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A COMPARATIVE OVERVIEW OF EDUCATIONAL TECHNOLOGY
IN THE UNITED STATES OF AMERICA AND IN BRAZIL

Mario R. da Cruz

Tallahassee, Florida

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Dr. William M. Rideout, in fulfilment of

an assignment concerning the course

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Establishment of Terms of Reference

It seems to be a general rule that in any discussion of educational technology it is necessary, first and foremost, to establish terms of reference. In other words, an indication has to be given concerning the points of view from which it is examined. By making a sweeping generalization, it could be said that it seems paradoxical that educational technology, which by its very nature connotes scientific precision, should be open to wide and varied interpretations. In witness of this, R. M. Morgan and R. K. Branson in the opening of their paper "EDUCATIONAL TECHNOLOGY: STATE OF THE ART" consider that it "may be defined in as many ways as there are definers..." Under these circumstances, Morgan and Branson hastened to establish a definition of educational technology for the purposes of their paper. Their definition states that educational technology is "the utilization of knowledge, research and invention in the facilitation of human learning process."

Insofar as it is known, there are no objective criteria for the selection of definitions of educational technology. In most instances, this is done subjectively or intuitively. When terms of reference have to be established, one then chooses a definition that is closer to one's feelings, beliefs and

experiences. Thus, for the purposes of this paper, the following definition of educational technology is set forth:

"... a systematic way of designing, carrying out, and evaluating the total process of learning and teaching in terms of specific objectives based on research of human learning and communication, and employing a combination of human and nonhuman resources to bring about more effective instruction."

(From the book TO IMPROVE LEARNING - AN EVALUATION OF INSTRUCTIONAL TECHNOLOGY, Sydney G. Tickton, Editor; R. R. Bowker Co.)

While there is no rationale for the existence of so many definitions, one seeks at least a possible explanation. Since educational technology involves human resources, it is bound to be the subject of as many definitions as there are definers.

Remarks on the Concepts and Components of Educational Technology

To add to the confusion brought about by a multiplicity of definitions, different terms are used in the same



context -- educational technology, instructional technology, technology of education. As it happens in the proverbial chicken and egg comundrum, it is difficult to assert where one begins and the other ends. No one would contest, however, that these terms are neither synonymous nor analogous. Broadly speaking, they reflect different concepts and philosophies. On account of these differences, one finds here again as many distinctions as there are proponents of distinctions. Under the same constraints of selecting a definition, one has to choose a distinction that is closer to one's feelings, beliefs and experiences. Thus, the following distinction between instruction and education is set forth:

"The term instruction is used here in a rather specific way to differentiate it from such general terms as teaching and education. Almost any experience a person has could be termed educational as something will probably be learned. The term instruction is much more specific, however. It refers to a carefully planned and implemented sequence of events designed to produce specific student learning, and hence competencies."

(From INSTRUCTIONAL DESIGN HANDBOOK by E. J. Ullmer;

Division of Research and Service; Florida State University).

By narrowing down from the general into the particular, one finds that definitions and distinctions of educational technology are, in turn, replete with an assortment of terms, most of which tending to be nebulous or amorphous in meaning. Terms of reference have to be established for process, method, design, analysis, systems approach, systematical approach, mediation, communications, management, utilization, implementation. And within these wheels within wheels, one finds group instruction, individualized instruction, own-learning rate, individualized approach, self-paced instruction, self-direction, behavioral objectives, criterion-referenced tests, instructional objectives, programmed instruction, formative and summative evaluation. To conclude this extensive albeit scarcely exhaustive list, one must needs include the "in" terms of educational technology: hardware and software.

The next aspect to be considered addresses the nonhuman resources in educational technology. There is a vast array of media that at least have the potential to make significant quantitative and/or qualitative contributions to the teaching/learning

process. According to the Center for Educational Research and Information (as shown in the report EDUCATIONAL TECHNOLOGY, THE DESIGN AND IMPLEMENTATION OF LEARNING SYSTEMS, April 1970), these are the eight major media that can be potentially used to assist in learning:

1. Prints in all forms.
2. Moving visual and audiovisual media (film, basic and related television technologies).
3. Static visual media (slides, transparencies, photographs).
4. Sound media (tapes, records, radio).
5. Situational information (drama, role playing, educational games, case studies).
6. Information from physical objects (models, simulators).
7. Computers (computer-assisted instruction, computer-managed instruction).
8. Human resources (teachers, peers).

