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ABSTRACT

Intended for developers of vocational education professionals and for educators making decisions about the usefulness of personal computers in education, this report deals with the effects of the personal computing revolution on professional development of vocational educators. The two major papers and published opinion pieces that make up this document result from the analysis of the state-of-the-art, projected advances, and current applications of personal computing technology. "Educating for Work in a High Tech Society" (Daun M. Anderson) considers the role of computer literacy in vocational education. It advocates teaching computer literacy as a basic skill, examines some existing assumptions about education for technology, considers the implications of attitudes toward technology and work, describes a noninstrumental orientation to education in high technology work, and discusses preparing vocational teachers from a noninstrumental perspective. "The Role of Personal Computers in Vocational Education: A Critical View" (David Lynn Passmore, Daun M. Anderson, Chi-Yin Yuen) is an analytical look at the opportunities and problems personal computers pose for vocational education. Four general uses are discussed: the personal computer as instructional content, for program administration, for instruction, and for communication. Three expected developments are reviewed: artificial intelligence, networking, and portability. Finally, three problems that limit the infusion of personal computers in vocational education are considered: lack of suitable professional orientation of vocational educators, poor quality of instructional software, and the validity of the "Law of Hammer" (the law states that if a hammer is available, something will be found that needs pounding). (YLB)

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FINAL REPORT

INFLUENCE OF RECENT DEVELOPMENTS IN COMPUTER TECHNOLOGY ON PROFESSIONAL DEVELOPMENT IN VOCATIONAL EDUCATION

Contract Number: 83-2813

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June, 1983

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ABSTRACT

83-2813: Influence of Recent Developments in Computer Technology on Professional Development in Vocational Education

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Summary

Needs, opportunities, problems, and effects of personal computing technology for professional development in vocational education were analyzed. Ideas in this report were presented to a panel of vocational educators for review at the 1983 meeting of the American Educational Research Association in Montreal, Canada, and several manuscripts were prepared or submitted for publication in refereed journals in education.

Audience

This report will be useful to developers of vocational education professionals and to educators making decisions about whether personal computers are useful in educational functions.

Publications Available

Final report, on a cost reimbursement basis, from the Division of Occupational and Vocational Studies at The Pennsylvania State University, from ERIC and from NTIS.

Introduction

The personal computing revolution has hit America's schools. According to a survey by the National Center for Educational Statistics, 52,000 microcomputers and terminals were available to elementary and secondary school students in the United States in October 1980. Over 30 percent of the schools housing these devices that did not offer instructional access to computers at the time of the survey planned to do so within three years. The retail value of microcomputers shipments to educational institutions from 1980 through 1985 could exceed $1 billion, with about $74 to $100 million in software sales estimated for 1981 alone. And, the potential market for microcomputers is underdeveloped. Not only are elementary and secondary schools only beginning to purchase computing power, but also homes, the export market, industrial training operations, and continuing education are ripe for market development.

The potential educational and business profits from the personal computing revolution have created great interest in the educational computing market. The National Council of Teachers of Mathematics, American Federation of Teachers, Society for Curriculum Development, and The National Council of Teachers of English have made positive statements about the future of academic computing in their national meetings and publications. A mini-industry of articles in educational journals has appeared describing the potential benefits of microcomputers. Several magazines devoted exclusively to educational computing have emerged. At least four college degree programs in educational computing were launched in 1981, including one at Stanford University. To nudge their way into the educational market, hardware and software vendors such as Apple, Bell & Howell, Commodore, and Radio Shack have provided many giveaways to educational institutions.

The personal computing revolution could affect the efficiency and productivity of vocational education in a number of ways. First, administration of vocational education could be improved by using personal computers to store, retrieve, and display data for such administrative functions as budget development, justification, and monitoring personnel management and equipment, facilities, and supplies management. Second, the management of vocational instruction could be enhanced by using computers for automation of student records of progress through individualized instruction, administration of tailored tests of mastery of content, maintenance of inventories of instructional supplies, and, perhaps most importantly, presentation of subject matter in a variety of modes to students. Third, the hardware and software of personal computing could become the object, rather than a tool, of instruction. Certainly, the personal computing revolution will create new jobs in development, testing, and installation of hardware and preparation and maintenance of software. Vocational education could produce people with the skills to fill these new jobs.

Before these improvements in efficiency and productivity can be captured, vocational educators must be prepared through pre-service and in-service professional development activities to participate in the personal computing revolution. Software will need to be developed for applications in vocational education. Moreover, vocational educators will need to develop capability to create this software. As in any revolution, these needs assume crisis proportions, and pressure is felt to purchase equipment, to create software, to get things going as fast as possible. In such an atmosphere, however, activities tend to focus on <u>ad hoc</u> solutions to particular problems, with few, if any, efforts devoted to evaluation of solutions chosen. This crisis approach to problems related to education and work, and the effects of this approach, are best exemplified in the career education movement, in competency-based vocational education, and in the almost forgotten programed learning thrust of the '60's. Rather than an ad hoc approach, a systematic analysis should be completed of needs, opportunities, and problems created by the personal computing revolution for vocational education and of the consequent effects on professional development of vocational educators.

We identified, collected, and analyzed information on the state-of-the-art, projected technological advances, and current applications of personal computing technology. We, then, prepared several written reports of the needs, opportunities, problems, and effects of the personal computing revolution on professional development of vocational educators. These papers were presented to and critiqued by vocational educators at the 1983 meeting of the American Educational Research Association (AERA) in Montreal, Canada. The papers were, then, revised. Several short pieces were published in the popular press describing our concerns about the effects of the personal computing revolution on American education.

These two major papers and pieces in the popular press follow. Specifically, the paper by Passmore, Anderson, and Yuen, "The Role of Personal Computers in Vocational Education: A Critical View," was presented originally at the 1983 AERA meeting, and currently is undergoing review by the editors of The Journal of Epsilon Pi Tau, an international refereed journal in technology education. Another paper by Anderson, "Educating for Work in a High Tech Society," was also presented at the 1983 AERA meeting, and currently is undergoing review by the editors of Occupational Education Forum, a refereed journal serving industrial and vocational educators. With the assistance of Kerri Brenner of The Pennsylvania State University's Department of Public Information and Relations, a short opinion piece was prepared and distributed to Pennsylvania newspapers. This piece, "Taking an Educational Byte Out of Personal Computers," appeared under the title, "Some Work Needed to Make Computers Valid in Schools," in the Centre Daily Times (State College, PA) on April 17, 1983, and under the title, "Computers in the Classroom: Good or Bad?," in GRIT, a national newspaper on May 1, 1983. The piece ran under its original title in the Center Update in the Spring 1983 issue (vol. 4, no. 2). Anderson also had a short article in this Center Update issue under the title, "Education for Technology Involves More Than Teaching Computer Literacy."

EDUCATING FOR WORK IN A HIGH TECH SOCIETY

by

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Home Economics Education Program
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Presented at the Annual Meeting of the
American Educational Research Association
in a Symposium Invited by
the Special Interest Group in Vocational Education,
Microcomputers in Vocational Education: Research Directions
(Robert C. Harris, Chair)

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April 14, 1983

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Long before the "high tech, post-industrial society of the third wave" came along, vocational educators grappled with problems of an economy and a society which demanded technical skills which most persons did not possess. New tools of production required technicians to operate and maintain machinery in an unfamiliar workplace--the factory. The household and its nearby environs lost its central role as a place of production (except for a few cottage industries and agricultural production) but it too was affected by technologies requiring the development of new skills and changed attitudes toward the "labor-saving devices" being produced for the home by the factory.

For the founders of the vocational education movement of the early 1900's, teaching the technical aspects of productive work was paramount. David Snedden, an influential spokesman for vocational education, viewed technical studies as far more important and necessary to the effective training of workers for the "right standards of efficiency in the economic world" (Snedden, 1913, p. 3) than "general vocational studies designed to enhance vocational intelligence and ideals" (p. 2). Charles Prosser, author of the Smith-Hughes Act, defined vocational education as "a social device for rapidly and efficiently developing specific habits as to environment, thinking and doing with regard to a specific occupation" (Prosser & Quigley, 1925, p. 222). He believed that through vocational education the future worker should be trained only in the physical and mental "habits" in the use of technical knowledge required for a particular job.

