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COMPUTER ANALYSIS OF EDUCATIONAL DATA

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ABSTRACT

Computer is employed at a price to replace human skill. But this is only one aspect of the increase in computer phenomenon. Though every time something is taken from man that he once did, his power of operation is diminished. Apart from computer analysis capability in a tremendously high speed, if its aim was to help man to become a better man, it has seriously failed. The extensive use of computer in spite of its unemployment side-effect is an illustration of the German proverb 'Wash me but don't make me wet'. A computer can be given rules of procedure which it will obey. It is ready to outline the programmed information and keep records of a variety of procedures stored therein. With this machine it is possible to provide maximumly adaptive instruction. This paper defines the presumably critical dimensions of instruction and the system that permits the collection of data which could develop it further. The idea of computer assisted instruction takes various forms, although the central idea is that of a computer which controls a series of peripheral equipment, where that peripheral equipment is the input-output to the computer and the output-input to the recipient of the computer information. However, we need to reorientate development programmes, and radically reorder priorities among investigations concerning the human individual, his nature, motivations, potentialities and limitations and compile instructions which project human qualities and defects in conjunction with computer capabilities without having to fall into the common error of confusing human initiative with computer identity.

The Use of Computers

Electronic computers are widely used in the solution of the problems of science, engineering, business, and education. This is based on the ability of computer to operate at a great speed, produce accurate results, store large quantities of information, and carry out long and complex sequences of operations with human intervention.

The design of a new aeroplane consumes thousands of hours of computer time in the investigation of interrelated requirements of aerodynamic structures, engines, and control systems as they would have to operate under various flight conditions. After a prototype has been built, flight testing generates voluminous data that must be processed and analyzed, often employing statistical techniques.

The design of a chemical plant too, requires calculations of capacity operating conditions and yields, under various circumstances. The techniques of operation researches often come into play in determining optimum operation conditions, taking into account economic factors and sometimes demanding very large amount of computer time.

Weather prediction studies involve large amounts of data and solution of equations that, although not very difficult in principle, call for vast amounts of calculation.

Statistical studies of the correlations among various factors that affect learning, often call upon the computer, ranging from modest computation that a student might do in a research project to nationwide studies involving millions of people.

The communication industry is also making increasing use of computers to store, process, and disseminate information.

The investigation of the possible structure of a complex compound in biochemistry could involve a combination of 'scientific' computations in relation to binding energies, interatomic distances, and so on, with an elaborate computer programme to present the result in a visually meaningful form.

The computer techinques that are involved in as diverse an application as those cited above, to a certain extent, depend upon the task. However, the person who intends to use the computer in any of those tasks, needs to know, at least, the primary objectives of communicating his intention to the computer which is commonly known as computer language.

The computer, on its own, cannot make decisions on our behalf. We will have to decide the nature of the task which the system is to accomplish, the goal or combination of goals it must satisfy, the condition under which it is to operate, and the general approach to solving the problem it is to take. In some applications these steps are trivial; in others in may take months or even years. Knowledge of the problem, there is usually little the computer can do to help.

Some organizations use computer to provide instructional support to educational activities. This system is called *Computer Based Education* (CBE). The use of CBE has served to simplify the job of the instructor in presenting individualized instructions. The CBE has also made possible the education of learners who would, for various reasons, be unable to obtain daily instruction in a conventional educational settings. I will be introducing three forms of CBE.

Computer Manager Instruction (CMI)

CMI encompasses a wide range of computer uses in education that involve the gathering and management of the information which helps developing flexible and individualized learning strategies. It utilizes the power of computer to solve problems of individualized instructions such as diagnostic testing, scoring, and instructional prescription management. Management functions of CMI may include test item analysis, scheduling of instructional resource, and student record keeping.

Computer Supported Learning Aid (CSLA)

CLSA uses 'computer as a supportive measure in the learning process. It does not use the computer to perform the functions of a CMI system, nor does it provide the primary instruction required for the student to master instructional goals. This type of CBE has no formal description, although many varied uses of CBE may fall within this classification. The other type of computer which uses a classified system similar to that of CBE, is the Computer Assisted Instruction (CAI).

