

# RECOMMENDED CHANGES IN THE TEACHER PRESERVICE PROGRAM TO REFLECT COMPUTER TECHNOLOGY AND ITS IMPACT ON EDUCATION

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Plutarch said, "The mind is not a vessel to be filled but a fire to be kindled." Learning in the past (and, to a great extent, in the present) had been geared to the filling of the mind with facts and concepts that supposedly will carry the learner through all the rest of the years of his life. Computers kindle fires — fires of motivation, interest and creativity.

The computer is a part of our lives and is also an increasingly large part of our education in almost every area of the curriculum. Yet the program for preservice teachers is largely unchanged from its traditional pattern in most universities and colleges. There is a vastly accelerating need for computer-knowledgeable teachers. Many of these teachers need not know computer programming or mathematics, but they do need a sound computer awareness program, some hands-on experiences and several other computer experiences. As the technology advances and students at all levels become more sophisticated, the preservice curriculum will necessarily be in a constant state of change to keep prospective teachers current with the educational needs of their students.

The following are some topics which are most urgently needed in the preservice curriculum: (1) computer literacy, (2) background information on various makes of microcomputers, (3) some knowledge of peripherals, (4) an introduction to available software, (5) hands-on experience using software, (6) inclusion in curriculum development courses of more information on computer-assisted instruction, computer-managed instruction, computer-extended instruction and various authoring languages, (7) classroom management techniques for using microcomputers in a variety of computer-access arrangements, and (8) changing teacher-pupil relationship in a computer usage setting.

## Computer Literacy

Computer literacy is the fundamental issue of this decade. While there is no consensus on the definition of computer literacy, there is some agreement on a few basic concepts

and topics for courses in schools. A national survey was made in August of 1982 by Instructional Computing, Inc. of Minneapolis<sup>1</sup> of the schools in the United States known to have microcomputers. The two topics which more than half of the schools indicated were included in their computer literacy courses are computer operation and BASIC programming. Other topics included in many schools are hardware and software concepts, practical computer uses, computer careers, role and impact on society and history of computers.

School districts are developing comprehensive programs in computer literacy, in many cases beginning with the first grade and continuing through the 12th grade. For example, School District #12 in Adams County, Colorado,<sup>2</sup> has such a program completely developed with a guide and resource materials. It encompasses all 12 grades and is the joint responsibility of the mathematics and social studies departments. It is developed in a spiral approach and includes such broad topics as the history of computers, knowledge of components of computers, recognition of the computer as a valuable tool, knowledge of the issues surrounding computer technology, skill in flow-charting, skill in using the computer and instructing it to run a selected program, and step-by-step simple programming.

Programs such as these involve a large number of teachers at every level, and again emphasize why preservice programs must include appropriate preparation courses.

## Hardware

The computer itself and all the peripherals which constitute the hardware should be discussed, demonstrated, and, as often as possible, made available for hands-on experiences. This includes the computer itself, the disk drive or cassette tape recorder, printers, modems, graphics tablets, light pens, etc. This segment of the preservice program should include the actual viewing of computer chips, and a discussion of their development, their power

and their function. Special terms that are encountered commonly, such as bit, byte, and kilobyte (and many more) should be defined. A general overview must be included of how the computer interprets commands and translates them into action. The program should encourage the prospective teacher to understand the nature of the input, the output, the central processing unit, and internal and external memory.

Most schools have established a policy that only one make of computer will be used in the district. This, then, is the type of computer on which teachers should have learning experiences. However, in the preservice program it is well to involve prospective teachers in using a variety of equipment, and to have them aware of the varying prices and characteristics of at least the most common makes of computers. Many of them will be purchasing home computers and will need to have some basic knowledge of computer hardware in general.

### Software

All teachers do not need to know a computer language, but all preservice programs should include definitions of common terms and a discussion and explanation of some of the jargon that is part of computer usage. Most specifically, they need to know about hardware and software and their interaction. The programs should not only provide for discussion of the terms but also the kinds of software, software distributors, and the modes in which software is presented—drill-and-practice, tutorial, simulations, and others. In addition, potential users should all have hands-on experience in loading, running, responding to and terminating various software programs. Guidelines and forms have been developed in many school districts for the evaluation of software. These, naturally, are similar to the criteria used to evaluate curriculum material in any form. Preservice programs should include these evaluative procedures in relation to software.

### Types of Educational Software

Many of the software packages are labelled as CAI, or, computer-assisted instruction, when they are simply drill-and-practice programs. Some do not even provide feedback to the user on the number of rights and wrongs, and do not include provisions for showing the correct answer when the student gives an incorrect one. Frequently there is no provision for reinforcement of learning. Preservice programs should include examples of various types of computer-assisted instruction. CMI, or, computer-managed instruction, which supposedly includes diagnostic and prescriptive components, should also be demonstrated. CEI, or computer-extended instruction,

which might include either CAI or CMI or might be loosely used to cover all manner of special computer projects and assignments, is another topic for inclusion.