In sharp disagreement with the Snedden-Prosser view of vocational education was John Dewey, the prolific writer and educational philosopher, who warned of the dangers of "merely trying to give a technical preparation for industries and professions as they now operate" (Dewey, 1916, pp. 315-316). He feared that overemphasis on the development of technical skills in vocational education would lead to the failure to educate the learner in "the full intellectual and social meaning of a vocation" (p. 316). Ultimately, he predicted, the proposed vocational education of his day would prevent positive growth and improvement in the existing industrial regime by leaving it unexamined by those potentially most capable of transforming it from within, the workers themselves. He was concerned that vocational education would perpetuate social divisions, providing overly specialized occupational competencies to those in the lower socio-economic classes and permitting them to be controlled by those with greater economic resources and broader educational backgrounds.

Teaching Computer Literacy as a Basic Skill

Today, as educators are recognizing the need to prepare workers for a job market impacted heavily by high technology, there is once again a tendency to focus on training solely in the technical realm. Helping students become "computer literate" has become an emphasis in general as well as in vocational education, and school systems are rushing to spend their dwindling budgets on microcomputer hardware and hastily written software. As Burtis and Peck (1982) have pointed out in their warning to basic skills educators,

> General purpose microcomputers are designed for the widest possible range of uses in administrative applications, not for specific educational applications. To utilize them in pedagogically sound learning situations would require radical modification of user behavior to interface effectively with the machine. . . . (T)echnology today and tomorrow must be designed to successfully interface with the human animal on human terms, not to require man to learn the language of the machine and become a slave to the machine for survival. (p. 2)

There is ample evidence that the computer and the advances in information control it makes possible will require varying levels of interactive skills from most persons at one time or another in their employment, in obtaining and using goods and services, and in other dealings within the society. In addition, many people are choosing to make use of the new "infocom technology" (Snyder, 1981), in facilitating the work of the home, in linking their televisions and personal computers to cable communications networks, and in gaining access to information which can facilitate better decision-making about a whole range of alternatives affecting quality of life. For most persons it is no longer a question of "Should I use a computer?" but rather "How do I interact with this computer?" Persons lacking the skills to address this question will be disadvantaged.

Wirtenberg, Strasburg, and Alspektor (1981) have warned of the social and political implications for women and minorities if they do not "acquire this full range of skills . . . and the concomitant abilities to gain access to information and utilize new electronic technologies" (p. 152). Without such skills, they "will continue to be precluded from participating in the critical decisions which will determine their futures" (p. 152). Reinforcing this concern, Snyder (1981) wrote:

> We can either address the problem of adult competency, with all of the power that infocom technology and the social and didactic sciences can bring to bear or we can choose to ignore the situation, and watch an ever-increasing proportion of our population lose the ability to manage their own lives. Unless we intervene, the 'information poor' will increasingly join the 'resource poor' (p. 147).

Lipkin (1982), in his examination of the issue of equity in education for technology, indicated that urban, low-income, minority students, when they receive computer education, are most likely to be taught to use the computer in the <u>tutor mode</u>; that is, in drill and practice usage of computers in which the computer controls the learner. The middle-class student, on the other hand, is more likely to be given opportunities to interact with the computer in a <u>tutee mode</u>, in which it is the student in control of the computer, using it to assist in problem solving or for creative purposes. Similarly, Kiesler, Sproull, and Eccles (1983) have identified sex biases in "computing culture" which, they conclude, "is overwhelmingly male" (p. 42). Accessibility to computers in entertainment settings (such as video arcades), in educational settings like computer camps and training sessions provided by computer stores, and in the classroom where computer time-sharing is not managed by the teacher has tended to be dominated by males, both as participants and as teacher/role models who reinforce the hidden message that computing is a male activity. This phenomenon, according to Kiesler et al. (1983) has discouraged females, particularly those of elementary school age or younger, from developing and practicing computer skills by forcing them to overtly challenge an apparent male bastion in order to gain access.

<u>Computer Literacy and Vocational Education</u>

Vocational education classrooms are where large proportions of low-income, minority, and female students (home economics and business education programs typically have high female enrollments) can be found. It therefore seems appropriate to educate these students in the computing skills which will be necessary in their employment and in the work of the household. Vocational students might be expected to gain significantly from the exposure to technological advances and to seeing them applied in specific occupational roles. However, before vocational education for high technology is implemented full-scale, there are some existing assumptions about education for technology which should be examined by vocational educators.

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First, there is an assumption that one becomes more employable or better prepared to take on the occupation of homemaker by becoming adept at using one highly visible tool of high technology, namely the 1983 microcomputer. Yet, over the past ten years computer technology has changed radically in product and in process, and this trend is likely to continue. As computers change, only the generalizable skills, attitudes, and knowledge gained through interaction with today's computer will be important. Effective computer education should enable students to learn fundamental skills, to examine the value of technology in confronting individual, family, and work-related problems, and to place all of this into a perspective in which they, and not the computer, are the decision-makers. This will enable them to see beyond a particular technological tool and apply what they have learned to address their future needs.

A second assumption is that workers who can perform skills required by high tech occupations will find that their work is "better" in some way. According to Briefs' (1980) exploration of overall consequences of computerization to the labor force,

> A large majority of workers will be subject to working conditions which require much less specific and professional qualification than in the past. They will be performing more or less marginal and boring activities in complex man-machine-systems, where the process of work is dominated by the logic of the electronic system. These workers will be exposed to 'qualification' requirements related to such 'extrafunctional' qualifications as more regularity, discipline, adaptability, and of course tolerance for frustration. There will be no need for them to understand the internal mechanism and structures of systems because these will be maintained and developed by the specialist elite. . . Life-long learning for them means a permanent process of learning more or less trivial operations without continuity and logic. (p. 59)

If Briefs (1980) is correct in his assessment, it appears that advances in technology may relegate a substantial portion of the work force to environments where persons are controlled by the demands of a system they do not understand and which they aren't encouraged to question. Kohn (1980) found in his longitudinal research of men employed in a broad range of occupations that work which is substantively complex has a significant and positive relationship with a number of dimensions of adult personality and intellectual development.

Persons employed in substantively complex work involving intellectual flexibility and independent judgment have high levels of job satisfaction, occupational commitment, and self-esteem; and they choose more intellectually demanding leisure-time activities. Those holding positions of low substantive complexity were shown to make smaller gains in intellectual flexibility over time, to experience greater feelings of powerlessness, self-estrangement, and normlessness, and to have significantly different attitudes toward conformity to external authority, receptiveness or resistance to change, and valuation of self-direction. These differences remained significant when other dimensions of occupation, including educational attainment, were controlled in the statistical analysis (Kohn, 1980, pp. 198-199). These findings suggest that persons working in occupations which have been reduced in substantive complexity through the applications of computer logic will experience less growth in intellectual functioning and a greater sense of anomie than persons whose work is tied less to the routine technical skills required by high tech occupations.

A third assumption is that some persons possess intellectual capabilities which fit them for work roles as computer designers and program developers, while others are better suited to work as skilled or semi-skilled technicians. Lipkin (1982) calls "inequitable" an education system which provides high-powered computer education programs for mathematically gifted students destined for college engineering programs and at the same time, tracks low income and inner-city students into vocational programs which teach skills in data and word processing or computer repair. He suggests that programs which guide only the students in the pre-college curriculum to learn about the inner workings of the computer and its uses in problem solving and discovery, tends to cast the upper classes of students in the role of leaders and those in the lower classes as followers. Some of John Dewey's predictions (1916) about vocational education for specialized occupations speak to the issue raised by Lipkin (1982). Dewey was concerned that training working class students in programs which taught technical skills needed in highly specialized, entry-level jobs would allow the continuation of existing social divisions. In addition, he believed that the failure to impart an understanding of the "human connections of the materials and processes dealt with" (Dewey, 1916, p. 318) would hamper vocational students in their ability to reflect about work as something over which they have some measure of control and to apply this knowledge in other aspects of their lives.