The complex nature of these media makes them as subject to dispute as it does with the definitions and distinctions of educational technology. Associated with each one of them, there are as many devices and processes as there are designers and



manufacturers. Furthermore, there is little compatibility among them. Like water and oil, they do not combine.

Considerations regarding the State of the Art

One finds oneself increasingly at odds over the question as to whether educational technology, strictly according to the definition set forth above, has already come into being. This issue lends itself to disagreement and differences of opinion. To state one's position, it is convenient to take the side of someone whose views are akin to one's own. James Koerner, in an article entitled EDUCATIONAL TECHNOLOGY: DOES IT HAVE A FUTURE IN THE CLASSROOM? (Saturday Review, April 14, 1973), argues that it has not: "The electronic revolution may be here but the educational revolution is yet to come." Koerner proceeds to give the reasons why he thinks that educational technology has not come yet.

"First, the equipment itself - the hardware - has fallen short of the claims made for it. Hardly a system today is equal to its propaganda. The most advanced hardware systems have had serious debugging problems, low reliability, high maintenance. Most continue to be incompatible with the other systems, because manufacturers are not able to agree on



industry-wide standardization. Moreover, hardware becomes obsolete so fast that capital investments for new or improved systems are a continuous necessity."

"Then there is the programming itself - the software - which has lagged far behind the hardware, imperfect as the latter has been. One has only to sample the materials that have been prepared for use on teaching devices to realize how rudimentary the state of the art is. Since educational technology today and tomorrow will be just as good or bad as the quality of the stuff available for the machines, a long road lies ahead before a true technology of education can be developed."

It befuddles the imagination to think about human resources, which are the key components of educational technology, both as its managers and users. The problems encountered here are as varied as human nature itself. To begin with, very little is known about the education process itself. If more were known about the way learning occurs, it would be easier to resolve such problems as different interpretations of the field itself; confused or conflicting objectives; quality of the software; overt, covert and sustained resistance by

the teaching establishment; inability to decide the extent to which technology is used in place of or as an additive to instruction.

A Comparative Overview of Educational Technology in the United States of America and in Brazil

In order to make a comparative overview of educational technology in the United States of America and in Brazil, the following random selection of topics has been made:

1. Principles of concepts of educational technology.
2. Research and literature.
3. Institutional commitment and environmental conditions for the utilization of educational technology.
4. General remarks about software.
5. Some hardware components, namely:
 - 5.1. Radio
 - 5.2. Television
 - 5.3. Computers
6. Concluding remarks.

1. Principles and concepts of educational technology

UNITED STATES OF AMERICA - It is generally agreed that educational technology refers to any given integrated system of teaching and learning, using human and nonhuman resources. There is no agreement, however, about the ways and means to bring about integration; to design and to implement systems; to determine what is teaching and what is learning; to establish appropriate ways to use human resources; to decide which kinds of nonhuman resources should be employed.

BRAZIL - With regard to principles and concepts, there is no substantial difference between the United States of America and Brazil. Considering that Brazil, to a great extent, looks upon the United States as a source of information, models, and personnel and institutional development, clarity or confusion regarding educational technology is likely to be shared by both countries.

2. Research and literature

UNITED STATES OF AMERICA - A mere glance at such materials as bibliographies and lists of research institutions will readily show that there is no other country in the world where

so much research and experimentation are being carried out, and so much literature is being written and published concerning educational technology as in the United States. This is essentially due to the traditional commitment of United States universities and other learned institutions to research and experimentation, and to writing and publishing.

BRAZIL - No significant research is being carried out at Brazilian universities and other institutions. Thus far, Brazilian universities have been practically concerned with instruction. In general, research and services have been almost totally neglected by Brazilian universities. Some experiments are being undertaken, mainly in the area of educational radio and television for nonformal and compensatory education. However, these experiments are largely hit-and-miss ventures rather than scientifically controlled and recorded experiments. Only negligible writing and publishing are taking place. The bulk of the existing literature in the Portuguese language regarding educational technology, in either the book or the periodical format, is comprised of translations, generally of United States origin.



