improvement. Specific design procedures for tutoring systems, simulations and games, and learner interaction are represented in the literature.

References to cognitive psychology are often made; for example, helping learners to conceptualize unfamiliar content and how to use a summary. Effects of practice, advance organizers, and teaching errors offer specific procedural advice to instructional designers.

Other aspects of design include message configurations such as text design, text density, visual design, use of symbol systems, and semiotics.

This trend includes motivation. Various models of motivation are discussed, as are learner interest, achievement, maintaining motivation, and use of media to assist in the formation of attitudes.

Most of the examples above represent *design*. *Development* relates to needs assessment activities, course development procedures, product development, and performance technology. Performance technology is a relatively new term used most frequently by business and industry trainers who use the principles and procedures of educational technology to train employees. Their efforts are usually measured by the performance of trainees in terms of predetermined objectives. Educators seldom use the term.

The heightened interest in *evaluation* signifies its relationship to design and development. In the content analysis, evaluation

referred to all those items that described measures and procedures for determining the worth or achievement of an instructional goal. Evaluation of software items seemed to dominate, with computer-assisted instruction software being the most frequently discussed medium. Program effectiveness measures were also frequently discussed. A theme that runs through most of this literature is the need for better computer-assisted instruction software evaluation procedures and databases of evaluations for individuals to use.

Another dominant theme in design, development and evaluation is *interaction*. Much of the interest is stimulated by the potentials of computer-assisted instruction and interactive video The theme is also picked up in the Technical Developments trend.

TREND #2. Professional education of teachers in the use of educational technology is needed.

Literature in this area is directed at educational technologists and teachers with emphasis on the teacher. The basic question is, "What competencies do teachers/instructors need to effectively use technology?" The implication is that, although all classroom presenters should be using media and technology, either they are not, or they are using them in less than optimal ways.

Many of the items reviewed were aimed at the use of computers and microcomputers by classroom teachers. The basic argument seems to be that the information revolution is upon us. Its major symbol, the computer, which is so common in the business world, ought to be part of the contemporary school curriculum. Much of the literature is written by individuals who are working with computers in schools and who have opinions about the basic knowledge and skills that all teachers should possess. This theme is picked up in two current influential publications: *Information Power: Guidelines for School Library Media Programs* (1988) and *Power On! New Tools for Teaching and Learning* (1988), the former published by the American Association of School Librarians and the Association for Educational Communications and Technology, and the latter by the Office of Technology Assessment of the U.S. Congress. Such publications often override the content analysis (or at least must be factored into the analysis) because of the influential source and the mass distribution they receive.

Some of the key statements from *Power On!* call for teacher training:

- OTA finds that investments in technology cannot be fully effective unless teachers receive training and support.
- Teachers can function as facilitators of student learning, rather than in their traditional role as presenters of ready-made information.
- OTA finds that, just as there is no one best use of technology, there is no one best way of teaching with technology.
- OTA finds that teachers who have taught with computers agree that—at least initially—most uses of computers make teaching more challenging.
- But the vast majority of those now teaching or planning to teach have had little or no computer education or training.
- Despite a nationwide call to improve teaching, there is almost no Federal money for the training of new teachers
- Teachers will need continuing inservice programs as technology changes, as more effective uses of technology are developed, and as research provides a better understanding of how children learn. (pp.14-16)

Information Power calls for school library media specialists to work closely with teachers in helping them to better understand and to gain skills in using the computer (and other media) in their teaching (1988, p. 23).

The current literature emphasizes the need for teacher training in the area of *information technology* rather than educational technology or library instruction. This subtle difference is indicative of the gradual blending of educational media and technology with library and information science in the elementary and secondary schools. Further, information technology is most commonly used to refer to computers in education settings. When training is called for, it usually means "computer literacy" and related technologies such as interactive video. The literature is not clear on *who* should do the training or whether it should be done on a pre-service or in-service basis, but the need is clearly stated and the expectations are evident.

TREND #3. Distance education is becoming a significant instructional delivery system that depends upon educational technology to reach its goals.

A follow-up study (1988) of the National Governors' Association action document, *Time For Results* (1987), reported that "by far the most prominent area of state involvement in 1987-88 was distance learning or telecommunications." The report goes on to say:

> Interest in this aspect of educational technology has been stimulated in part by concerns over equity in the face of shortages of qualified elementary and secondary school teachers. Where a sufficient supply of teachers is unavailable or where there are unusually high turnover rates, as in rural or inner city districts, student opportunity to learn is diminished. By bringing lessons to where the students are (via educational television, satellite, cable, or microwave), distance learning affords students the chance to take otherwise unavailable courses from highly skilled and experienced instructors. There are numerous applications of distance learning including K-12 enrichment courses and programs with low enrollment in any one site, e.g., high school Japanese, elementary and secondary school staff development; and college courses offered to multiple campus sites, or to those studying at home or at the job site. (National Governors' Association, 1988)

Most of the items analyzed for this monograph were case studies of distance education programs at all levels—elementary through adult—using the principles and products of educational technology. The reason for the success of many of these efforts seems to be that the distance learning protocols are in direct response to real teaching/learning problems. When equity of access is required, distance education can respond. When resources ought to be shared, distance education helps. When insufficient teaching personnel are available, distance teaching offers extensions of existing personnel. In addition to these benefits, the focus is on the individual learner, a focus that has been actively sought but rarely attained except in the development of Individual Educational Programs (IEPs) for handicapped children. Delivery systems often require combinations of media, technology, and communications to reach the learners. The use of such configurations are natural and not forced; they become extensions of the

teacher. To prepare material for distance learning requires a systematic approach to instructional design and a focus on the individual student rather than group teaching.

Much of the literature about distance education referred to the use of various telecommunications systems which provide the means for optimal participation by the learners. Common among the examples were the use of telephone lines to connect an individual teacher with remote groups, sometimes with two way audio and one way video; sometimes using an "electronic chalkboard" and audio; sometimes using various video delivery systems, e.g., cable, microwave, and direct broadcast. (More information about these developments is included in the trends in technical developments.)

The literature of adult distance education focuses on open universities, which are usually extensions of existing community colleges and universities. The basic procedures are the same. Individual learners can pursue courses remote from campus on their own time and at their own pace. Courses are sometimes transmitted by local Public Broadcasting System (PBS) stations while enrollments and supervision are handled by institutions that grant credit upon the successful completion of courses.

Distance education seems to be the culmination of several disparate movements that have occurred in the field of educational technology over the past 25 years:

- Concern for stating instructional objectives in behavioral terms;
- The systematic design of instruction;
- Focus on the individual learner;
- Use of appropriate media and technologies;
- Evaluation as an integral aspect of the instructional design; and The management of teaching and learning.

TREND #4. The computer is the dominant medium in the field of educational technology.