How can vocational educators overcome criticisms that they are training a student population which is disproportionately high in minority and low-income students for jobs which provide less personal satisfaction and more limitations on intellectual growth potentials, tying them to jobs for which their specialized skills may become obsolete, and reinforcing occupational choice and attainment along class lines that carry with them stereotypes about human potentials? In an article about the changing nature of work, John Coates (1982) enjoins vocational educators to educate persons for a world of ever-advancing technology by offering "multi-faceted training for choice and for change" and through educating "students in the new loyalties to quality, performance, and self. . . in all seasons of their lives" (p. 29). Vocational education programs which focus on teaching answers to "how-to" questions, or technical problems, related to specifics of an occupation only, do not help students to explore the questions which will have a far greater bearing on the choices they must make as technology orchestrates change throughout their working lives.

Attitudes Toward Technology and Work

Jacques Ellul (1980), a social historian and philosopher, suggests that it is a mistake to think of technology as a separate issue in the problems of today's society. Technology, he writes, "is no mere instrument of our will, a tool which we can use according to whim" (Ellul, 1980, p. 243) but rather it is a creation of such magnitude "that it is no longer possible for us to form relationships of any kind without its intervening between us and our environment" (pp. 242-243).

The implications of this far-reaching view of technology for vocational education and education in general indicate that we must rethink how we approach teaching students about each new technological advance, such as massive computerization of the working environment. Mastery of technical skills required for effective use of a computer in an occupation will help prepare the vocational student for future work roles to a limited extent, but such mastery will not help the student address questions related to human problems arising from the pervasive influence of technology on work and other daily activities.

Marjorie Brown (1980) provided a conceptualization of home economics education in which she critically analyzed the need for technical knowledge and skills in addressing the problems facing individuals and families in today's society. Although her analysis focuses on work as it relates to the satisfaction of needs in the family setting, much of her examination was concerned directly with the desirable nature of human work in any setting. Brown emphasizes the need to educate students in a non-instrumental (non-technical) perspective regarding work activities. Although some aspects of work are pursued from a means-end rationality or instrumental orientation at times, a continual focus by the worker on products and extrinsic rewards in his or her work does not encourage development of personal commitment to the intrinsic value of work. The aim in education should be, according to Brown, to assist the student in recognizing that satisfactions can be gained from an activity itself which make it worth doing. When a person is able to adopt a non-instrumental attitude toward work, a desire arises to explore knowledge about work in order to do it better, to set personal standards in the conduct of work which will further commit the person to doing the work well, and to develop a sense of accomplishment and pleasure in doing it. (Brown, 1980, p. 91)

Brown (1980) further reflected that "intrinsic values do not develop from mere know-how as can be observed in people who are technically skilled but who lack pride, satisfaction, and responsibility in what they do" (p. 105). She discussed the need for breadth of knowledge which goes beyond understanding technical work processes in the following passage about the work of the home:

> In the procurement or production of physical objects or conditions needed by the family, technology and skill are involved. . . . However, intrinsic values in such activities or products develop with a depth of understanding. . .with having standards for doing them well, with comprehending the historical and cultural interpretations associated with them, with recognizing their potential contribution to human happiness of human suffering. (p. 105)

There is evidence that people who do not recognize the intrinsic value of their work will respond negatively when changes in the work environment or work activities remove opportunities to engage in intellectually challenging or socially rewarding aspects of work. Yankelovitch (1981) has documented recent shifts in American attitudes which indicate dissatisfactions with what he refers to as the current "giving/getting compact in the workplace." (p. 41). People object to corporate decisions which do not insure that work will be interesting in addition to paying well. They dislike jobs which deny the importance of personal goal-setting, eliminate outlets for creativity, and replace variety in work with routinization. According to Yankelovitch (1981), the result is the growing attitude that without psychological incentives (intrinsic rewards) as well as economic rewards, "workers engaged in the search for self-fulfillment retaliate by holding back their commitment, if not their labor" (p. 41).

A possible solution to this negative response to the changing nature of work might be to make adaptations in the work to suit human needs in addition to those of high technology systems. But accompanying any attempt at adapting the work itself should be an educational process which promotes critical reflection by the worker (or vocational student) about the role of work throughout one's life. As Gregg Edwards wrote in The Family in Post-Industrial America (1979),

> Just as we need a much better sense of our economic mutuality, we need a much better sense of our social mutuality. We need to understand and appreciate not merely the ways by which people are productive in terms of economic markets or job status, but also in terms that can be related to the entire social enterprise. Individuals and groups must be given a means to understand how their day-to-day activities and their ongoing lives may be assessed not only in terms of personal satisfaction, but also in terms of the mutual satisfaction of the larger community and its members. (pp. 86-87)

A Non-Instrumental Orientation to Educating for High Tech Work

Of primary consideration in making curriculum decisions about preparing students for changes in their lives brought about by advancing technology is formulating a rationale for choosing what and how to teach. In a sense, this can be approached as any problem requiring decisions and actions. Few problems of persons in the real world can be addressed adequately by considering only the range of technical alternatives from which one might choose. Instead, judgments made by persons directly affected (both those who are the actors and those who are acted upon) generally will guide choices from among technical and non-technical alternatives. Problems approached from a non-instrumental perspective can be characterized as problems of "what should be done" (note that this implies human value judgments), not problems of "what to do" or "how to do," although these two concerns will follow (Brown, 1980, p. 81).

Problems requiring personal or group decisions about what should be done must be addressed in many aspects of one's life. In productive activities, it is tempting to desire easy and efficient ways to accomplish goals, but all too often when technology provides an answer that seems easier or more efficient, some human consequences are unsatisfactory. In employment, the company frequently loses profits when costs of implementing technological solutions to production problems are high in financial terms, but there are other costs which only human employees must absorb, creating an overlay of people problems which cannot be responded to so readily through technical means. Dissatisfactions which grow from a sense that one is subordinate to the logic and demands of a computerized system, long-term effects of little intellectual stimulation, and boredom caused by routine interaction with computers instead of people, all are problems of the employee when technological improvement is viewed as the primary good in the workplace. In their immediate working environment, employees may not be able to do much to change an emphasis on technology regardless of cost. But in many other aspects of their lives, persons can take control of the decisions about what should be done to make appropriate use of technology.

In the work of the home today, for example, families and individual family members face problems in which technology is presented as "the answer" by advertising claims. Families are told that they can manage their money, plan nutritious daily menus, shop more efficiently and effectively, protect their homes from intruders, provide at-home education for their children, and even receive expert advice about child rearing if they buy a microcomputer, peripheral devices, and if they learn how to place the appropriate software into action. In fact, Coates (1982) reported that "recent research on why people buy microcomputers for use at home shows that they do so. . .to achieve a sense of autonomy and control" (p. 29). However, a closer look at the kinds of approaches to family problems proposed by technologists reveals a focus on "how to do" solutions which are thought best implemented when control is assigned to the software programs and systems logic of the computer. To take control over the problems which affect their lives, persons must develop a perspective about the nature of human problems that goes beyond asking for technically "right" answers and places decision-making in the personal realm.

Brown (1980) proposed that the role of the home economics educator should be to assist students in formulating and defining the problems of the family in a historical and social context. This would help move students' thinking away from seeking technical answers because it would become obvious that technological responses to human problems rarely provide more than short-term

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solutions. Through a process of teacher-facilitated dialogue, students would identify, examine, and consider actions others have taken in response to such problems or concerns of families as

> Developing competency in communicative action in the family and in social processes outside the family.
>
> Being critically aware of the misuse of technical reason within the family and in society.
>
> Implementing nurturant values in work and home (including pride in quality of accomplishment).
>
> Changing working conditions outside the home to make them nurturant of the family. (Brown, 1980, p. 80)

Obviously, these are not means-end problems to which the microcomputer provides a ready solution through programming. Undoubtedly, secondary students would not state the problems of families in precisely these words, but the tone of the critical analysis of these and other human problems would go far beyond learning how to boot a disc or program in BASIC.