### Classroom Management

There are a multitude of arrangements for the placement of computers in schools—they may all be located in a media center or a library, or on carts for transporting to different areas, or they may be assigned to departments of grade-level areas or even to individual classrooms. Wherever they are located there are seldom enough for one computer per student. This gives rise to problems of management. The schools may have established some policies regarding scheduling and location of computers, but the teacher has to devise some plan for scheduling usage so that every student has an opportunity for hands-on experience. Questions arise, such as “how can I teach a class of thirty with one computer and maximize student learning time and computer usage?” The question could even be, “how can schedules be set up with only one computer for each 300 students?” Preservice programs should include study of possible plans in various settings.

### Changing the Teacher-Pupil Relationship

Since the beginning of the school as an institution, the teacher has been the authority in the classroom—the one who not only had to plan the program, but also had to have the answers to all questions that students might present. Now it is a great truth and a common experience that within any group of students at any grade level, there emerges the “computer genius”—one or several students who seem to have a special affinity for and understanding of the computer and who manage to be extremely creative in its use. In secondary school and even in the intermediate grades in elementary school, these students sometimes surpass the teacher in understanding and expertise in working with computers. Such a situation may become a threat to the teacher unless he is prepared for this new relationship and can handle it properly, using the student as a resource person and to demonstrate and work with other students. Preservice programs should prepare prospective teachers for this emerging relationship and discuss modes of using to advantage the “student power” in the classroom.

The aforementioned areas should all be included in a preservice program which is cognizant of the increasing incorporation of computers in the precollege curriculum. These needs will also be constantly changing as programs in the schools change and develop. A continuing period of flux will characterize the next few years as programs must be modified when children with computer expertise in elementary schools reach the secondary schools.

New developments in software must be carefully noted by schools of education. Educational software is improving in quality, quantity and in the variety of modes of presentation. Many of these programs are using a game format since this is a very appealing mode of presentation. Learning specialists have long acknowledged that carefully planned games used in the classroom increase motivation, interest and length of span of attention. Educational games should not be confused with arcade video games which have little value beyond improving hand-eye coordination. In this format, some supposedly advanced concepts can be mastered by young students. Preservice courses must be aware of the changing scene of software and keep the content and manner of presentation current.

### Conclusion

In all of the previous discussion, the greatest problem to education and, therefore, to preservice programs has not been mentioned: the need to restructure educational programs (and, indeed, society itself) to utilize the power of the computer. For example, children, using computers with voice output, may learn to write before they learn to read. A word can be spoken, then spelled, and the student is to respond by typing it in. Age-old learning problems such as how to teach analytical thinking, decisionmaking, and problemsolving have become natural processes in using the computer. Word processors are being used not only in business education classes, but also in English classes. The teachers of music and art are finding a new medium for creativity in their fields. The computer has brought about a revolution of the mind.

Our society has quietly changed from an industrialized society to an information society. We live in an age when information has proliferated rapidly, but with the computer we can access great stores of information. Information utilities are available for home and business use with a personal computer, a telephone line, a modem and a TV set. There are many sources for relearning and updating learning. The schools, and therefore the preservice programs, must face a complete restructuring of learning with less emphasis on learned facts and more information on accessing information and relearning.

Preparing a student for a career is one of the tasks of education; however, careers undergo changes almost daily. Changes had once been so gradual that the general public was able to absorb them without an awareness of how the sum total would affect work, home, or recreational activities. The home of the future—and the office of the future—will be drastically different from the present. With word processing, for example, typists and file clerks are becoming vanishing species. Robots in the assembly line are causing changes in employment patterns

in factories. Careers and professions not known ten years ago are becoming common. New sciences are growing rapidly.

As society and living are changing in this age of information and computer technology, education itself must change and preservice programs must take account of these changes in the preparation of teachers.

It is an exciting and challenging age for education, but it will require a constant revision of emphases, content and method as computer technology advances and changes. Schools (and universities) cannot predict what is the best preparation for careers when the careers themselves are new and changing. Revised goals and procedures and great tolerance, understanding and flexibility are the qualities required of those in charge of preservice programs.

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### Footnotes

<sup>1</sup>*National Survey*, Instructional Computing, Inc., Minneapolis, Minnesota, August 1982.

<sup>2</sup>*A Handbook for Teachers*, School District No. 12, Adams County, Colorado, 11285 Highline Drive, Northglenn, Colorado 80233.

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