The number of computer-related items in the content analysis does not tell the full story. Many of the items in other categories (see Figure 1) included computer-related content. For example, an article about the design and development of computer-assisted instruction would be placed in the "design and development" category rather than in the "computer-related" category.

Likewise, a presentation on the use of computer conferencing in distance education would be placed in the "distance education" category. Thus, many of the items analyzed for this review were actually computer-related, but in most cases, the computer was the tool and not the topic.

The dominance of the computer in the literature of educational technology in 1988 is not entirely reflected in this review. There are half a dozen journals that are completely devoted to computers in education and none of them were used in this study because they would skew the analysis. of the literature. Mainline educational technology journals were used since they usually contain a balanced view of the field. Even with these selected journals, the computer was still the most popular topic

Microcomputer Hardware Data

One of the most reliable sources of information about microcomputer usage in the schools is *Microcomputer and VCR Usage in Schools*, which is published by Quality Education Data. The *Second Edition, 1982-1988* contains comprehensive state-by-state data on such variables as enrollment, expenditure per pupil, relative wealth indicator, and minority percentage. This edition refers to the "maturing usage" of microcomputers in the schools and presents the following evidence:

- Microcomputers are in virtually every school...95% of all public schools.
- More than 75% of all high schools have in excess of 10 computers; by 1985-86, 50% of all high schools had 10 or more computers.
- More than 70% of all public schools have more than 6 microcomputers; by 1985-86, 50% of all public schools had this quantity.
- The Microcomputer-pupil ratio has decreased from 125 students per micro in 1983-84 to 50 students per micro in 1985-86, and to 32 students per micro in 1987-88.
- It is no longer just the computer-established secondary schools that lead the field; more than half of all U.S. elementary schools now have enough computers to provide at least one for each two classrooms (*Quality Education Data*, 1988, p. 1).

Apple microcomputers account for 60% of the units in the schools while IBM and IBM-compatible machines are about 9% of the total. Other manufacturers include Radio Shack (non IBM-compatible units), 13%, and Commodore, 10%. Other manufacturers account for the rest. For 1987-88 IBM had the largest growth in market penetration—more than double the past two years. This growth is in the secondary schools.

The mainline educational technology literature does not feature articles or presentations about microcomputer hardware; the emphasis is on software and its applications.

Microcomputer Software

Another trend report is published annually by Talmis. Its sixth annual report, *The K-12 Market for Technology and Electronic Media*, covers the 1987-88 school year. The figures reported by Talmis are very close to those reported by Quality Education Data. They report Apple with 59%, Radio Shack with 16%, IBM with 11%, and Commodore with 9%, and also underscore the fact that IBM had 22% of the sales that year.

The information on software is especially useful. Schools now own an average of 55 titles per building, having spent an average of $1,400 per building last year. When asked to list three software publishers that they felt offered the best quality software, the most frequently listed companies were Broderbund, Apple, Scholastic, Sunburst, MECC, and Hartley Software.

With regard to computer use, elementary schools use their micros primarily as supplements to improve basic skills and to provide opportunities for drill and practice. In secondary schools, the micros are used primarily for teaching formal computer literacy. Teachers express interest in having publishers develop software that teaches problem-solving skills and higher order thinking skills.

There appears to be continuing criticism of software quality in the literature. Some of the concern is based on the fact that software producers are using outdated instructional methods and following simple models rather than taking advantage of the interactive capacity of microcomputers. Naiman (1987) states that, "Good software is expensive to make, is rarely produced on schedule, is never completely debugged before it goes to market, and represents an investment risk." He further says that, "Most textbook publishers are not enthusiastic about publishing

software and have produced only the minimal amount necessary to sell textbooks."

TREND #5. After computers, telecommunications and video are emerging as major media delivery systems.

The preoccupation of educators with computers often overshadows the increasing interest in telecommunications and video. While schools continue to use the traditional audiovisual equipment such as films, filmstrips, slides, audiotape recordings, and overhead transparencies in a more or less routine fashion, the new development seems to be with video in the classroom for large group instruction, and with telecommunications for individuals and small groups within the school and in distance education programs.

Videotape Recorders

Both the Quality Education Data study (1988) and the Talmis statistics (1988) indicate that over 90% of the schools in the United States are using videotape recorders (VCRs). This dramatic increase since 1983—when about 30% of the schools used VCRs—parallels the growth in the public sector. The Electronic Industries Association reports that VCRs can be found in 60% of American households, up 10% from 1982. In schools, the VCR is replacing the 16mm film as the primary delivery medium for projecting moving images. Video programs cost less than the traditional instructional films, i.e., about $80 vs about $300. Distributors provide volume discounts and/or license arrangements so that individual school districts can make multiple copies for less. This means that video materials are often accessible in individual school buildings and do not have to be scheduled in advance as is the case with 16mm films. Local availability means that teachers have more flexibility in timing the use of the video program. With the use of the recording feature (and arrangements with local PBS stations), schools can record programs at the time of broadcast for later use. The classroom teacher is no longer tied to a broadcast schedule.

The increasing availability of VCRs in the home means that teachers are more familiar with the operation of the equipment. The operating procedure is much less intimidating than threading a 16mm projector, and the familiarity with the VCR eliminates barriers that often stand in the way of using films. Its simplicity is like that of the audiotape cassette with which almost everyone

is familiar. All of these factors contribute to the acceptance and use of VCRs in schools.

Telecommunications

Use of telecommunications usually involves point-to-point linkages. These linkages are most often by telephone or cable lines. In some cases microwave transmission serves as point-to-point communication. Broadcast involves transmission through the air directly from a radio or television transmitter or indirectly via satellite. Decisions on which system to use are usually based on the purpose and the cost, although geographical location, distance, and personal preference are sometimes influential. The important element in telecommunications is the *connection* between the user (learner) and a source. The source might be another person, as in a telephone conversation; a computer, as in an online database search; or some combination involving many individuals, as in computer conferences or teleconferences where a number of people dial in to one source, e.g., a mainframe computer, as in the case of a computer conference, or an audio bridge as in the case of a teleconference.

The Quality Education Data study (1988) reports that one in 12 schools surveyed (7,062 school districts with 1,000+ students) is using a telephone modem with its microcomputers, an increase from 1984-85 when one in 16 was so equipped. Secondary schools are leading the way (p.47).

Telecommunications is the basic delivery system of many distance education programs. For individual learners, the computer connected to a mainframe (using electronic mail protocols) appears to be the most frequently used medium. For group learning, the amplified telephone is the major medium providing live two-way communication. Some systems add one-way video (usually at the origination point) and use two-way audio for discussion. In a few cases, two-way video is used, but the expense of this arrangement usually limits its use.