The aim of home economics education approached from this non-instrumental orientation would not be to provide ready-made answers, but to assist students in recognizing problems they may face throughout their lives as family members and to develop systems of action which would enable them to seek and implement solutions. Through a process of developing cognitive modes of thinking, linguistic and communicative competence, and emotional and motivational maturing (Brown, 1980), students would become less likely to make decisions which are unexamined. This potentially would be emancipating and should have carryover effects in employment roles and in other aspects of their lives.

In vocational education programs in which preparation for entry-level occupations force an emphasis on teaching the technical skills of computer technology, there is a tendency to use instrumental modes of action in approaching other aspects of work as well. A non-instrumental orientation would involve students in the definition and examination of problems or questions a worker would address in a particular occupation and throughout his or her occupational life. Through this process, students could become more capable of considering what should be done about such problems. This would involve assisting students to examine vocational problems in their historical and cultural contexts and to consider their roles as workers in providing for the needs of their families, employers, and the society as a whole, in addition to personal needs and goals. Teaching computer literacy skills or other technical skills required for using and maintaining advanced technologies would not be eliminated in a vocational education program with a non-instrumental orientation, only placed in the context of the human problems in productive work.

Preparing Vocational Teachers
From a Non-Instrumental Perspective

A first step in establishing a non-instrumental perspective toward education for advances in work technology is to help vocational teachers see beyond microcomputer hardware and software possibilities. An inviting aspect of this new technology is its promise of easier, more productive work for those who develop the skills to use it. There will be a temptation to "gear up" to train workers as quickly as possible for the technical requirements of a high tech workplace.

Placing this problem in historical context, however, allows us to recognize that a similar situation occurred nearly 65 years ago, when vocational education was viewed as the means by which workers would be turned out rapidly to meet the requirements of new industries which depended upon having workers trained in the new technologies of the day. Since that time, vocational educators have been criticized repeatedly for providing training instead of education and for a myriad of other societal problems too numerous to list here. Vocational educators must be concerned about the educational needs of their students in addition to their training needs, for there are educative things to learn about the nature of work and one's life as a worker.

In addition to becoming prepared to train students to become good technicians, vocational educators must be taught to provide an educational setting where intellectual autonomy is encouraged when examining work and related human problems. Technological expertise in vocational educators should be accompanied by pedagogical expertise in teaching higher level thinking and employing effective strategies in helping students to consider the human need to have work that is satisfying and which encourages one to set and achieve personal standards of quality. The teachers who plan their courses so that students examine and question the meaning of technological developments in relation to work roles will not have to become experts on the sociology of work, but they will have to understand the nature of the work for which they are preparing students beyond its technical task requirements. Finally, these teachers will have to view their students as capable of being contributors to the decision-making processes involved with implementing technological advances in the workplace and of making occupational choices in a technological world throughout a lifetime.

Computer technology will not provide the means or the answers to any of these educational concerns, but it can serve as a vehicle for improving society through its appropriate use as a tool in the workplace and in the home. It will be a powerful vehicle for vocational education and society itself as long as it is not treated as the destination.

References

Briefs, U. The impact of computerization on the working class and the role of trade unions. In N. Bjorn-Andersen (Ed.), The human side of information processing. New York: North Holland Publishing Company, 1980.

Brown, M. M. What is home economics education? Minneapolis, Minnesota: University of Minnesota, 1980.

Burtis, E., & Peck, A. D. Comment; The rush to computers in the classroom: A critic says, 'Stop the bandwagon!' Education Times, September 20, 1982, p. 2.

Coates, J. F. The changing nature of work. VocEd, 1982, 57(1), 27-29.

Dewey, J. Democracy and education. Toronto, Ontario: The MacMillan Company, 1916.

Edwards, G. Familiar groups as molecules of society. In D. P. Snyder (Ed.), The family in post-industrial America. Boulder, Colorado: Westview Press for the American Association for the Advancement of Science, 1979.

Ellul, J. The power of technique and the ethics of non-power. In K. Woodward (Ed.), The myths of information: Technology and post-industrial culture. Madison, Wisconsin: Coda Press, 1980.

Kiesler, S., Sproull, L., & Eccles, J. S. Second class citizens? Psychology Today, March 1983, pp. 40-43; 46-48.

Kohn, M. L. Job complexity and adult personality. In N. J. Smelser & E. H. Erikson (Eds.), Themes of work and love in adulthood. Cambridge, Mass: Harvard University Press, 1980.

Lipkin, J. The troubling equity issue in computer education: Is computer literacy the answer or the problem? Education Times, October 25, 1982, p. 7.

Prosser, C. A., & Quigley, T. H. Vocational education in a democracy. Chicago, Illinois: American Technical Society, 1925.

Snedden, D. Debatable issues in vocational education. In C. A. Bennett & W. T. Bawden (Eds.), Vocational education, (Vol. 2). Peoria, Illinois: The Manual Arts Press, 1913.

Snyder, D. P. The information age: Rationalized life styles. In G. I. Swanson (Ed.), The future of vocational education. Arlington, Virginia: The American Vocational Association, 1981.

Wirtenberg, J., Strasburg, G., & Alspektor, R. A. Educational trends for expanding women's occupational lives. Psychology of Women Quarterly, 1981, 6(1), 137-159.

Yankelovitch, D. New rules: Searching for self-fulfillment in a world turned upside down. Toronto, Ontario: Bantam Books, 1981.

The Role of Personal Computers in Vocational Education:

A Critical View

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Running head: Personal Computers

The chip is it. Advances in microprocessor technology have made computers personally accessible to many people who never dreamed that they would use, let alone own, a computer. Personal computers (PC's) have brought nothing less than a revolution to the ways people learn, work and play.

This PC revolution has hit America's schools. According to an April 1982 survey of instructional uses of computers in public schools conducted by the National Center for Educational Statistics (summarized by Love, 1982), the nation's elementary and secondary school students had access to 96,000 PC's and 24,000 computer terminals in Spring 1982, compared with 31,000 PC's and 22,000 terminals in Fall 1981. Approximately 29,000 public schools have at least one computer; 80% of those schools have PC's only, 5% have terminals, and 15% have both. The number of PC's in schools is expected to increase by 52,000 during the 1982-1983 school year.

The retail value of PC shipments to educational institutions could exceed one billion dollars between 1980 and 1985, with 75 to 100 million dollars in software sales estimated for 1981 alone (Prentice, 1981, p. 87). Harvey Long (Note 1), Educational Applications Consultant for IBM, estimates that 40 million PC's would be required to deliver just 20 minutes of instruction daily to each of the nation's elementary and secondary school students. To nudge their way into controlling shares of the educational market, hardware and software vendors such as Apple, Bell and Howell, Commodore, and Radio Shack have provided many gifts to educational institutions. PC's in education are, and promise to be, big business.

We are sure that vocational education will not be allowed to sit out the revolution created by PC's. The pressures to become involved are too great. And, like Brer Rabbit into Tar Baby, vocational education programs already are too entangled in the revolution by their equipment purchases and verbal commitments to back away now. Only thoughtful planning for PC use in vocational education will keep PC's from going the way of other faddish educational boondoggles.

In the remainder of this paper we take a cold, analytical look at the opportunities and problems PC's pose for vocational education. Readers desiring one more Panglossian statement about PC's in education can look elsewhere, for they will find no shortage of glib, saccharine pieces to choose from. Through their meetings and publications, many professional organizations in education have expressed positive and general sentiments about the future of PC's. A mini-industry of articles in journals treating education has sprung up to describe the potential benefits of PC's. Several magazines devoted exclusively to computing and education have emerged. And, there is constant hand-wringing in the popular press about when the schools finally will use the computer technology laid before them. No need for more of the same.