Computer Assisted Instruction (CAI)

This system has several distinct advantages over more conventional instructional media. These include an unlimited storage capacity (memory bank), an ability to release information accurately and rapidly, a problem solving capability, and a versatility in terms of possible modes of presentation. In addition,

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Stolurow (1960) claims that of all instructional media, computer is the only one that communicates on a completely individualized basis. It does so, by modifying its responses depending upon the person using it. Conventional programmed instruction, on the other hand, takes into account individual rates of learning. But even in the case of braching programs, it cannot allow for a sufficient variety of individual differences.

Basically, a CAI system includes a computing centre plus a number of student terminals. Typically, the learner interacts with the computer program by means of a typewriter keyboard and/or a video screen that reacts to a light pen. The machine, in turn, communicates with the learner via audio and/or video systems.

A CAI system can be put to several uses. The most common one being nothing more than the solving of computational and logical problems. The instructor continues with his teaching, as usual. The students employ the computer only as a computational device for problems assigned by the instructor.

A second use involves drill and practice. A CAI system may be used to provide practice for such subject areas as mathematics or language learning. Unlike problem solving, this function requires the system to be especially programmed.

Stolurow (1968) discusses a third application: the inquiry function. This involves using the computer as an information bank. To gain access, the student must feed the computer with appropriate questions, usually by means of a typewriter keyboard.

The fourth intriguing application involves the use of computer for simulation and games. This requires the formulation, in a program form, of some relatively complex model or situation which the student interacts, and about which he may be asked to make certain decisions. Such skills, as are involved in problem analysis, decision making, and logical inferential processes, may be taught and practiced through the simulation of problem situations.

Finally, a CAI system may be used for tutorial instruction. This may be described as the application of computer facilities for teaching, in the seans of imparting skills and information centre, or a computational tool, for simulation or practicing skills.

As a tutorial device, a computer can, quite easily, be used to present complex branching programs, or simply offer information much the same as a textbook does. It is also possible to use computers in unimaginative, conventional, and highly wasteful ways.

As pointed out earlier, computers are not widely used in education, particularly as instructional systems. This is partly due to the shortage of instructional materials (programs), and partly because computers are expensive. In computer jargon, the program is really one of software. Although, the cost of hardware (electronic equipment) is a problem too, interestingly, the software problem with regard to CAI does exist, because there is little reliable information about alternative instructional procedures and their relative merits. One of the major early contributions of computers to education was to stimulate interest in research on instruction.

How Should Computer Be Used in Instruction?

Despite occasional set backs, the instructional use of computers has become steadily more wide spread. While new and different ways of using computers in education and training are emerging, the vast majority uses appear to support instructional methodologies which fail to take significant advantage of computer capabilities. Yet, these are the very uses which education and training institutions have been able to justify on the basis of 'instructional effectiveness' and/or economics. Unfortuantely, the more an instructional methodology uses the full potential of a computer, the more difficult it has been to justify. There has been little basis for comparison of these more sophisticated uses because there is no competitive alternative to them.

The decision as to whether to use computers in learning, is both difficult and complex for any educational constitution or training staff to make. It, typically, requires considerable justification of the value of some forms of computer assisted instruction. It also involves careful analysis of the economics of introducing computers in an instructional capacity. The purpose of this paper is to provide some aid in making that decision, precisely, in terms of computer's potential and the practical aspects of its use in instruction. Each individual instance must be considered on its own merits, and no general paper, such as this, can solve the specific problem confronted by the managers of any particular institution. There are, however, certain considerations which need be examined in every case. This paper will attempt to outline those considerations, and it will also indicate the relative importance it should have in making the desicion whether or not to introduce computers in any particular instance.