The marriage of the microcomputer and the telephone is the most frequently mentioned configuration in the current literature. The possibility of linking a computer from the home or office to a central information source, usually a mainframe computer, is becoming an established vehicle for communication and learning. There are three primary uses: (1) *electronic mail;* (2) *database searching;* and (3) *bulletin boards.* Microcomputers of the sender and receiver are connected to the mainframe computer by

telephone lines and messages can be sent or received at the convenience of the users.

Electronic mail permits messages to be sent to one or more individuals via a mainframe computer that stores and delivers messages. Microcomputers of the sender and receiver are connected to the mainframe computer by telephone lines, and messages can be sent or received at their convenience.

Database searching allows a person with a computer or microcomputer terminal and a telephone modem to "dial up" a mainframe computer that contains one or more databases which can be searched remotely. (ERIC is one such database.) The user must have an identification number since there is usually a charge for the telephone call as well as for the computer time. The current literature suggests that more junior and senior high school students are doing database searching from their school libraries.

Bulletin boards involve the connection of two microcomputers, one of which is the "host" and holds information of potential use to the user of the other microcomputer, who dials in to connect the two units. Only one person at a time can use a bulletin board just as only one person can use a telephone to one specific number. All messages are "public" in that other users who dial in can usually read the messages of the previous users unless there is a "private" feature. Public domain microcomputer software is often shared via bulletin boards. Some bulletin boards focus on specific topics, very often related to computing. The literature shows that bulletin boards are used by secondary school students and some computer-oriented teachers, but such use is not widespread as an instructional medium.

Interactive Video (IAV)

One other development in the technical arena is the increasing interest in interactive video (IAV). It is in the early stages of research and development, but it is worthy of mention because articles, presentations, and demonstrations are beginning to appear with increasing frequency.

The basic equipment for interactive video is a microcomputer connected to a video playback source, such as a videotape recorder (VCR) or a videodisc player. It is designed for individual use and programmed in such a way that the learner is directed to alternative visual displays depending upon the response selected. Interactive video is being used more for industrial and medical training than for general educational applications. Where it is

used in schools, most of the material has been of a remedial nature. Some programs provide opportunities for decision-making in the laboratory sciences.

It is difficult to obtain specific data on use of interactive video but the Quality Education Data survey (1988) contacted 173 large school districts that enroll 28% of all students and have more than 25% of the total public school budget in the United States. They discovered that 28% of those schools use interactive video and that 52% *plan* to use this emerging technology by 1990 (pp. 74-75).

TREND #6. The role of the educational technologist is changing.

There are very few professionals who actually hold the title of "educational technologist." They are usually represented by such titles as "media specialist or coordinator" or "library media specialist"; sometimes director, supervisor or coordinator of educational or instructional media or communications. Newer and more specific titles are emerging, e.g., microcomputer coordinator, instructional computer teacher, or specialist in educational computing. It is likely that most large schools and school districts have one or more persons who are responsible for administrative, logistic, and instructional aspects of instructional media or, in some cases, just computers.

The confusion is apparent in the current literature. The traditional media professional (once called the audiovisual or educational communications specialist) has either stepped aside to let the school librarian (now school library media specialist) assume responsibility for the full range of instructional resources, or has upgraded and updated his/her knowledge and skills to include the newer technologies, specifically computers. There are those who have become self-appointed computer coordinators, usually coming from the ranks of classroom teachers who are competent in the use of computers, and they are beginning to help colleagues who are interested in acquiring some of the same knowledge and skills. Later, many of these individuals are officially designated as the computer specialist in the school, district, or region, and usually receive some relief from a full-time teaching load to assume the additional responsibilities. Currently these individuals are the specialists who deal directly with educational technology-related matters in the elementary and secondary schools. Post-secondary education is following a somewhat different pattern.

The educational media and technology professionals in higher education have cast their lot with the process of instructional design and development. In fact, many professionals in colleges and universities hold the title of "instructional developer." Many of these individuals have embraced the computer as an instructional tool and have been modestly successful in using the computer as an integral part of course development. They are usually supported by computer specialists who manage the institution's computing center. This is the organization that is usually responsible for campus-wide computer operations from administrative uses to research applications. The design of computer-based instruction is usually a minor activity in such centers, but they support individual faculty members and instructional developers who choose to use this medium as a part of the instructional design. College and university librarians and information specialists have not become as active in the design and development of instruction as their school counterparts. Neither have self-appointed instructional computer specialists emerged except within individual departments.

More and more individuals seem to be entering the profession through business and industry positions. These appointments are usually in the area of Education and Training and call for skills in educational media and technology. Some individuals are leaving school and higher-education based programs for jobs in medical education, military training and corporate training where the activities and roles are similar to those performed in formal education settings. The literature does not clearly spell out this trend, but a review of the professional journals in the field shows that an increasing number of authors from the business/industrial sector are publishing in this area.

It is clear from the literature that leadership and expertise in the application of technology to teaching and learning are needed at every level and in every subject matter field. The "old timers" are concerned about preserving their status, and the "newcomers" are trying to justify their existence. In some cases there are local "turf" battles, but by and large, the literature does not reflect these conflicts, which occur mostly at the local level. The question that seems to underlie all of the ambiguity is, "What competencies are required of individuals who are designated to be the educational technologists in a school, college, or other institution?" Not much progress has been made in defining these competencies. A substantial amount of the literature reviewed in the category of

"personnel" reflected the definition used by the document reviewers: "Those individuals who serve at all levels in the field of educational media and technology: their preparation, job roles, legal status, and leadership functions." Beyond the items counted in the content analysis, several significant documents issued during the year reinforce the trend.

The Condition of Teaching (Carnegie Foundation, 1988) infers the need for competent leaders by noting, "Nationwide, seven in ten teachers agree that better use of technology is an important way to give teachers more time for instruction" (p.66). The National Governors' Association follow-up study (1988) of *Time for Results* (National Governors' Association, 1987) found that "many school technology coordinators reported that they had minimal training in computer studies. They rated themselves as mediocre in their ability to use computers" (p.33). The Office of Technology report, *Power On! New Tools for Teaching and Learning* (U.S. Congress, 1988) clearly states that "the local school district is the key provider of all inservice training for teachers, and this role carries over to inservice training in the use of technology" (p.107). To accomplish such training, competent professionals who understand teaching and technology must be available to conduct and support this training. *Power On!* calls for administrative support and an environment in which teachers are free to experiment with technology. One or more competent professionals are needed to fulfil this charge.

Even though the debate continues, the American Association of School Librarians (AASL) and the Association for Educational Communications and Technology (AECT), the two professional organizations most closely related to the public and private schools, have published *Information Power: Guidelines for School Library Media Programs* (1988). This publication offers the official standards for elementary and secondary school programs in the United States. In doing so, it helps to define the roles and functions of professionals working in areas related to educational technology. The degree to which these standards will be accepted has yet to be determined. They are discussed further in the companion volume to this publication, which focuses on trends in library and information science in education settings.