We believe strongly that a critical approach to the use of PC's in vocational education is sorely needed. Crisis reigns at the outset of many revolutions; the PC revolution is no exception. The pressure is on to purchase equipment, to create software, to get things going as quickly as possible. In such a Manhattan Project atmosphere, however, activities tend to focus on ad hoc solutions to particular problems, with few, if any, evaluations of solutions chosen. This confusion would not be so tragic if it was not so costly. Higgledy-piggledy implementation of PC's in vocational instruction wastes staff time and effort, and, more importantly, learning time is lost from other techniques with worth proven by experience.

Opportunities

We begin our analysis of opportunities afforded vocational education through implementation of PC's by defining PC functions in the abstract. This definition should provide a demystification of PC attributes. Then, we shift to a listing and discussion of potential uses of PC's in vocational education. Last, we speculate about the usefulness for vocational education of expected developments in PC's.

Definition and Function

Mention PC's, and most people conjure visions of Apple II's, TRS-80's, or TI-99's. Most people like to think of these machines as "microcomputers". Other adjectives that come to mind are "home", "hobby", "recreational", "small business", or "tiny". None of these adjectives precisely describes PC's.

The world's first large-scale computer, ENIAC (Electronic Numerical Integrator and Computer) is now almost 40 years old. It weighs 30 tons, takes up 15,000 square feet of space, and uses 40,000 vacuum tubes. Radio Shack's desk-top computer solves ordinary arithmetic problems 18 times faster than ENIAC.

Ten years ago, $10 bought a computer chip with a capacity of 1,000 bits. Today, that same 10 bucks will buy a chip with a memory capacity 20 times larger. In the late 1950's, a medium-sized computer with a capacity of 180,000 bits would have set you back a quarter of a million dollars. Today, PC's offer three times as much memory for less than $2,000.

It is true that PC's may be used at home, as a hobby, for recreational pursuits, in small businesses. And, some of them are tiny. But, an adjective such as "powerful" perhaps is more descriptive.

What about the P in PC's? A more functional way to consider these new computers is through their "personal" aspects. Gammill (1978) characterizes the PC as "an unshared computer facility for carrying our time-critical functions where convenience, guaranteed access, guaranteed response, or other such issues are more important than the actual unit costs of computer resources such as processing and on-line storage" (p. 1). "Private" is a good synonym for "personal" when considering PC's.

The personal attribute of PC's is what makes them most attractive. Many analyses of value-added by PC's consider alternatives such as terminal access to a shared computer facility (see, e.g., Gumpert, 1977, Horn & Winston, 1975, Isaacson, 1977, and Warren, 1977). The shared computer facility offers shared costs, shared expertise, reduction of overhead for highly technical maintenance, and access to mass storage. However, the decision to buy a PC is similar to the decision to buy a personal automobile. Mass transit may be available, if you live in a city. The personal automobile affords flexibility in timing and nature of use not provided in mass transit. Car owners may pay more per ride for this flexibility, but owners can make their own cost and convenience trade-offs. So, it goes with PC's: if you need to, or are willing to, "drive" by yourself, then a PC furnishes benefits over other computing schemes.

For all of the hoopla surrounding it, though, the PC is nothing more than a computer. It receives input, performs prescribed functions, and displays output. Some of the things PC's do are grand and glorious; others are dull and dispensible.

Gad, this sounds trite, but the PC is merely a machine. Personal computing is a human activity, directed by humans, for human benefit. Any good generated by a PC is the result of some person programming the PC to fulfill a human need for fast, accurate, and systematic work. Any problems created by a PC are human failures. Many of the activities PC's perform currently--word processing, number crunching, computer-assisted instruction, to name a few--have been available on computers for years. PC's inspire so much awe because they make these activities accessible and affordable to many people who never saw or used computers before. Like a first motorcycle ride, first contact with a PC can excite the novice with the possibilities of PC use. After that, it is all work.

Uses

We list and discuss four general uses of PC's in vocational education: the PC as instructional content, for program administration, for instruction, and for communication. These uses represent potential classes of uses, and not the state of the art for PC's in vocational education.

Content. Eighty-five percent of all jobs in the U. S. economy may require computer skills by 1985 (Long, Note 1). In addition, significant needs could exist for people to maintain PC hardware and to prepare PC software. To the extent that school-based vocational education is an appropriate training delivery mode for these skills, PC's will have an effect on the instructional content of vocational education programs.

Two aspects require additional research before the influence of PC's on vocational subject matter can be determined. First, an analysis is needed of PC skills necessary for successful entry into various occupations supplied by vocational program graduates. Without a doubt, the exact nature of these skills will change frequently. Will general "literacy" skills be more important than specific experiences with specific PC applications?

Second, an analysis is needed of supply and demand conditions for occupations working directly with PC hardware or preparing PC software. Although information about the current and expected demand for workers in these occupations is necessary, a comprehensive description of the supply of these workers especially would be helpful. For instance, could redundant workers from other related occupations transfer easily into PC-related occupations? Can some skills best be acquired through only modest on-the-job training? Would employers prefer to hire graduates of vocational education programs over workers from related occupations or unskilled new entrants to the labor force?

Administration. Many accounting and planning systems commonly developed for PC's used in small businesses may have special applicability in vocational education administration. A wide range of manual/clerical systems currently implemented in vocational schools--scheduling, inventories of supplies and capital equipment, personnel, attendance--could be streamlined through PC applications.

Instruction. Since the early 1960's, a great deal of effort has been expended in use of computers to deliver instruction. According to Kearsley, Hunter, and Seidel (1983, p. 90; see, also, McDougall, 1975), experience from 50 major computer-based instruction projects indicates that:

1. ample evidence is available that computers can make instruction more effective and efficient;

2. a great deal has been learned about overcoming institutional and organizational inertia and resistence to implemention of computer-based instruction; and

3. good mechanisms have been developed for the dissemination of computer-based instruction ideas and courseware.

A wide variety of instructional programs can be purchased for use with PC's. According to an EPIE Institute (1981) report, most programs currently available are intended for supplementary drill and practice in the classroom; 95% of the largest computer-based instruction packages are arithmetic programs. The major emphases of most programs are skill development and recall of previously learned facts.

Of course, vocational instructors can develop their own instructional programs. A number of systems and languages are available for creation of instructional programs. These systems and languages help authors control the format of presentations of subject matter, process student responses to program prompts, and structure collection and analysis of data concerning student progress and program effectiveness. For instance, authoring systems such as PILOT (Starkweather, 1969), PLANIT (Feingold, 1968) and NATAL (Westrom, 1977) are available.

Avner (1979) presented data showing that authoring languages can make computer-based instruction more efficient. However, little evidence exists that using a particular authoring program helps to make courseware transportable between PC operating systems. Also, authors are constrained to the instructional design model upon which the authoring system is based.

Communications. PC's can simulate remote terminals for communication with shared computers. Files can be interchanged, and remote batch job entry can be accomplished. PC's can be vehicles for distributing and receiving messages through electronic "mail." Access to communications almost is without limits when PC's are connected via local telephone lines to earth orbiting satellites.

The PC can carry on many of these functions with the user absent. Text containing messages or other information can be sent or received using a modem (modulator/demodulator) and software suitable to the task of handling communications.

Expected Developments

According to Seidel (Note 2), three major developments will affect PC use in the near future: artificial intelligence; networking; and portability.

Artificial intelligence. For the most part, PC's grind through calculations quickly and effectively. This is their advantage over manual/clerical systems. As Simon (1977) notes, most computers use programs that are best described as exact strategies, not as scenarios. That is, they perform prescribed functions, but they do not adapt and learn as most human problem solvers do.

A large amount of work and interest is devoted to the development of computers that use so-called "artificial intelligence." Artificial intelligence provides computers with capabilities for improving their own programs. Artificial intelligence developments have produced new applications to solution of large combinatorial problems in mathematics, medical diagnosis, and linguistics, to name a few areas. Some artificial intelligence applications simulate human capabilities of seeing, hearing, and touching. These developments are likely to have profound influences on vocational education, not the least of which will be through alteration of the technical content of many traditional vocational education courses. For instance, recent interest in robotics among vocational educators cannot help but confront issues in artificial intelligence.

