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Not too long ago an Apple was a fruit, a Pet was a cat or dog, and computers were strictly for adults. Today in some classrooms, a preschooler may learn to discriminate between "above" and "below" on an Apple microcomputer, a first grader might check his spelling on a Commodore Pet, and a second grader might practice arithmetic problems on her classroom's TRS-80. Awareness of research relating to such computer applications, as well as insight into these applications themselves, is becoming essential for teachers, program planners, and others involved with young children.

RESEARCH ON CHILDREN AND COMPUTERS

While extensive research on microcomputers and young children is yet to come, Hallworth and Brebner (1980) have reviewed studies of the effects on children grade school age and older of using lessons made available on large mainframe computer systems (such as PLATO and TICCIT). Their report indicates that, in basic skills, subjects tested were able to learn as well using computers as they did using more conventional materials and methods--and that they enjoyed learning in this manner. Self-pacing of learning and computer feedback on progress were found to be two of the motivational factors in computer-assisted learning.
Working with an Apple II microcomputer, Ann Piestrup (1981) taught 3- and 4-year-olds the concepts of "above/below" and "right/left." Both teachers and students were enthusiastic about the experiment, and criterion tests on four reading-skill concepts showed children improved after a 3-week period using the computer lessons.

Also specifically investigating the effects of a microcomputer application, Hungate (1982) worked with economically disadvantaged kindergarten children, employing a Commodore Pet program to teach basic mathematics and visual discrimination, and to provide name and telephone number practice. While Hungate's sample was small, results indicated children who used the computer improved their skills more rapidly that those who did not.

Recently, Sheingold (1983) has suggested that computer programs can be effectively used to reinforce the symbolic aspects of lessons children have already experienced in other forms (such as when a simulation of the development of a chick within an egg accompanies an in-class incubation project with real eggs). Yet other researchers have pointed out that children may even gain a sense of power through controlling their own learning on computers (Damarin, 1982; Paisley & Chen, 1982).

COMPUTER APPLICATIONS

Despite the relatively new status of research on the effects of microcomputer use, teachers and administrators of programs for young children need to become aware of the various ways in which computers may be used with this group. The following categories are not intended to be exhaustive, but rather to suggest some of the more important ways computers are presently being employed:
Computer literacy. The primary goal of any use of computers with young children might be considered computer literacy (i.e. teaching children what computers can do and how to use them). Computer literacy can include teaching children how to use the computer as a tool (a medium with which to calculate, draw, or write), as a tutor (to provide instruction), as a tutee (to be programmed), or as a combination of these three (Taylor, 1980).

Computer assisted instruction (CAI). When the computer is used as a tutor, concepts, information, or skills normally presented through conventional teaching methods are taught by computer. For example, 4- or 5-year-old children can learn the alphabet, counting, or how to discriminate between similar and different objects by interacting with a computer programmed to present information, receive responses, and offer new information based on the children's responses.

Computer programming. One of the reasons given for teaching young children to program (in other words, to learn to use a computer language to give the computer instructions) is to promote computer literacy and to prepare children for a computer-oriented future. Another reason for teaching children to program is related to cognitive development. Specifically, programming requires the child who works with the computer to do certain things: to appreciate the fact that there may be many ways to solve a problem, analyze a task, pose alternative solutions to problems, understand how to sequence instructions, and use logic. These kinds of skills are viewed as valuable in themselves and may be generalizable to situations and learning experiences other than those involving computers.

Computer art. A teacher working with young children may introduce computers to them by illustrating how the computer can be used to draw pictures or designs. Children (like many adults) appear to be fascinated by computer graphics and quickly learn the instructions or activities necessary to create their own designs and pictures. The computer used in this manner functions as a very powerful tool or medium for expression. As children become more skilled, they are able to produce valuable and interesting art based on increasingly complex programs. Through using computer graphics, children gain personal satisfaction as well as an increased understanding of design, composition, and use of color (Piestrup, 1982).

Word processing. Primary school children can use computers as tools to create their own text and to practice writing and reading. Word processing programs can encourage young children to experiment with language as well as to record their own writing ("Classroom Computer News Forum." 1982).

Administrative uses. Although not part of children's direct involvement with computers, administrative uses of computers may free educators from routine record keeping to spend more time in instructional activities and at the same time help them to develop computer literacy. Computers in schools are frequently used for accounting, reports, word processing, attendance or personnel records, and budget preparation or management.

Given appropriate software, all of these applications could be handled on a single microcomputer, a possibility illustrating the microcomputer's versatility. As educators increase their knowledge of computer technology, they will be better able to choose appropriate applications for specific instructional settings. Principals, teachers, and

program planners need computer skills and experience if they are to become involved in determining classroom policy, making plans for integrating computer use into existing curricula, and developing and critically reviewing educational software for children.

The text of this Short Report was adapted from sections of a paper by Mima Spencer and Linda Baskin, "Microcomputers in Early Childhood Education." (ED 277 967); the paper will also be published in CURRENT TOPICS IN EARLY CHILDHOOD EDUCATION, Vol. 5. Lilian G. Katz (Ed.), Norwood, NJ: Ablex Publishing Corporation, in press.

FOR MORE INFORMATION

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