TREND #7. Implementation of Educational Technology is based more on successful practices than on theory or guiding principles.

In the content analysis the reviewers used the following definition of management: "The process of organizing, operating, and documenting activities or entities for the purpose of efficient and effective delivery of instructional and learning services." This interpretation led to the inclusion of case studies that reported the success (rarely the failure) of organization, operations, facilities, and dissemination activities.

It is natural for individuals to describe the programs that they initiate and guide successfully. The emphasis in most of this literature is "how we did it at our school." Articles describe a variety of activities that seem to contribute to the acceptance and use of new services and resources by teachers and other users. Often a new system, such as a computer-based circulation system or the use of microcomputers in school libraries, is described. Much of this literature covers the outreach efforts of a technology-oriented program, e.g., involving parents in the operation of a technology-based program, or cooperative efforts between the school and local business organizations. It is an idea-oriented literature hoping to help others in similar circumstances and perhaps to gain a little glory for the effort expended. Most of the items are descriptive and do not carry much information in the way of theory, research, or development. They serve to provide a rich resource for potential users of new technologies because each article describes a program that has worked. People who study the diffusion and adoption of educational innovations know that one of the most powerful factors affecting adoption is evidence that an innovation has worked in a situation similar to the one where it is being considered. Case studies serve as "lighthouses" or "pilots" for other institutions or organizations.

The value of case studies in the organization and management of educational technology is demonstrated in the Office of Technology Assessment report, *Power On!* (U.S. Congress, 1988). Spread throughout the 246 pages of this document are 29 comprehensive case studies of technology use in schools. Such reports as "New York State Teacher Resource Centers and Electronic Networking," "Writing by Hand/Writing with a Wordprocessor," and "Software Evaluation in California" help educational practitioners to see how others have successfully used technology to solve specific problems of teaching and learning.

TREND #8. Educational Technology is becoming more solidly established as a field.

With more than 100 items in the content analysis about the status, ethics, legal aspects, history, and future developments of the field, there is an apparent interest and tangible evidence that educational technology practitioners have a visible concern about the profession of which they are a part. There is some overlap with the "personnel" category, especially within the "roles and responsibilities" area, but this overlap reinforces the concern of people in the profession about who they are, what they should be doing, and how others view them. Such concerns are typical among individuals who feel that they are in an emerging profession without the tradition of an established discipline. It is generally a healthy trend and one which will probably be evident for many years to come.

TREND #9. Educational technology principles, products, and practices are beginning to be integrated into courses and curricula.

The history of media in education is one of enrichment or enhancement. Thus, audiovisual *aids* were used and *learning resources* were provided to make teaching richer and learning less difficult or painful. The literature of media management "services" examines the support given to teachers or instructors for their teaching and, hopefully, to improve learning. Such items as support for curriculum or course development (in higher education instructional design and development) and information services to teachers and students are included here. Instruction and guidance on how to access and use the media and technology resources are also part of this trend. Current influential reports also discuss the trend.

The term *integrated learning systems (ILS)* is beginning to appear in the literature with increasing frequency. An ERIC publication by P. Kenneth Komoski (1987) argues that schools must take the initiative and begin designing curricula that will provide teachers and students with a variety of options and strategies for achieving curriculum goals. He describes the Integrated Instructional Information Resource, a group of broadly accessible, electronically searchable, and interrelatable databases that are designed to provide educators with the information they need to achieve an "opened-out" curriculum. Talmis (1988) reports that only about 7% of the public schools use integrated learning sys-

tems. Computer Curriculum Corporation, IBM, and Ideal Learning dominate the market, with Wicat and Control Data (PLATO) close behind. *Power On!* (U.S. Congress, 1988) speaks of the extensive financial resources that are necessary to produce and install integrated learning systems: "The appeal of these systems is their comprehensive coverage: in terms of lesson planning and integration of electronic media, they make fewer demands on teachers than do individual programs that treat small sections of the curriculum" (p. 124). With such programs, however, there is less flexibility and teachers sometimes feel that they have lost control of the instructional process.

TREND #10. The field of educational technology is becoming increasingly aware of the society and culture in which it exists.

One of the surprises in reviewing the literature for this content analysis was the need to create a new category. The original list of categories did not include an item for "society and culture." This term was created when it became obvious that there was a critical mass of items that could only relate to a context broader than the field. When articles addressing the information age in which we live and the influence of television on young children's behavior began to appear and they did not fit comfortably into any of the existing categories, it was clear that a new category had to be invented. Thus the items that were coded for "society and culture" spoke of relationships between technology and society and ways in which education must help to prepare learners to live and cope in such a world.

TREND #11. Research activity in educational technology appears to be creating syntheses of past research and applications of these findings.

On the list of categories for this content analysis, "research and theory" rated the lowest. The limitations of the definition probably contributed to the low ranking: i.e., "inquiries that explore questions and concepts related to (the other categories)." That is, if there was a study reporting on the attitude of young children toward computers, it would likely be placed in the "computer-related" category. If there was a survey of job responsibilities among educational technology professionals, it would be placed in the "personnel" category. The remaining items are about research and theory for their own sake. Also included are summaries of research and those items in which research methodology was more dominant than the subject being studied.

To get at the trends in research, it is necessary to go directly to the research literature, much of which appears in other journals and in summaries of research on topics in educational technology. Two current and comprehensive sources are *Research on Instructional Media, 1978-1988* (Clark and Sugrue, 1988) and *Assessing the Impact of Computer-Based Instruction* (Roblyer, Castine, & King, 1988). A third source is a content analysis of the *Educational Communications and Technology Journal* from 1978 to 1988 (Young, 1988). From these resources it is possible to determine indicators of research.

Clark and Sugrue (1988) focus on "research that defines media as technological devices employed for the purposes of instruction" (p. 19). They note that there has been a paradigm shift in the research on instructional media from a behavioral to a more cognitive approach. A framework for organizing research on instructional media is used to report findings from the decade. First, *behavioral issues* are discussed in terms of media effects on learner achievement; next, *cognitive issues* consider effects of media attributes and instructional methods on cognitive processing and achievement; thirdly, *attitudinal issues* relating to interactive effects of attitudes, methods, and media on cognitive processing are reviewed; and finally, *economic issues* that show effects of medium type on cost and time of instruction are described. These four issues serve as focal points for the review and for future research directions.