3. Instructional commitment and environmental conditions to
bring about educational technology

Strong institutional commitment and adequate environmental conditions are key elements in any educational technology system. This often requires that policies and financial support take place at the national level or at least in significant regional areas. Experience shows that educational technology systems demand large investments, and that no small undertaking can effectively achieve the combination of human and nonhuman resources called for in the definition selected for this paper.

UNITED STATES OF AMERICA - For historical and traditional reasons, the United States system of education is too fragmented and too jealous of its local interests and prerogatives to permit multi-institutional commitments and to create environmental conditions for large-scale planning, implementation and management of educational technology. As a general rule, educational technology efforts in the United States are personality or institution oriented. With no intention to seek any relative or absolute values, the fact of the matter is that United States educational institutions are characterized by their distinctive individual features. To what extent this is conducive to systematic utilization of educational technology is a moot question.



This situation can also be viewed from another angle. The United States system of education is not being compelled to resort to large-scale use of educational technology. Usually, major or dramatic changes only take place when stimulated by major or dramatic challenges. The United States system of education, at least after World War II, has been shaken up by only two major or dramatic changes: the first one was prompted by the Sputnik; and the second by the integration of schools. The former has brought about considerable changes, particularly in the areas of science and mathematics, while the latter has brought about no visible instructional impacts.

For one thing, educational technology offers the opportunity to bring about qualitative improvement of instruction, and it can make available quantitative education for more people. Here, there is no great inducement to resort to educational technology, considering that the United States has a highly developed and expanded system of education (although largely created for the tranquil society of the first decades of this century and whose present day effectiveness is being questioned) which, by and large, still meets the needs of universal education. Having reached the so-called "zero population growth", enrollment expansion ceases to be a problem.



BRAZIL - Two essential factors provide for more favorable opportunities to make wide-spread utilization of educational technology in Brazil. In the first place, Brazil is undergoing a process of education reform and change in order to cope with its educational requirements. The existing system of education is totally inadequate to meet basic universal needs. Therefore, new alternatives have to be found for the solution of problems related to an almost exponential growth in enrollment, and to the improvement of the quality of instruction in all levels of education. Secondly, Brazil has centralization capabilities in its educational system that permits the establishment and execution of national level policies or guidelines to be followed at the local level. This system is flexible enough to provide for local peculiarities, while requiring the achievement of goals and objectives of national interest.

At the institutional level, the Government of Brazil has created a national agency to coordinate, to systematize and to integrate all federal, state, local and private efforts related to tele-education. This agency is located at Ministry of Education and Culture, while operating under an intraministerial system involving the Ministries of Finance, Communications, and Planning and General Coordination, together with the Ministry of Education.



4. Software

UNITED STATES OF AMERICA - Software, or the content, substance or program delivered by the system to the user, is usually produced by using cottage industry methods: each school system, or even separate schools or individuals, design, produce and apply their own versions. At the same time, it is not uncommon that software is conceived, developed and set up by individuals who have no responsibility for or are not involved in carrying it out. As a consequence, achievement of software objectives falls short of expectations. Too often teachers are not well-prepared to make adequate use of an innovative process. In other instances, teachers merely show apathy for innovations, if not downright opposition. This is particularly symptomatic at the college level. Indeed it seems odd that a college professor, who makes no objection to adopting a textbook written by somebody else, is unwilling to use a system designed and set up by an outsider.

Viewed as whole, however, there is a large amount of software currently in use or in preparation in the United States. This at least serves as a basis for further research and development.

BRAZIL - Partly because Brazilian universities failed to assume greater initiative in the development and use of instructional technology, production of software is lagging behind. A few efforts that have been attempted are unstructured and lack depth. For instance, those universities which set up instructional television systems did not give due attention to the development of adequate programming.