A number of interesting applications of artificial intelligence capabilities for PC's are envisioned. First, artificial intelligence will allow the development of "expert programs" that act as intelligent assistants, providing advice and making judgments in specialized areas of expertise. For instance, University of Pittsburgh researchers have developed a medical system that uses artificial intelligence principles to diagnose diseases using sophisticated reasoning processes. Schlumberger Ltd., a oil field services consulting firm, uses artificial intelligence programs to synthesize geologic information to provide better and quicker interpretations of the resources embedded in geologic formations.

Networking. Most PC's of reasonable cost have limited storage capabilities. The limitations have created restrictions in implementation of PC's. Mass storage for PC's currently is rather expensive for most users who purchased a PC for cost considerations. The solution may be networking--that is, a communication system which allows a number of PC's to communicate and to use common data bases. At this point, the technical standards for networks are not commonly agreed upon, but these may be available in the near future. The development of networking capabilities further blurs the distinction between PC's and shared computer facilities, and opens a wide variety of PC capabilities for vocational educators.

Portability. It is one thing to enjoy use of a powerful Apple II or an IBM PC, but an entirely new variety of uses could be envisioned if this computer power was portable. The U. S. Army and Navy are developing PC's that can be used as portable job aids (Morriss, Note 3). The maintenance manual for a sophisticated weapon can take up several large racks. The manual often is difficult to access and is frequently updated. PC's with sufficient storage are able to store the manual electronically and to display maintenance specifications and procedures at the site of the work. Updates are simple to complete. In the future, manuals for equipment used in vocational shops might become available in an on-line system that can be accessed.

Problems

A group calling itself the Ad Hoc Committee on Basic Skills (1982) formed in California recently to halt what it calls "the bandwagon effect" of efforts to put PC's into America's classrooms. The Committee characterizes the rush to computers in classrooms as clumsy, inefficient, and inexpensive.

The Committee believes that advocacy of PC's in education is nothing more than a merchandising "scam" designed to promote dependence on specific models of PC's. This dependence, in turn, coerces purchases of these same PC models by families for home use. Also, the Committee asserts that many educators adopt PC's merely to embellish their careers by appearing to be "front runners" in technology applications in education.

The Committee wants more attention to curriculum strengthening, teacher improvement, and use of established, simple, and effective techniques and technologies. Dwindling budgets, the Committee says, are being spent for a high-priced technology that "in no way has been proven effective in the teaching of reading comprehension, spelling, or arithmetic" (Ad Hoc Committee on Basic Skills Education, 1982, p. 2).

The Committee's position seems extreme. They remind us of the Luddites, early 19th century English workmen who attempted to prevent the use of labor saving textile machinery by destroying it. To us, the problems that exist with the use of PC's in vocational education seem to have solutions. In this section we discuss three problems that limit the infusion of PC's into vocational education: lack of suitable professional orientation of vocational educators to PC's; poor quality of instruction designed for PC's; and validity of the "Law of the Hammer" for PC's in education.

Orientation

An April 1982 survey (reported by Love, 1982) of instructional uses of computers in public schools conducted by the National Center for Educational Statistics reveals that about one-half of U. S. school districts need qualified staff and start-up assistance to implement computers in instruction. Nearly 60% of the nation's teachers require extensive training to use PC's in any meaningful way.

This problem may be larger than estimated. Most first-time PC users approach the PC as an electronic fad. And, a fad it seems. No one walks into a friend's home and exclaims, "Wow! I see you're into telephones!" A PC in the home draws looks of awe and envy. Many teacher orientation sessions with PC's provide lots of hand holding and non-threatening experiences with PC's. Many educators feel relieved if they can turn the PC on and off. Clearly, more than comfort is needed by teachers if they plan actually to use PC's.

Quality of Software

Over one-half of all U. S. school districts purchase computer programs from commercial publishers or equipment vendors (Love, 1982). A critical evaluation of commercially-produced courseware--that is, computer programs for instruction--funded by the National Institute of Education and the Republic of Venezuela (Feurzeig, Horwitz, & Nickerson, 1981) finds most instruction designed for use with PC's to be of poor quality.

Frequently, the computer is used as an automatic page turner. A number of pages of text are displayed sequentially to the student, and the PC is relegated to advancing the display, page by page. This is not even as good as a book because previous "pages" cannot be reviewed without starting the entire program over.

The theory of learning behind most of the available instructional programs designed for PC's is best characterized by the story of the woman who bought a parrot. The salesman said that the parrot could talk, but that the parrot only learned through repetition. The parrot could say one phrase: "Who is it?" She took the parrot home, and all day long she heard the parrot ask, "Who is it?" Who is it?".

She went shopping one day, and failed to arrive home to meet the telephone repairer at an appointed time. The repairman rang the doorbell. The bird asked from behind the door, "Who is it?". The repairer replied, "Telephone repairer." The bird asked again; the repairer answered politely again.

This questioning and answering went on for quite a time until the exhausted repairer passed out in a heap on the doorstep. The woman arrived home and exclaimed as she saw the collapsed repairer, "Oh my, who is it?" The bird said, "Telephone repairer."

Of course, as we wrote previously in this paper, teachers can use authoring systems to write their own courseware. However, even good teachers may find this difficult. Instruction through PC's is quite different from what most teachers do everyday.

If a student falls asleep, appears confused, or looks out the window during a lesson, the good teacher adjusts. Correction is given. . . .analogies are drawn. . .a different approach is taken. But, when the same good teacher tries to design instruction for delivery through PC's, the computer-aided instruction may fail because these same intuitive changes--the very art of teaching--cannot be made when the program is used.

To be successful as instructors with PC's, vocational teachers need well-developed formal skills in instructional design which draw on disciplines such as educational psychology or human/machine engineering. Unfortunately, few vocational teacher training programs emphasize development of these skills.

"Law of the Hammer" Applied

The "Law of the Hammer" is one that most vocational teachers understand. The law stated roughly is that if a hammer is available, something will be found that needs pounding. There is a danger that solutions to vocational education problems will be made to fit available hardware and software. This is a situation like the fellow Procrustes found himself in. He was too long for his bed, so they cut off his legs to fit the bed available. Student problems with fractions can be solved merely by asking them to use the computer-assisted instruction module on fractions. Grammar problems are handled by the courseware purchased at great expense during the previous year. The budget is fit to the format dictated by the general ledger program purchased for the school PC. There is a danger that form will not follow function if a uncritical approach to implementation of PC's in vocational education is taken.

Summary

PC's are inexpensive, portable, accessible, and adaptable to use in vocational education as instructional content, for administrative use, to deliver instruction, and to improve communications. Developments in artificial intelligence, networking, and portability of PC's may increase the usefulness of PC's in vocational education. For PC's to be infused successfully into vocational education, several improvements are needed: orientation of personnel to PC's; improvement in the quality of educational software; and careful planning of PC use.

Reference Notes

1. Long, H. The uses of personal computers in training. Presentation at Conference on Interactive Instructional Delivery in Military, Industrial, and Basic Skills Job Training and Performance sponsored by the Society for Applied Learning Technology, Orlando, Florida, February, 1983.

2. Seidel, R. J. Interactive skills training using spatial data management systems. Presentation at Conference on Interactive Instructional Delivery in Military, Industrial, and Basic Skills Job Training and Performance sponsored by the Society for Applied Learning Technology, Orlando, Florida, February, 1983.

3. Morriss, S. H. Maintenance information delivery systems for Army and Navy technicians. Presentation at Conference in Interactive Instructional Delivery in Military, Industrial, and Basic Skills Job Training and Performance sponsored by the Society for Applied Learning Technology, Orlando, Florida, February, 1983.

References

Ad Hoc Committee on Basic Skills Education. Comment. Education Times, September 20, 1982, p. 2.

Avner, R. A. Production of computer-based instructional materials. In H. F. O'Neil (Ed.), Issues in instructional systems development. New York, New York: Academic Press, 1979.

Feingold, S. W. PLANIT--A language for CAI. Datamation, 1968, 14(a), 41-47.