An entire issue of *Computers in the Schools* is devoted to "Assessing the Impact of Computer-Based Instruction." It is probably the most comprehensive synthesis of its kind to date on the topic of computer-based instruction. The editors, M. D. Roblyer, William H. Castine, and F. J. King, summarize the literature reviews and findings from 1975 to the present; present meta-analyses of studies from 1980 to the present; review findings from specialized areas of interest, e.g., Logo; and discuss findings and implications for computer use and research. The 131 pages offer a gold mine of research evidence on the use of computers for teaching and learning, and raise many more questions for researchers to explore.

At the risk of oversimplifying their extensive analysis and omitting the many caveats that must necessarily be stated when interpreting research using differing methodologies, there are five specific recommendations based on the findings:

1. Computer applications seem to be potentially effective with students at all grade levels. . . .
2. In each of four areas in which research was summarized (mathematics, reading/language skills, science, and English and reading for second language learning), CBE was found to be more effective overall than the methods to which it was compared. . . .
3. All levels of skills in reading and mathematics should be expected to profit from computer-based methods, but the kind of application seems to make a dramatic difference in some areas. . . .
4. Computer applications can be about equally effective with low-achieving and regular students. . . .
5. Even though uses of computers should have a positive impact on students' attitudes toward themselves and their subject matter, educators should not expect to justify the purchase or use of computer systems by effects on attitudes. (Roblyer, Castine, & King, 1988, pp. 129-130)

The major research journal in educational technology in the United States is the *Educational Communications and Technology Journal* published by the Association for Educational Communications and Technology. That title was given to the publication in 1978 after 25 years as *Audio Visual Communication Review*. That change, and the change that will occur in 1989, are indicators of changing emphases in the field. Beginning with the first issue in 1989, *ECTJ* will become *Educational Technology, Research & Development* and will incorporate the *Journal of Instructional Development. This merger is partially an economic matter, but it also reflects* the applied nature of the field where higher values are placed on development issues and less on research. However, it seems important to maintain a publication vehicle as an outlet for the research that is being done and as a matter of professional prestige.

An analysis of the content of the first 25 years of the *Audio Visual Communication Review* was done by Torkelson (1977). Recently, Young (1988) undertook an analysis of the next 10 years of the journal under its new rubric to discover what type of research is being done (and reported), who is doing it, where it is being done, and what research methods are being used. The leading areas of research are visual stimuli, design of instruction, and

computer-related topics. Most of the research reported in *ECTJ* came from persons at the University of Wisconsin, Pennsylvania State University, and Florida State University. The dominant research designs involved: (1) posttest only; (2) pretest-posttest; (3) attitude measures; and (4) aptitude-treatment interaction.

There is a limitation to using just one journal to determine research trends. There are other good journals such as *Instructional Science* and the *Journal of Educational Computing Research*. Foreign journals such as the *British Journal of Educational Technology* and *Programmed Learning and Educational Technology* contain substantive research articles that contribute to trends. The purpose of this content analysis is to determine trends in the entire field of educational technology and not just in the research aspect. If more research journals were included, research would probably be more visible; if computer-based instruction journals were used, it is likely that computer-based instruction would be the top contender.

Issues

Issues are problems or questions for which there are two or more points of view. In educational technology it is not difficult to find issues in each of the categories used in this content analysis. In stating the issues it is often useful to raise questions rather than to try to describe the various positions on a single matter. There may be other viewpoints that have not been considered.

Instructional Processes

1. For what purposes and to what extent should behavioral psychology principles be followed by educational technology?
2. What specific principles from cognitive psychology can be used in the design of instruction?
3. What contributions are made by the use of instructional development models?
4. What happens when instructional development models are modified?
5. Should motivation be intrinsic to the design of instruction or should it be externally stimulated?
6. In what ways can principles of visual message design be applied to text and screen design?

Personnel

1. What competencies are required of personnel who work in the field of educational technology?
2. How does the changing paradigm of the field affect the roles and responsibilities of educational technology personnel?
3. Who should train teachers to use educational technology principles and practices?
4. To what extent are computers incorporated into the responsibilities of educational technology generalists? of school library media specialists?
5. Is there a need for a new type of specialist to work with computers in education?

Technical Developments

1. Can learners be expected to be more responsible for their own learning with the help of technology?
2. Will networking occur within the classroom, building, or multischool area?
3. How can existing software be used with new computer developments?
4. Will new compact disc (CD) formats be used to relieve the teacher of some instructional delivery?
5. To what extent will technology be integral or supplementary to the curriculum?
6. When should hardware be replaced?

Management

1. What should be the physical location of hardware and software in the school?
2. What administrative arrangements should be made for educational technology in the individual school? in the system? in the university?
3. To what extent can educators depend upon home use of computers and video?
4. How can equal access to technology in the schools be assured?
5. What are the optimal physical arrangements for individual use of computers and video?

The Field

1. Should states require certification for professional educators who work with computers? If so, what should be the requirements?
2. How can individuals who work in the field gain respect for their efforts?
3. What are the individual responsibilities of the educational technologist with regard to ethical matters such as copyright?
4. Are there major roles for professionals to play beyond the management and logistics responsibilities?
5. What future developments in educational technology are likely to influence the job description of the educational technologist?

Services

1. What content should be included in the syllabus for teaching the use of information technology?
2. When and how should learners be taught to do database searching?
3. How can the use of resources be built into the curriculum of any subject matter?
4. What is the difference between curriculum enrichment and integrated curriculum systems?
5. Who is responsible for teaching about the use of information technology?

Society and Culture

1. What is the role of education in helping learners to cope with the information age?
2. How can education help the society to use its resources for the common good?
3. What are the characteristics of computer literacy? visual literacy? information literacy?

Research/Theory

1. What are the cost/effectiveness ratios for the various media and methods of instruction?
2. What instructional methods can foster cognitive processing?
3. What are the effects of feedback in individual learning?
4. How can the design of software account for individual differences in learners?
5. How can graphic design facilitate learning?

The list of issues is not comprehensive. Indeed, each issue could generate several more issues. The questions listed above were derived from the content analysis of one year's publications and presentations from a limited number of sources. In this sense they are random and biased. But, just as the trends are indicators, so are the issues.

Trends by Source

In the first section of this monograph trends were indicated by multiple source origins. Thus, "design and development" trends were a product of journal articles, dissertations, conference

programs, and ERIC input. This procedure was determined to be reliable in detecting current trends in the field. An alternative approach to trend analysis is to review the content of each source. Using the numbers from Appendix D, a different figure can be generated by collapsing the numbers into categories and determining those categories that yielded the greatest number of entries from each source.