Lack of software is a shortcoming that prevents the realization of the promises of educational technology to contribute to the solutions of educational problems in Brazil. Hopefully, with the creation of proposed centers for educational technology at Brazilian universities, the awareness that the key to effective educational technology rests on software will be brought forth.

5. Hardware

It has already been established that educational technology is more than the use of machines. An instructional approach may or may not involve hardware. On the other hand, because of its unlimited capabilities to aid learning, hardware becomes practically inextricable from educational technology.



UNITED STATES OF AMERICA - There are two major considerations to be drawn about hardware in the United States. First, the development and manufacture of hardware in the United States is very expanded and widespread. Particularly during the 1960s, a large industry of learning came into being. Second, this industry succeeded in disseminating hardware to the extent that the generalization can be made that almost every educational institution in the United States is equipped with some form of hardware.

BRAZIL - In opposition, there has been no significant development or manufacture of hardware in Brazil. In a smaller scale, a similar dissemination of hardware is occurring now. Hardware installations range from multi-million dollar educational television complexes to amateurish kinds of equipment set up in the name of closed-circuit educational television systems. There are scores of examples of establishment of costly installations, equipment, and provision of personnel whose needs are to be determined at later stages. By virtue of the laws of probability, the coincidence of of the effectiveness of such systems with actual needs is very small.

△

5.1. Radio

UNITED STATES OF AMERICA - The rediscovery of radio as an instructional medium is currently taking place in the United States. Particularly since the advent of television, radio has not been used in the United States for educational purposes. In fact, its educational potentialities were completely neglected. By and large, this rediscovery is still in the drawing-boards. Radio is used now primarily for cultural and informational purposes rather than for education, as it is characterized by the National Public Radio.

BRAZIL - Radio is being extensively used in Brazil for instructional purposes, particularly for nonformal or compensatory education. A typical use of radio for compensatory education is the variety of courses broadcast for those who were unable to complete either elementary or secondary education. These courses are offered both by government-sponsored institutions and by private organizations. Students attend controlled reception classes under the guidance of monitors. These students can then sit for examinations comprising standardized tests at locations selected and controlled by school authorities. The radio courses and the examinations cover the regular elementary or secondary



school curriculum. If successful, candidates receive elementary or secondary school diplomas corresponding to formal education certification.

As required by law, all radio stations (the same is true for television), commercial or otherwise, have to provide a minimum of five hours a week for educational or cultural purposes.

5.2. Television

Television is often considered as the most dramatic resource in educational technology. It does encompass practically all capabilities of all other media. In view of its potentialities, it is not uncommon to confuse instructional television with instructional technology. To talk about television, it is necessary to understand that it is a broad term involving many features. It comes in diverse forms, and each form has different capacities and limitations. A list of the varied forms of television existing now is useful to the purposes of this paper.

Broadcast Television. Its distinguishing characteristic is transmission of television signals over the air which can be received by means of an antenna, but only one signal or program



can be transmitted by a broadcasting station at a time.

Closed-Circuit Television. It has the ability to transmit more than one signal through the same interconnecting cable at the same time, forming a closed network.

Television Fixed Service. This method of signal distribution is characterized by broadcast signals at very high frequencies that can be picked up only with special receiving equipment, and it has a range of coverage of up to 25 miles.

Cable Television. This is the extended counterpart of the closed-circuit television system. In this system, specially designed antennas on high towers and mountain tops pick up television signals from distant points, strengthen them, and then distribute them to homes, business or schools over special cables.

(This list has been extracted and adapted from the book THE FOURTH REVOLUTION, A Report and Recommendations by The Carnegie Commission on Higher Education; June 1972)



For this variety of forms, there is a corresponding variety of transmission and receiving systems involving antennas, towers, relays, airborne systems, balloons, satellites, and so on and so forth. It also includes an array of devices and processes which for the sake of convenience are lumped together as related television technology, comprising such things as videotape, recording and palyback systems, videocassettes, and other. Finally, at the receiving end, there is also a variety of forms involving black-and-white and color alternatives.

