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ABSTRACT

Generalized conclusions presented in this paper on the use of computer-based education techniques in nations with developing educational systems are based on an 18-month study conducted in Brazil from 1975 to 1977. This study was the first of its kind in Latin America, and the results should be of interest to nationals of developing nations as well as those interested in providing them with technical assistance in the area of computer-based education. (Author/VT)

COMPUTER BASED EDUCATION FOR DEVELOPING EDUCATIONAL SYSTEMS

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by

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COMPUTER BASED EDUCATION FOR DEVELOPING EDUCATION SYSTEMS

The purpose of this paper is to present generalized conclusions on the use of computer-based education techniques in nations with developing educational systems. The conclusions are based on an 18 month study conducted in Brazil from 1975 to 1977 by the reporters. The study was the first of its kind in Latin America, and therefore the authors feel the results should be of interest to both nationals of developing nations as well as those interested in technical assistance to developing nations in the area of computer based education.

THE NEED FOR THE STUDY

The Brazilian Educational System is typical of many developing nations which has two outstanding features which make this study imperative:

1. Economic: the primary emphasis in the educational system is on economic development. The educational system must greatly improve to assume this responsibility.
2. Demographic: In a population of over 100,000,000 over 65% are 15 years or under and less than 2% of those entering school ever graduate from high school.

These two factors - the economic goal and the demographic situation add up to one over-riding fact. More people must receive more education. Rising aspirations and rising expectations for more people in an already under-educated culture produce inevitable pressures on the educational system. Coping with these factors is a large and formidable task which requires the employment of techniques already developed and the creation of new ones.

THE STUDY

The project to study the feasibility of using computer-based education techniques in the instructional system design in Brazil:

a. surveyed existing hardware and software facilities in Brazil paying particular attention to the capital of Brasilia where the study was located.
b. analyzed the existing instructional system of the Centro de Ensino Technico de Brasilia (CETEB), the specific locale of the study. CETEB is an autonomous educational organization, broad in scope and dedicated to educational innovations. All of its instruction (both direct, on campus and indirect, off campus) is designed to be individualized.
c. designed an integrated system for academic control and management by computer (Hereinafter called CAC/CMI).

d. educated the software personnel in the specific programming required to implement the CAC/CMI.
e. collaborated with the educators at CETEB in designing an instructional system to take advantage of the CAC/CMI system.

These activities are listed in the order of occurence, not in order of importance or of duration of time.

RESULTS

The results of the study are given in the same order as the study activities defined in the methodology above.

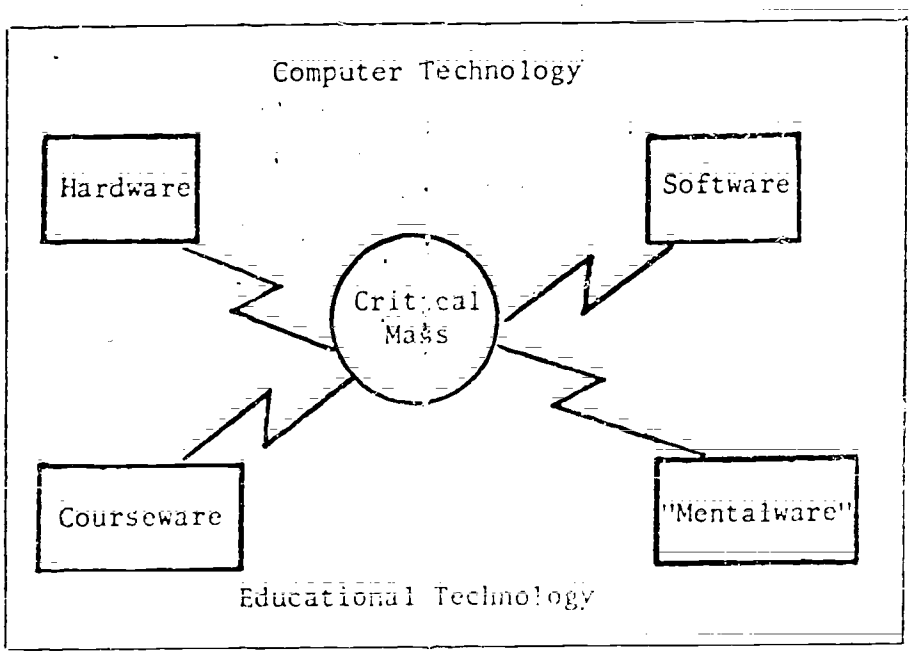
a. Hardware and Software survey.
   1. Computer power is available in quantities sufficient for the needs of the CAC/CMI system. The machines are located in the business and government sectors as well as in the universities. None seem to be devoted exclusively to educational use. There is no need to recommend additional hardware.
   2. There is no software designed for instructional use although some existed for administrative control, particularly at the university levels.
b. Instructional system analysis.
   1. There was but a superficial commitment to a systematic approach to instruction. Much work needed to be done to produce a truly integrated system which treats coherently the various inputs, the resulting objectives, the activities to meet the objectives and evaluation, both formative and summative, of the progress of the system and the learners.
   2. The individualization of the students' courses was limited to the student's own unique pace. Everything was uniform except the student's rate of speed in his studies.
c. Design of CAC/CMI system.
   1. An integrated system for academic control and instructional management was designed with the following phases --
      --registration
      --instruction (amplified into a CMI system)
      --examination
      --termination
      --evaluation
d. Instructional system design.
   1. Two position papers, on instructional system design and on computer based education, were written, in Portugese, as basic documents for the study.
   2. Course designs for CMI were tested experimentally. In addition to being designed to fit into the CAC/CMI system, these courses provided for the individualizing of student's pace: prior knowledge,

abilities and degree of autonomy in making his own educational decisions.

CONCLUSIONS

The principal conclusion is that the use of the CBE techniques in the instructional system is completely feasible. However, before this can take place various ingredients must be present in proper proportion (quantity, quality, and ratio) to form the "critical mass" necessary to produce the explosion of CBE. The following diagram demonstrates this concept in a graphic fashion.

CBE Ingredients Necessary for Critical Mass



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RECOMMENDATIONS

To produce these ingredients in the proper proportion for this "critical mass," the following steps are recommended; it is further recommended that these be accomplished in the order presented.

1. A pre-disposition for systematic organization, which can be called "mentalware" must be fostered. This mentalware is a readiness to look at instruction as an integrated organic system. Creation of this readiness, this mentalware, may mean a new type of person in instruction--the instructional system designer. At the very least, creation of this mentalware means raising the level of expectations of the educators.

2. There should be an exploration of all the techniques in instruction made possible by CBE. A whole constellation of these techniques is available: individualized instruction, mastery learning, modularized organization, diagnosis and prescription of activities are some of these; to take full advantage of these requires an integrated system of instruction as well as computer management of the system.

3. The software development should include the four components of computer-based education: computers for academic control (CAC) computer managed instruction (CMI), computer assisted instruction (CAI) and computer supported resources (CSR). However, it is adviseable to develop these in the order given rather than simultaneously. Also it is recommended that there be concentration on the first two, CAC and CMI.

4. It is recommended that the same rather cautious development approach be taken with hardware. This is not to say that small mini-computers should be used instead of large main frame networks, but rather that small scale learning centers should be developed prior to national scale programs. In our case a mini-computer was recommended, but that was dependent upon the particular internal communications system of Brazil.