Figure 1. Trends by Source

Source	First Rank	Second Rank	Third Rank
Journals	Instructional Processes	Technical Developments	Personnel
Dissertations	Instructional Processes	Personnel	Management
Conferences	Insructional Processes	Personnel	Management
ERIC	Instructionsal Processes	Society & Culture	Technical Developments

The overwhelming number of items in the *design and development* category led the way for *instructional processes* to be the top category. *Evaluation* and *distance education* were also incorporated into this category and helped to bolster its ranking. *Personnel, technical developments,* and *management* fell into second and third place. The one aberration was *society and culture* among the ERIC documents. There is no rational explanation for this ranking. Speculation would be that ERIC receives more documents of this type than journals since the latter are more interested in other topics. These items tend to be less data-based and more opinion in nature. ERIC includes a broad spectrum of literature, often with more opinion pieces than research-oriented papers, which are reserved for refereed journals and conference presentations.

The trends by source analysis confirm the findings of the multiple source analysis. The major categories used in Figure 1 are not as specific as the detailed subcategories of Appendix D. If an analysis were made of the subcategories, there would likely be more precision in identifying the trends. This gross analysis was made to compare the trends identified earlier from another perspective.

Trends—A 20 Year Retrospective

In November 1970, the ERIC Clearinghouse on Educational Media and Technology, which was located at Stanford University, published *Trends in Instructional Technology* (Allen, 1970). This state-of-the-art publication drew on responses to open-ended questions from about 40 leaders in the field of educational technology. These responses formed the agenda for a smaller group who met to discuss the trends and to come up with a substantive summary regarding the field at that time. Since the 1970 publication probably reflected trends that began earlier, this 20-year retrospective seems reasonable.

The trends from that publication are not much different than those that are outlined here. The five categories have a familiar ring.

Individualization of Instruction

> A trend toward greater emphasis on the determination of individual learning requirements—and then the design of learning experiences, environments, materials, and procedures that will meet these objectives—is strongly indicated.

The current trends view "instructional processes" as the major thrust with "design and development," "evaluation," and "distance education" not far behind. Distance education is oriented toward the individual learner who usually works alone without the physical presence of a teacher.

"Accountability" for Learning

> *Accountability* has been referred to as the big educational catchword of today. Yet the concept of accounting for the learning that results from schooling may be more than a catchword; it may bring about a reexamination of the educational process and put the burden of responsibility on educators to develop quality education of proven value. They may then be forced to discover and employ the most effective techniques of instruction which are available.

There is less of a direct tie here to the 1988 trends. Some of the current literature dealing with *planning*, *organization*, and *policies* falls into the accountability category. In the broader field

of Education, the call for quality is related to this 1970 trend. The concern for *evaluation* could also be interpreted as a call for accountability.

The Systems Approach to Education

> The emphasis on the systems approach and its application to the development of integrated large- and small-scale systems of instruction utilizes one of the products of technology. It would appear that instructional media will be more widely employed as courses are redesigned and as the part such media can play in the enhancement of instruction is determined.

Once again *instructional processes* represent the contemporary version of this 1970 trend, especially in the *design and development* category where it is assumed that a systems approach is used and that media are integral parts of the teaching/learning plans. The creation of individualized educational programs (IEPs) for handicapped children offers evidence that a systematic approach is being followed. Likewise, the design of distance education materials requires a deliberate use of the systems approach.

Increasing Emphasis on Instructional Materials

> There would appear to be at least verbal recognition of the need for more scientifically designed and educationally relevant instructional materials. The trend may well be away from the proliferation of many incompatible devices and toward the production of validated materials to fit the instruments we now have.

In 1970 the terms *hardware* and *software* were just emerging. The computer was just beginning to attract attention as a viable teaching tool, and television was best known for its broadcast efforts over educational (or public) television channels. Current interest and efforts in instructional design and the emerging emphasis on cognitive psychology reflect the earlier concern for more scientifically designed instructional materials. The computer as an instructional device is certainly a dominant trend that follows the 1970 statement regarding the use of "instruments that we now have." New developments appear to be the marriage of the computer and telecommunications technology and the linkage of the microcomputer with videodisc or videotape. Today's professionals are beginning to talk about one device that will provide

all of the audiovisual stimuli that required several devices 20 years ago.

Need for Demonstrations of Effectiveness and Procedures

> Finally, it is apparent that more demonstration projects should be funded, and these may account for a large share of the government's commitment to instructional technology development. The trend will be away from basic research to applied research which is readily transferable to the operation level of education.

The place of *research/theory* in the current review confirms the relatively low status of research compared with development (or applied research). Most of the issues are concerned with applications of technology, rather than fundamental questions about learning. The call for action by the Federal Government is still evident. *Power On!* says that, "If educational technology is to reach its full potential, the level of funding for R&D must be increased. The Federal Government must take principal responsibility for research, development, and demonstration in educational technology" (U.S. Congress, 1988, p. 25). The recommendations go on to request centers for interactive technology, technology demonstration schools, and a national education futures initiative. Apparently the need still exists.

The parallels and differences between trends that are approximately 20 years apart serve to remind us how far we have come and how far we have to go.

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Appendix A: Content Analysis Methodology Used in This Study

by Alan Januszewski

Purpose

The Educational Resources Information Center (ERIC) attempts to generate syntheses of the literature from various academic disciplines and other areas that contribute to the field of Education. The purpose of this synthesis is to provide some indication of the direction in which the field of educational technology is moving. The identification of emerging trends and issues is a first step in this endeavor.

The ERIC Clearinghouse on Information Resources specializes in the areas of educational technology and library/information science. One objective of this study is to identify emerging trends and issues in the field of educaticnal technolog·· A parallel study of trends and issues in library and information science was conducted at the same time using the same methodology. Findings from that study are reported in IR No. 81, *Trends and Issues in Library and Information Science 1988*, which is available from the ERIC Clearinghouse on Information Resources. Because the sample of the literature that was included in this study was drawn from a single-year period (October 1987-September 1988), the ability to verify trends is somewhat limited. Another purpose of this study, then, is to develop a database that will serve as a reference point for trends in the area of education technology to facilitate their analysis in the future. A third objective is to develop a methodology for the identification of emerging trends that would allow a large number of documents to be re· ·wed in a reasonably short time without relying too heavily on purely quantitative forms of analysis.

Content Analysis: Some Background

Content analysis was used to determine the emerging trends and issues relevant to educational technology. A *trend* is considered to be a cumulative indicator of activities or products that shows direction. An *issue is* considered to be a problem or a question for which there are multiple points of view. It is important to note that a trend may be considered by some to be an issue. As a problem or question develops within an academic field, it may be con-

sidered an issue. The distinction between these two concepts is not as clear as one might like it to be.

Content analysis is intended to be a method for the objective and systematic collection of pre-specified data for the purpose of identifying the special characteristics of those data (Carney, 1972). It is a broad concept that can be used in any attempt to practice research or science. Whenever symbolic action or communication is the subject of investigation, the analysis of content is involved (Janowitz, 1976).