There are three basic different factors of justifying the use of computers in instruction. In most cases, at least two of these factors will have to be considered, in order to make a practical decision. Usually, one will be of primary importance, but seldom will it be the only one worth considering for decision making. First, there are some uses of computer in instruction for which there is essentially no other competitive method for accomplishing the same results. Second, the computer has certain unique characteristics which can provide important instructional capabilities. Third, there are instances where computer is simply the most economical way to perform instruction which may be done equally well, by other methods. The following sections will address each of these aspects in relation to the continuum of instructional uses of computers, shown in Figure 1

Figure 1.

Continuum of Instructional uses of Computer

Greater Potential Capabilityof Computer	Student designed automations
	Student-developed simulations of real systems or processes
	"Open-ended' problem solving
	Student programmed automata
	Student developed instruction
	Exploration of simulated system or environment
	Interactive CAI multi-level branching;
	artificial intelligence applications
	Instructional management systems
	Calculational electronic sliderule
Less Potential Capability of Computer	Tutorial (computerized programmed instruction) or multichoice CAI)
	Testing and record keeping
	Drill and practice

Section One- Teaching Information Processing System (TIPS)

This system which was developed at the University of Wisconsin according to Kelly (1968), provides feedback to student and teacher alike, based on a computer scored weekly quiz. The information provided to the student contains a summary of his performance including his responses, the correct responses, and the total correct. This is more than a test scoring program. Required and optional assignments are made based on the quiz. If the student performs poorly over several quizzes, a message is sent suggesting an appointment with the instructor. The instructor, who is also notified about students with problems, receives the usual summary information by items in each section. This is used to indicate what has not been learned effectively.

Section Two- Comptrac

This system was developed at Florida State University. It helps teachers in monitoring classroom performance. Healy (1971) says, "It is helping to tailor instruction to individual needs." The program determines which student should have the highest priority for the teacher's attention. Every six weeks, a summary class progress file is provided. Twice a year, there is a summary analysis of performance on objectives which is a feedback mechanism to identify ineffective learning routines.

Section Three- PLATO System and its Cost

Daniel Alpert, dean of the graduate college at the University of Illinois, points out that one fully utilized PLATO system will be able to provide 10 million hours of instruction per year; an amount that could increase the enrollment of the Illinois State Educational System by 20 per cent for a cost of less than 2 per cent of the State's education budget. For this reason, the PLATO system has attracted considerable attention from State officials, and as a result, they are providing roughly half of the fund to support its demonstration.

References

1. Angline, Leo and Devault, M., *Perspective and Problems in CMI* Wisconsin Elementary School Report.
2. Butman, Robert C., CAI: *There is a way to make it pay,* educational Technology, (1973).
3. Dobbins, Jame, *The Computer and Organizational System in Higher Education,* Journal of Educational Data Processing, Vol. 8, No. 1, (1971).
4. Finch, J. M., *An Overview of Computer-Managed Instruction,* Educational Technology, July (1972).
5. Fitzgibbon, N., Handgrate, J. H., CAI: *Where Do We Go From Here?,* Elementary English, (1970).
6. Former, R., *Distinctions Between CAI and CMI System,* Educational Technology, May (1972).
7. Gleason, Gerald, *Computer-Assisted Instruction:* Prospects and Problems, Educational Technology.
8. Glossary: Computer Jargon, Module Three, IDD 536, Summer (1976).
9. Greate: Students Manual, Computer-Managed Instruction Control Data, CBE Education, Company copyright, (1976).
10. Hartman, Edward, *The Cost of Computer-Assisted Instruction,* Educational Technology, December (1971), Vol. XI, No. 12.
11. Johnson, J. R., *Computer as a Management Tool,* College Management, (1972), Vol. 7, No. 4.
12. Lippey, Gerald, *Computer-Managed Instruction-Some Strategic Considerations,* Educational Technology, January (1975).
13. Mowbrog, George and Jack B. Levine, *The Development and Implementation of Campus:* A Computer-Based Planning and Budgeting System for Universities and Colleges, Educational Technology, May (1971), Vol. XI, No. 5.
14. Veldman, D., *Introduction to Computer System in Fortran,* Programming for the Behavioral Science, Holt Rinehart and Winston, (1962).
15. Weinstock, Henry, et al *Critique of Criticisms of CAI,* May (1973).