UNITED STATES OF AMERICA - Broadcast, closed-circuit, and cable television are the forms which are widely used in the United States. As a general rule, broadcast and cable television forms are used mostly for public broadcasting or cultural purposes rather than for instruction as such. There are examples of successful instructional programs in broadcast television, such as Chicago's TV College, offered as an extension of Chicago City College. There are also programs such as "Sesame Street" and "The Electric Company" created by the Children's Television Workshop in New York City to help build learning skills of young children. However, it is difficult to determine whether or not these programs can be regarded as formal or nonformal education.



Closed-circuit television is the most frequently used system of instructional television used in schools, colleges, and universities in the United States. It is reported, however, that there is a decrease in its use for instructional purposes. Many sources are of the opinion that it is increasingly becoming public television.

BRAZIL - Broadcast television is used largely for cultural purposes and for nonformal and compensatory instruction. There are, however, three outstanding endeavors currently underway in which broadcast television is used for classroom instructional purposes. In São Luiz, the capital city of the State of Maranhão; and in Manaus, the capital city of the State of Amazonas, broadcast television is used to transmit live or recorded conventional teacher lectures to sixth through ninth grade classroom students. Reception is received and controlled by a monitor. There is considerable doubt regarding the quality and content of these lectures. It is also argued that the quality of program production is not up to standards. In spite of these shortcomings, these broadcast television courses have made possible an increase in enrollment, and have helped in solving the problems of teacher shortage in those areas. In the State of Rio Grande do Norte, elementary teachers are being upgraded by means of broadcast television courses. This is being done in preparation for the use of broadcast television for classroom



instruction, starting with grades first through fifth.

Several Brazilian universities (e. g., São Paulo State University; Federal University of Pernambuco) have installed closed-circuit television systems, and several others are planning such installations. These efforts are primarily in the direction of hardware and physical facilities. No major software efforts are being made.

The State of São Paulo Educational Television Foundation has designed, produced, and transmitted a variety of instructional programs for nonformal and compensatory education. These programs are based on assessment of needs, and are considered as examples of excellence both in instructional content and in quality of production.

5.3. Computers

UNITED STATES OF AMERICA - Many experiments in computer-assisted instruction (CAI) and computer-managed instruction (CMI) are being carried out by most universities and by some private institutions in the United States. As described by



M. R. da Cruz in a paper entitled "OBSERVATION OF TWO EXEMPLARY COMPUTER-ASSISTED INSTRUCTION SYSTEMS", two projects can be selected to exemplify the utilization of computers for instruction in the United States. The PLATO IV project at the University of Illinois is described as a large-scale, computer-controlled teaching system capable of handling up to 4,000 teaching stations. The PLAN system of the Westinghouse Learning Corporation uses the computer to assist the teacher in managing instruction, including the preparation of programs of studies and learning units, the recording of grades and attendance, as well as the suggestion of assignments. The computer also provides for guidance of instruction based on student performance.

BRAZIL - There is no computer-assisted instruction or computer-managed instruction systems being used in Brazil now; and insofar as it is known, none is planned.

6. Concluding remarks

UNITED STATES OF AMERICA - Educational technology is bound to have a powerful influence on American education in general. Or perhaps it would be more accurate to say that it will have a powerful influence on education throughout the world. But the fact



remains that changes in the American educational system are not likely to happen quickly or sweepingly. In the light of present evidence, the penetration of educational technology further into the American educational establishment depends largely on the unmistakable proof of its effectiveness.

BRAZIL - At the present time, Brazil should have two outlooks of educational technology: one, is to consider carefully the uses that can be made of simpler instructional resources. For many students in many schools throughout the country, textbooks in quantity and in quality are still the latest and the most advanced component of educational technology to be placed within their access; two, is to give attention to the exceptional capabilities of engineering and electronics to assist education. Efforts should be made as early as possible to explore possible alternatives that will enable Brazil to make the quantum leap in education.



Summary

To make a comparative overview of educational technology in the United States of America and in Brazil, terms of reference were established in order to indicate the points of view from which this examination was made. A definition of educational technology was selected to serve as the basis for discussion. The distinctions and formats of educational technology, both from the human and from the nonhuman standpoints, were presented. General considerations were drawn about the state of the art. Six topics were randomly chosen, and a comparison of their respective status in the United States of America and in Brazil was made.

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