Not all content analysis is the same: there are both quantitative and qualitative strains of content analysis. A common form of qualitative content analysis is conceptual analysis, i.e., the investigation of the use and meaning of particular words. A common type of quantitative content analysis is the measurement of article length. A tabulation of the results of either approach to content analysis is required in order to make any inferences about trends. Examples of the use of content analysis as a methodology have appeared in both the popular and the academic press. For example, John Naisbett's *Megatrends* (1982) identified ten trends that he thinks will become influential in our lives.

Morris Janowitz (1976) outlines the application of content analysis to determine socio-political trends from a sampling of our nation's newspapers.

Reviews of the advantages, limitations, and features of content analysis can be found in Janowitz (1976), Carney (1972), and Hosti (1969).

Content Analysis in This Study

The professional literature of a field reports the concerns, activities, and research that are important to that field. Such is the case with the literature of educational technology. It was decided that a review of the professional literature of educational technology would reveal the ideas that were of current importance to the field. Through this process it was hoped that indications about the direction (emerging trends and issues) of the field could be derived. The basic idea behind this study was that if one could classify and tabulate writings based on interpretations of the authors' purpose, it would be possible to analyze current directions in the field.

In order to achieve this end, it was determined that a substantial number of source items would have to be reviewed. Because this study was primarily concerned with the number of times that a

topic was discussed (as opposed to the length of the discussion or the particular use of the concepts involved in the discussion), and given the resource constraints (limited time and manpower), it was decided that a content analysis would be the appropriate data collection technique, but that a "hybrid" form of content analysis would have to be developed for the purpose of this study.

It was imperative that the data collection teams be able to review and classify sources efficiently and effectively, while avoiding the pitfall of playing "fast and loose" with the data. The development of this "hybrid" form of content analysis can be outlined as follows:

- The conceptualization of the recording units and categories.
- The determination of the sources to be reviewed.
- The specification of the data collection procedures.
- The analysis of the data.

It is reasonable to state that the vast majority of content analyses that are concerned with determining trends must somehow address these steps. However, these particular tasks do not always occur in the order in which they were performed in this study. A reordering of tasks can be the difference between inductive and deductive studies. In this study we use a deductive methodology. Because of the nature of the content that is specific to each field in trends research, there is no one right way to do content trends analysis. Hence, by necessity, it is a hybrid methodology. It is important to acknowledge that each type of content analysis has its own advantages.

Conceptual Categories into Operational Definitions

The general content categories that were used in this study were based on the concept of functions performed by media personnel that were discussed by Chisholm and Ely in 1976. This conceptual scheme reflects the definition of educational technology put forth by the Association for Educational Communications and Technology (1977). These general areas were thought to be indicative of the field of educational technology: Personnel, Management, The Field, Instructional Processes, Information Services, Technical Developments, and Research and Theory. The content categories were determined before the study began rather than during the review of the data sources. In this sense the categories were "imposed" upon the study rather than generated in a more inductive fashion. This conscious decision was based on the need for

efficiency in the data collection process. After the general content categories had been identified, subcategories were specified. Some were added later during the data collection process. The specification of these components was based on a thorough knowledge of the literature and extensive experience in professional practice.

An example of one of the conceptual categories is "management." The broad concept of management was operationalized by specifying the following tasks: planning, budgeting, diffusion and implementation, logistics, operations, and facilities.

Two instruments had to be created for this study. The primary instrument allowed reviewers to record both the source of the data and the category into which the source had been classified (see Appendix B). The second instrument served as a tally and comment sheet for each item collected and classified on the primary instrument (see Appendix C).

Content Source Units

Journal articles, dissertation abstracts, ERIC documents, and professional conference programs were chosen as the content units because they provide a current record of issues and topics that leaders in the field of educational technology have acknowledged as important.

The analysis of the content in professional journal articles and dissertation abstracts is not new to research in the area of educational technology.

Torkelson (1978) reviewed 25 years of the *Audiovisual Communications Review* (*AVCR*) as part of an investigation to determine which issues had had the strongest impact on the development of educational technology as a professional field. His article covers his AVCR findings as well as trends and areas identified for further study.

Mayo (1976) analyzed *AVCR* journals published in a 20-year period between 1953 and 1972 for a doctoral dissertation. The study showed several trends within the context of the journals. These included increase in the sophistication of research design, the methodology, and the statistical analysis.

Lard (19[illegible]) used two journals, *Audiovisual Communications Review* (*AVCR*) and *Audiovisual Instruction* (*AVI*), the official journals of the AECT. The scope of her study also included the abstracts of dissertations from five universities with major

doctoral programs in the field of educational technology. This study revealed that there were three distinct paradigms operating in the field of educational technology during the 21-year period covered by the study: the media movement, systems theory, and behavioral technology.

The journals selected for analysis in this study were those that had been identified as five of the "most influential" professional journals by Moore in 1981 and Moore and Braden in 1987: *The Journal of Instructional Development*, *The Educational Communications and Technology Journal* (formerly *AVCR*), *Educational Technology*, *TechTrends* (formerly *AVI*), and *The British Journal of Educational Technology*.

The dissertations that were included in this study were produced at the universities that were identified by Moore in 1981 and Moore and Braden in 1988 as being the "most prestigious institutions" in the field of instructional technology: Arizona State University, Florida State University, I diana University, Syracuse University, and the University of Southern California. Conference programs and ERIC documents were added to the study in order to broaden the scope of the content to be analyzed. It appeared that conference programs would reveal the latest developments in the field of educational technology because conference presentations usually discuss the most recent findings of current research and development efforts. Three professional conference programs, the Association for Educational Communications and Technology (AECT), the National Society for Performance and Instruction (NSPI), and the Educational Technology International Conference (ETIC) were included in the database for this study. The AECT and NSPI programs were included here because these two organizations are considered to be the two most prestigious organizations in the area of educational technology in the United States. The AECT conference is considered to be the one for those interested in the academic aspects of the field of educational technology, while the NSPI conference is considered to be the one that is attended by practitioners of educational technology. The ETIC conference program was included in the study to ensure a more global outlook on the emerging trends and issues in the field.

ERIC documents were included in the scope of this inquiry since the materials entered in the ERIC database represent a cross-section of the contemporary literature of educational technology. Following the basic premise of Webb (1966), the research

team believed that a multiple operational approach should be emulated.

The research team felt that it could have an increased level of confidence in its analysis if it increased the scope and breadth of the data included in the study.

Data Collection Procedures

The data classification and tabulation instruments were tested for their functionality. This was done by asking prospective data collectors to use the instrument to review the same three articles from one professional journal. Particular attention was paid to the conceptual clarity of the content areas, and efforts were made to identify ambiguities and confusing elements within the instruments that might mislead the data collectors into generating erroneous classifications. The graphic design of the instruments was checked to insure the efficiency and the effectiveness of the data recording process.

