A panel session—Computers in early education

SESSION CHAIRMAN—ORLANDO S. MADRIGAL
California State University, Chico

Panel Members

Alan Kay—Xerox Palo Alto Research Center
David Moursund—University of Oregon
John Maniotes—Purdue University
William G. Lane—California State University
A. M. Banks—Beyer High School

PANEL OVERVIEW—Orlando S. Madrigal

This session will have five panelists/speakers who will discuss the use of computers at the pre-college level. The speakers will include topics related to:

- The cost-effectiveness of the use of computers for high school education, by William G. Lane—California State University, Chico.
- Computer Science education for preservice elementary school teachers, by David Moursand—University of Oregon.
- Programming for children on a personal computer. To include a brief movie that will demonstrate the speaker's experiences with children who are taught programming at an early age. By Alan C. Kay—Xerox Palo Alto Research Center.
- The teaching of micro-computers in high school, by Amberse Banks—Beyer High School, Modesto, California.
- The state of high school data processing programs, by John Maniotes, Purdue University.

SPEAKERS AND TOPICS:

(1) Professor David Moursund, University of Oregon
Title: Computer Science Education for Preservice Elementary School Teachers
Abstract: Calculators and microcomputers are now cheap enough so that elementary schools can afford to give students quite good access. Thus this equipment could be playing a major role in the curriculum. But progress to date has been slow. A major cause is lack of suitably trained teachers. Preservice elementary school teachers need to receive a substantial introduction to computer literacy, teaching using calculators and computers, and teaching about calculators and computers. The author has been involved in the development of courses of this sort, and is currently teaching such a course. This paper includes a detailed course outline and discussion. References to the text used, as well as supplementary material, are given.

(2) Professor John Maniotes, Purdue University, Calumet Campus
Title: The Interface Between High School Data Processing Students and the Two-Year Community College Programs in Computer Science
Abstract: Data and problem areas will be presented to explore the transition of high school students, with data processing background, to a formal 2-year curriculum in Computer Science. More and more high schools teach computer-related courses. Students in these programs are able to phase into a college program in computer science including the exemption from the basic courses including introductory programming and concepts. A high school data processing program that is well articulated with college level programs will greatly benefit the students in the program. There will be less course duplication and students will be able to obtain advance placement in the Computer Science area.

(3) Professor William G. Lane, California State University, Chico
Title: Cost-Effectiveness of the Use of Computers For High School Education
Abstract: As more and more high schools start offering computer programming courses, the cost of high school education will greatly increase. And with the trend towards a "no increase" in school budgets, new avenues of educational financing will have to be pursued in order to allow school districts to pursue the addition of basic computer science to existing high school curricula. It will be shown that various avenues of cost-sharing among computer users in a given area can reduce the "per student cost" for computing use to a level that will be within the budgetary restrictions of most school districts. Another area that will affect cost is the need for high school teachers who can qualify as teachers in the Computer Science area. The
current move to establish high school credential programs in various states will be discussed.

(4) Dr. Alan Kay, Xerox Palo Alto Research Center

Title: Experiences With “Small Talk” and Preschoolers

Abstract: The author has been involved with the development of personalized computing systems including both hardware and software. A major result of his work is the “Small Talk” system which utilizes a mini computer that can be used interactively to train preschoolers in the use of computers. The system utilizes a specially designed terminal that will allow the user to perform interactive color graphics without prior training in the use of computers. Hundreds of preschoolers have gone through the “Small Talk” system, and interesting observations have been noted including the users response to a unique computer environment and eventually relating these experiences to the classroom.

These systems, although not yet commercially available, can be considered as the forerunner to personalized computing where users can gain exposure to computing at an early age.

(5) Mr. Amberse Banks, Beyer High School, Modesto, California

Title: Augmenting a High School Curriculum With Microcomputer Education

Abstract: Microcomputer education can be paralleled to the traditional electronics training for television and stereo systems. However, microcomputers are more complex since computer programming must be included in the students work.

The author has devoted two years to the development of high school courses which train students in the intricacies of building and programming microcomputers. More and more students are getting involved in these courses. A number of these students have aspirations for college-level training in Computer Science and eventually enter the field as computer professionals.

PROGRAMMING FOR CHILDREN ON A PERSONAL COMPUTER—Alan Kay

The “Small Talk” system utilizes a mini computer with an attached terminal that can be used interactively to train preschoolers in the use of computers. The system utilizes a specially designed terminal that will allow users (preschoolers) to perform interactive color graphics without prior training in the use of computers. Hundreds of preschoolers have gone through the “Small Talk” system, and interesting observations have been noted including the users response to a unique computer environment and eventually relating these experiences to classroom learning.

These systems, although not yet commercially available, can be considered as the forerunner to personalized computing for children where users can gain exposure to computing at an early age.

COMPUTER SCIENCE EDUCATION FOR PRESERVICE ELEMENTARY SCHOOL TEACHERS—David Moursund

Calculators and microcomputers are now cheap enough so that elementary schools can afford to give students quite good access. Thus this equipment could be playing a major role in the curriculum. But progress to date has been slow. A major cause is lack of suitably trained teachers. Preservice elementary school teachers need to receive a substantial introduction to computer literacy, teaching using calculators and computers, and teaching about calculators and computers. This talk includes a detailed course outline and discussion of course requirements for such training.