Feurzeig, W., Horwitz, P., & Nickerson, R. S. Microcomputers in education (Report No. 4798). Cambridge, Massachusetts: Bolt, Beranek, and Newman, Inc., 1981. (ERIC Document Reproduction Service Number ED 208 901)

Gammill, R. C. Personal computers for science in the 1980's. Paper presented at Conference on Problems of the 80's: The Oregon Report on Computing, Portland, Oregon, March, 1978. (ERIC Document Reproduction Service Number 164 010)

Gumpert, D. The computer moves from the corporation to your living room. Wall Street Journal, February 4, 1977, p. 1.

Horn, B. K. P., & Winston, P. H. Personal computers. Datamation, 1975, 21(5), 111-115.

Isaacson, P. Personal computing dissected. IEEE Computer, 1977, 10(1), 71-73.

Kearsley, G., Hunter, B., & Seidel, R. J. Two decades of computer based instruction projects: What have we learned? T. H. E. Journal, 1983, 10(3), 90-94.

Love, J. For your information: Computers in schools. Education Times, September 27, 1982, p. 8.

McDougall, A. The computer as part of the educational environment: A review of research. The Australian Journal of Education, 1975, 19(2), 178-190.

Prentice, L. R. Educational computing--The giant awakes. Microcomputing, September, 1981, pp. 86-90.

Simon, H. A. What computers mean for man and society. Science, 1977, 195(4283), 1186-1191.

Starkweather, J. A common language for a variety of programming needs. In R. Atkinson & H. Wilson (Eds.), Computer-assisted instruction--A book of readings. New York, New York: Academic Press, 1969.

Warren, J. Personal and hobby computing: An overview. IEEE Computer, 1977, 10(3), 10-22.

Westrom, M. Summary and current status of NATAL-74. AEDS Journal, 1977, 10(4), 83-89.

Taking an Educational Byte Out of Personal Computers

by David Lynn Passmore

The electronic chip is it. Advances in microprocessor technology have made personal computers inexpensive, portable, accessible, and adaptable. And, let's not forget *faddish*.

No one walks into a friend's home and exclaims, "Wow! I see you're into telephones." A home computer, though, draws looks of awe and envy.

Many personal computer purchases are motivated by little more than vague notions of computer benefits ("I want it to run my budget.") Most ads highlight bug-eyed young video freaks sampling the latest computer games. Sandwiched into these ads are scenes of serious-looking adults and children learning things from computers ("Bonjour, put your name here").

Nothing since pet rocks has stirred consumers and the business world so much as personal computers. Can they be helpful? Sure. Fun? Yep. Educational? Well, maybe.

A group calling itself the Ad Hoc Committee on Basic Skills Education formed in California during 1982 to halt what it calls "the bandwagon effect" of efforts to put personal computers into America's classrooms. In a recent *Education Times* article, the committee characterizes the rush to computers in classrooms as "clumsy, inefficient, and expensive."

The committee believes that advocacy of personal computers in education is nothing more than a merchandising "scam" designed to promote dependence on specific models of personal computers. This dependence, in turn, coerces purchase of these same models by families for home use. Also, the committee asserts that many educators adopt personal computers merely to embellish their careers by appearing to be "front runners" in technology applications to education. The committee wants more attention to curriculum strengthening, simple, and effective techniques and technologies. Dwindling budgets, the committee says, are being spent for a high-priced technology that "in no way has been proven effective in the teaching of reading comprehension, spelling, or arithmatic."

The committee's position seems extreme. Few educators deny the great potential personal computers show for improving education. And, in spite of the committee's plea for caution, educators already are stuck into personal computers like Brer Rabbit onto Tar Baby.

Nearly 22,000 educational institutions had at least one personal computer in 1981. About 60 percent of U. S. school districts used computers in instruction. Fifteen percent of the nation's instructional materials money were spent on computers.

The retail value of personal computer shipments to educational institutions could exceed one billion dollars between 1980 and 1985, with 75 to 100 million dollars in computer program sales in 1981 alone. IBM estimates that 40 million personal computers would be required to deliver just twenty minutes of instruction daily to each of the nation's elementary and secondary school students.

Personal computers in education are, and promise to be, big business. But, will they be good business? Maybe. But, not for the same pessimistic "maybe" cited by the Ad Hoc Committee.

An April 1982 survey of instructional uses of computers in public schools conducted by the National Center for Educational Statistics reveals that about one-half of U. S. school districts need qualified staff and start up assistance to implement computers in instruction. Nearly 60 percent of the nation's teachers require extensive training to infuse personal computers into instruction in any meaningful way.

Over one half of all school districts purchase their computer programs from commercial publishers or equipment vendors. A critical evaluation of commercially produced courseware — that is, computer programs for instruction — funded by the National Institute of Education and the Republic of Venezuela finds most instruction designed for personal computers to be of poor quality.

Frequently, the computer is used as an automatic page turner. A number of pages of text are displayed sequentially to the student, and the computer is relegated to advancing its display, page by page. This is not even as good as a book because previous "pages" cannot be reviewed without starting an entire program over.

Of course, teachers can write their own programs. However, even good teachers may find this difficult. Instruction through computers is different than what most teachers do everyday.

If a student falls asleep, appears confused, or looks out a window during a lesson, the good teacher adjusts. Correction is given, analogies are tried, a different approach is taken. But, when the same good teacher tries to design instruction for delivery through personal computers, the computer aided instruction may fail because these same intuitive changes — the very art of teaching — cannot be made when the program is used.

To be successful as instructors with personal computers, teachers need well-developed formal skills in instructional design which draw on such disciplines as educational psychology or human machine engineering. Unfortunately, few teacher preparation programs currently emphasize development of these skills.

Our ability to use innovations often lags far behind the fantastic technology that creates the innovations. Personal computers are no exception. The time has come to reduce this lag. School systems require assistance, and soon, to exploit the personal computer technology they already own. Teacher preparation must be revolutionized to incorporate recent advances in the science of instruction. We must demand better courseware from commercial sources. To do less would relegate personal computers to museums with the Edsels, hula hoops, duck-tail haircuts, and other fads that came and went.

Dr. David Lynn Passmore is an associate professor of vocational education. He has been studying the impact of personal computers on education through a grant from the Pennsylvania Department of Education. This article reflects some of Dr. Passmore's concerns about the use of computers in education.

The findings of both these articles are part of a study done through a grant from the Pennsylvania Department of Education. Also, the findings were highlighted in an invited address at the American Educational Research Association Conference held in Montreal during April.

Education for Technology Involves More Than Teaching Computer Literacy

by Daun M. Anderson

As new tools of technology are created, we tend to view each advance as vastly different from anything that we had available to us in the past. Regarding the microcomputer, for example, we speak glowingly of the new potentials provided to us and of the "revolution" it has brought about in our lives. Have we forgotten that technology in its many forms has played a part in shaping the environment for thousands of years? Vocational educators have grappled with the problems of educating people in technological literacy for sixty-five years or more in this country, and we have much to offer to our fellow educators about our experiences in planning curricula to teach this literacy. Yet, even in our own field the emphasis seems to be on filling our classrooms with the most advanced "high tech" equipment and training our students to become "computer literate" in the sense that they can operate that equipment according to *its* demands. Perhaps it's time we took a broader look at education for technological literacy and begin planning our instruction based on what we know about the role of technology in our students' lives and their need to become effective users of any new tool of technology in all of its potential applications.

Jacques Ellul (1980), a social historian and philosopher, suggests that it is a mistake to think of technology as "being merely a concrete element incorporated in a certain number of objects" (p. 242). Technology has become so pervasive in the functioning of our society, according to Ellul, "that it is no longer possible for us to form relationships of any kind without its intervening between us and for our environment" (pp. 242-243).

A first step in developing a broader view of technology and its implications for vocational education is to look beyond the dazzle of microcomputer hardware and software possibilities. An inviting aspect of computer technology is its promise of easier, more productive work for those who develop the skills to use it. In vocational education we are tempted to gear up to train workers as quickly as possible for the technical requirements of a computerized working environment. Mastery of technical skills required for effective use of a computer will help prepare the vocational student for future work roles to a limited extent, but such mastery will not help the student address questions related to the *human* problems arising from the pervasive influence of technology on work and other daily activities.