A training session was held for the data collectors, who were all graduate students at Syracuse University. This session was designed to teach them how to:

- Identify the purpose of an article by reading the introduction, abstract and concluding statement.
- Use the data source and classification instrument.
- Use the tabulation and comment instrument.
- Locate the data sources.

The ability of the data collectors to meet these four objectives were demonstrated by a test for inter-rater reliability.

After a period of one week the data collectors met and compared the results of their interpretations of the articles from three different professional journals. The Pearson Correlation Coefficient (r) that had been calculated for the pairs of data generated by the collectors slightly exceeded r=0.8. To insure further reliability, it was decided that each data collector would designate two possible categories for each of the journal articles, a primary choice and a secondary choice. The employment of this technique virtually eliminated cases of non-agreement among the data collectors. Inter-rater reliability was virtually assured as data collectors discussed those cases where they had disagreed until an agreement could be reached.

At the conclusion of the data source recording and classification phase of the study, the data collectors tabulated the results. They reported the results of all of the dissertations on one tabulation instrument for analysis. Each of the five professional journals and each of the three conference programs that were reviewed was reported separately, as were monthly entries in the ERIC index, *Resources in Education* (*RIE*). This style of reporting allowed for cross-source analysis.

The author of this monograph also used major reports and position papers published within the time period of the study and personal observations from professional participation in national and international events to provide further input and clarification.

Limitations of the Study

There are a number of limitations to this study. First, as a form of content analysis, the study is a "hybrid." It does not enjoy the advantages of conceptual analysis, i.e., the inquiry into the use and meaning of particular terms that have a bearing on the field of educational technology. Second, it has no quantitative base other than that of tabulation. The methodology did not reveal the depth of the particular content that was used or analyzed in the sources. Third, the decision to use sources that have no precedent in content analysis (e.g., conference programs) raises questions about the data sources that were used in the study. Fourth, there is the possibility that certain items that were reviewed as source data were "specialty items." Special issues of a particular journal or a conference dedicated to a particular theme could "skew" the results of a study. Fifth, it is difficult to make statements about trends based on the data gathered in a single year since there is no earlier referent. Finally, the attempt to emulate the multiple operational model of analysis was not a true one. Since multiple operationalism is an attempt to bring several different methodologies to bear on a particular question or concern, this study could be considered as a cross-methodological meta-analysis. Although attention was given to increasing and varying the amount and types of data sources used to analyze trends and issues in the field of educational technology, the study used a single methodology.

Recommendations for the Future

It is more than an exercise in humility to acknowledge the limitations of a particular study: it is intellectual honesty. Three goals were set forth at the beginning of this study. The first was to

provide an indication of the emerging trends and issues in the field of educational technology. The difficulty of recognizing trends based on data gathered from a relatively short time span has already been mentioned. But certainly the number and variety of sources utilized make the analysis provided here more than an "educated guess." The second goal of this study was to develop a data source that will serve as a baseline so that trends in the field of educational technology can be more easily recognized in the future. It is much easier to have confidence in having met this second goal. The data that have been gathered during the course of this study will presumably be used by future analysts, as they provide a tabulation of the professional discussions about what comprised the field of educational technology in 1987-88. The third goal of this study was to develop a methodology that will allow an expedient review of the professional literature of the field of educational technology. Here, too, it is easy to feel confident of having met the goal; however, there is still much to be done in this regard. The instruments require some refinement. Data sources must be reconsidered. Integration of other types of trend and issue analysis into this methodology should be addressed. Webb, Campbell, Schwartz, and Sechrest recommend the technique of multiple operationalism, asserting that "once an idea has been confirmed by two or more in dependent measuring processes the uncertainty of its interpretation will have been greatly reduced" (1966, p. 3). Resource and time constraints precluded the use of other data-gathering techniques and contribute to limitations of this study. The decision to broaden the scope and number of content sources sampled, however, increases the level of confidence that can be placed in the data. These are questions that must be faced at the beginning of any such trend analysis. Surely more such questions will emerge. Upon the completion of this phase of this infinite enterprise one can only think that long journeys start with small steps.

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Appendix B

RECORDING UNITS - TRENDS REVIEW

Document Name: Reviewer:

TRENDS	Tally	Comments
The Field		
History		
Status		
Future		
Ethics		
Legal Aspects		
The Standards		
Personnel		
Roles/Responsibilities		
Recognition		
Certification		
Leadership		
Professional Education		
Management		
Organization		
Logistics/Operations		
Procedures/Policies		
Facilities		
Finance/Budget		
Planning Processes		
Technical Developments		
Computer Related		
Telecommunications		
Video		
Audio		
Photography/Holography		
Instruct'l Proc./Services		
Distance Education		
Simulations/Games		
Problem Solving		
Evaluation		
Interactive (video)		
Design & Development		
Services		
Lit. and Rdg. Guidance		
Curriculum Support		
Skills Instruction		
Information Services		
R[illegible] Theory		

ERIC Full Text Provided by ERIC

Appendix C

TRENDS REVIEW - ARTICLE LOG

#	Title	Source	Date	Category
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Appendix D

TRENDS BY TOPIC AND SOURCE

	Journals	Dissertations	Conferences	ERIC	Total
INSTRUCTIONAL PROCESSES					
Design & Development	50	11	259	128	448
Evaluation	7	1	48	41	97
Distance Education	7	1	17	35	60
Simulations/Games	4	0	10	5	19
Problem-solving	1	1	5	3	10
PERSONNEL					
Professional Education	145	3	86	39	145
Roles/Responsibilities	11	1	30	9	51
Leadership	3	0	3	1	7
Recognition	0	0	1	0	1
TECHNICAL DEVELOPMENTS					
Computer-related	23	0	24	35	82
Video	11	0	18	2	31
Interactive Video	4	0	16	9	29
Telecommunications	6	0	3	5	14
Audio	1	0	0	1	2
MANAGEMENT					
Logistics/Operations	3	0	33	7	43
Organization	0	1	30	6	37
Facilities	4	0	19	2	25
Planning Processes	4	1	11	8	24
Diffusion/Dissemination	2	2	17	3	24
Policies/Procedures	2	0	3	0	5
THE FIELD					
Status	3	0	35	23	61
Ethics	1	0	7	6	14
Future	1	0	10	0	11
Legal Aspects	2	0	5	3	10
History	5	0	1	1	7
Standards	0	0	1	0	1
SERVICES					
Curriculum Support	7	0	9	9	25
Information Services	4	0	17	0	21
Skills Instruction	1	0	7	9	17
Reading Guidance	2	0	3	0	5
SOCIETY AND CULTURE	1	0	3	68	72
RESEARCH/THEORY	5	0	22	18	45