THE STATE OF HIGH SCHOOL DATA PROCESSING PROGRAMS—John Maniotes

In recent years, computers have had a profound effect on all of the institutions of society, including early (and late) education. If we, as educators, are to prepare students for the future, we need to participate fully in the computer evolution/revolution and to teach our students to use, understand, and live with these logical machines that will exert such a significant influence on the rest of their lives.

The number of computer and data processing related courses and programs a high school has to offer depends upon the size of the school, the availability of experienced EDP or computer science teachers, the attitude of the school’s administrators, and above all the amount of funds allocated to the EDP program. Although some schools continue to overlook the impact that computers have had in the business and scientific world, others have found economic ways to incorporate some kind of computer-related courses in their curriculum.

Several programs that have been categorized according to the equipment available to the students are described. These programs include the:

- Textbook concept programs
- Input/Output terminal programs
- Centrally located computer concept programs
- Home-based computer concept programs

For those schools which lack the aforementioned programs, all sorts of extracurricular activities can be found intermingled with the obligatory academic subjects. In particular, the role of the ACM computer clubs, science and math clubs, and the explorer posts are described.

Finally, some of the major problems facing high schools in implementing vocational data processing programs are
explored. In particular the problems associated with:

- Curriculum objectives and guidelines
- Recruitment of qualified instructors
- On-going teacher education in EDP
- Instructional materials
- Computer oriented aptitude tests
- Funding to support the EDP programs
- Physical facilities for computer hardware
- Computer software and application packages
- Recent impact of microcomputers, intelligent terminals, and programmable calculators
- Interfacing with 2-year BDP and 4-year CS programs at colleges and universities.

COST-EFFECTIVENESS OF THE USE OF COMPUTERS FOR HIGH SCHOOL EDUCATION—William G. Lane

A decade of program development in elementary and secondary education has been characterized by oversell, under-delivery and poor timing. CAI projects, which promised to raise the overall class growth “X” grades, while letting everyone proceed at his own pace, ran into a number of problems:

- Parent taxpayers, whose only probable previous experience with the computer was in trying to get a credit card purchase error corrected, raised much concern over “turning the education of our children over to a computer.”
- Teachers were resistant to adopting new methods that too frequently were perceived as having a potential for lowering the number of faculty positions and that had the effect of reducing their status to a regulated learning manager rather than an independent learning deliverer.
- Curriculum personnel and school administrators were asked to operate in a new environment for which they had little or no training.
- Marketing analysts had underestimated the cost and length of the development effort and over-estimated early market, causing computer companies to become disenchanted and to withdraw support.
- Low cost hardware technology required for broad acceptance had not yet been developed.

Given these problems, it is not surprising that computers in the elementary secondary education areas have not even begun to reach their potential. But times have changed; hardware costs have lowered, TV games and microprocessors have become a major factor in the home market, the computer is no longer perceived as a job-eating monster and, as such, we are now probably ready to again access the feasibility of installing computers at all levels of our school system.

Several pilot studies are evaluated and analyzed for their potential:

- The use of computer graphics in the teaching of mechanical drawing at the junior high level.
- The use of modularized instruction and computer-based testing in lower elementary levels.
- The use of a computer in handicapped education.

Each of the above studies showed a need for differing systems and peripheral architectures, as well as responsibility for the classroom teachers. These led to the requirement for differing architectural concepts and approaches.

TEACHING MICRO-COMPUTERS IN HIGH SCHOOL—A. M. Banks

In view of the impact of computers upon our society, few people would question their inclusion in the secondary school curriculum. But why should it be done by using micro-computers? Can such curricula be of value to students? While it is true that such small systems do have more limitations than do larger systems, they also offer many new options to the high school program that only have access to micro-computer systems.

Most computer courses in high schools are arranged to suit the type of equipment that is available to the students. Terminals are the most common form of computer access at the high school level; however, in many cases, the students are assigned as low priority users. The restrictions that are thus placed on high school programs curtail, prevent, or even discourage students. Also, the increasingly bleak financial situation of most school districts makes the acquisition of systems large enough to support more sophisticated time-sharing a virtual impossibility. Also, the rising costs of telephone lines makes the use of district-wide systems more and more difficult.

Highly flexible, expandable micro-computers now cost the same as terminals did a year ago. The newer self-contained, assembled systems cost so little that schools can afford to build up a laboratory with several machines. Multiple machines offer variety and protection against system-wide downtime.

Can the computing work that is possible on a micro-computer compare with that possible on larger systems? Yes and no. First there is the matter of the languages that are available. Currently, there are several excellent BASIC interpreters and some reasonable assemblers available for each of the microprocessors used in micro-computer systems. In addition, there are versions of PILOT, APL, PL/1 and FORTH available for some chips. While the lack of COBOL, for example, is a handicap if we are training professional programmers, these available languages are more than adequate for high schools. Software advances are being announced every month for those who do not wish to write their own. This is an area where interested students can do advanced work on micro-computer systems but not in larger systems.
There is an additional aspect of computers that can be covered using micro-computers which cannot even be attempted with larger systems. It is possible to have students do hardware work, including maintenance and hardware configuration. It helps the student to view a computer as a tool to be used rather than as a shrine into whose presence only a privileged few are permitted. Instead, they find new ways and new places to put it to work. This kind of attitude is not generated when students use larger computers or even mini-computers.

Thus, we see that micro-computers can match almost every service offered by a larger system to high school classes, and can offer additional opportunities to students that are just not feasible with larger systems.