We have ample evidence that the computer and the advances in information control that it makes possible will demand varying levels of interactive skills from most persons at one time or another in their employment, in obtaining and using goods and services, and in other dealings within society. Vocational teachers are among the "frontline" professionals who will help learners place these tools of technology into applications that permit appropriate uses of technology in addressing critical decisions about home, family, and work.

In vocational home economics classrooms, for example, the curricular implications for teaching about home management and interpersonal relationships as more and more families purchase the home computer will require that *all* students (not simply those who are mathematically gifted or those training to become information processing workers) be provided with learning experiences which help them to address questions about the impact of technology on their everyday lives. Snyder (1979) has suggested that families, given the necessary technical skills and a sense of their collective power, could use *presently available* computer technologies to increase significantly their abilities to manage resources and expenditures.

The social and economic implications of large numbers of families which would consistently be able to make the "best buy" purchases, to fully utilize all warranty commitments, to claim every benefit permitted by federal, state, and local revenue laws, and to make effective investments of time and capital — all based upon a broad range of pertinent and ecosystemic inputs — is patently powerful. (Snyder, 1979, pp. 108-109)

It will become the responsibility of home economics teachers as well as other vocational teachers to make curriculum decisions that strike "a balance between what is made technically possible by microelectronics and what is educationally desirable in learning situations" (Shane, 1982, p. 306). There is little doubt that any student can gain from learning basic technical skills in the use of the 1983 microcomputer for vocational applications. However, as computers change and with future technological advances, only the *generalizable* skills, attitudes, and knowledge gained through interaction with today's computer will be valuable. Educational opportunities should enable students to learn fundamental skills, to examine the value of technology in confronting individual, family, and work related problems, and to place all of this into a perspective in which they, and not the computer, are the decisionmakers.

Computer technology will not provide the answers to the important educational questions we face in vocational education regarding how to prepare students for technological demands. Yet, it is obvious that the computer can serve as a vehicle for improving society through its appropriate use as a tool in the workplace and in the home. It will be a powerful vehicle for vocational education and society itself as long as it is not treated as the destination.

References

Ellul, J. The power of technique and the ethics of non-power. In K. Woodward (Ed.), *The myths of information: Technology and post-industrial culture.* Madison, Wisconsin: Coda Press, 1980.

Shane, H. G. The silicon age and education. *Phi Delta Kappan*, January 1982, pp. 303-308.

Snyder, D. P. The family — An appropriate technology for America's third century. In D. P. Snyder (Ed.), *The family in post-industrial America.* American Association for the Advancement of Science Selected Symposia Series. Boulder, Colorado: Westview Press, 1979.

Daun M. Anderson is an instructor of home economics education. She analyzed in this article the needs, opportunities, problems, and effects of computer technology on professional development. The study further broadens the philosophical base for program planning and policy formulation concerning computer technology in home economics education.

Computers in the Classroom: Good or Bad?

By DAVID LYNN PASSMORE

Passmore is associate professor of vocational education at the Pennsylvania State University.

The Ad Hoc Committee on Basic Skills Education was created in California last year to halt what it calls "the bandwagon" effect of efforts to put personal computers into America's classrooms.

In a recent Education Times article, the committee characterizes the rush to computers in classrooms as "clumsy, inefficient, expensive."

The committee believes that advocacy of personal computers in education is nothing more than a merchandising "scam" designed to promote dependence on specific models. This dependence, in turn, coerces purchase of these same models by families for home use.

Also, the committee asserts that many educators adopt personal computers merely to embellish their careers by appearing to be "front-runners" in educational technology.

The committee wants more attention to curriculum strengthening, teacher improvement and use of established, simple and effective techniques and technologies. Dwindling budgets, the committee says, are being spent for a high-priced technology that "in no way has been proven effective in the teaching of reading comprehension, spelling or arithmetic."

The committee's position, however, seems extreme. Few educators deny the great potential personal computers show for improving education. And, in spite of the committee's plea for caution, educators already are stuck on personal computers like B'rer Rabbit on Tar Baby.

Nearly 22,000 educational institutions, for example, had at least one personal computer in 1981. About 60 percent of U.S. school districts used computers in instruction. Fifteen percent of the nation's money for instructional materials was spent on computers.

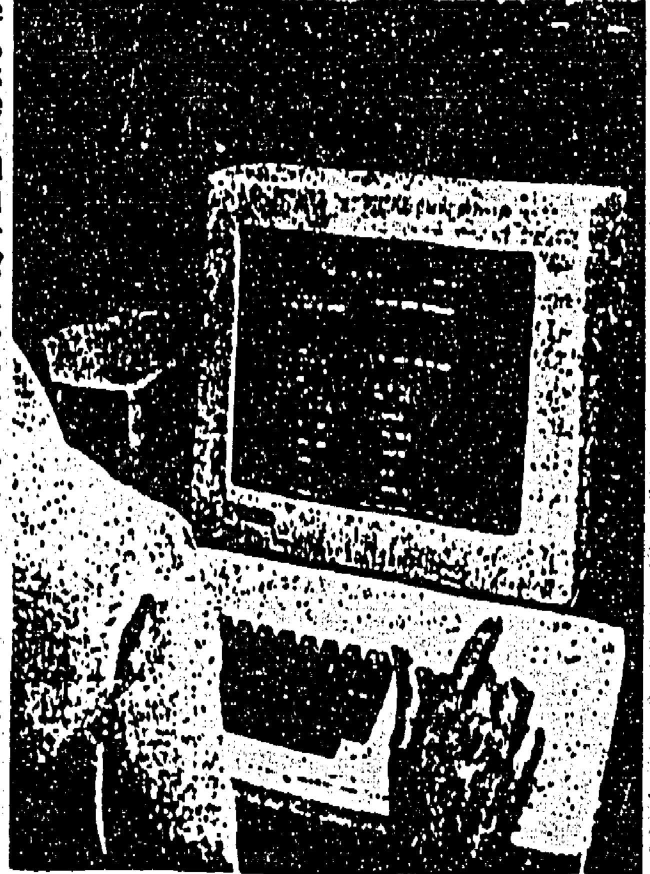
The retail value of personal-computer shipments to educational institutions could exceed $1 billion between 1980 and 1985, with $75-$100 million in computer-program sales in 1981 alone.

GIVEN the fact that computers are with us to stay, the concerns of the Ad Hoc Committee on Basic Skills should be directed toward how schools actually are managing to adapt to computers. It seems that answer is "not very well."

An April, 1982, survey of instructional uses of computers in public schools conducted by the National Center for Educational Statistics reveals that about one-half of U.S. school districts need qualified staff and start-up assistance to use computers in instruction.

Nearly 60 percent of the nation's teachers require extensive training to infuse personal computers into instruction in any meaningful way.

More than one-half of all school districts buy their computer programs from commercial publishers or equipment vendors. A critical evaluation of commercially produced computer programs for instruction, funded by the National Institute of Education and the Republic of Venezuela, finds most instruction designed for personal computers to be of poor quality....



So Far, Schools Have Not Adapted Well to Personal Computers, Penn State Professor Maintains

Of course, teachers can write their own programs. Even good teachers, however, may find this difficult. Instruction through computers is different from what most teachers do every day.

If a student falls asleep, appears confused or looks out a window during a lesson, the good teacher adjusts. Correction is given, analogies are tried, a different approach is taken. But, when the same good teacher tries to design instruction for delivery through personal computers, the computer-aided instruction may fail because these same intuitive changes—the very art of teaching—cannot be incorporated into the program.

To be successful with personal computers, teachers need well-developed formal skills in instructional design which draw on disciplines such as educational psychology or human/machine engineering. Unfortunately, few teacher-preparation programs currently emphasize development of these skills.

Our ability to use innovations often lags far behind the fantastic technology that creates the innovations. Personal computers are no exception. The time has come to reduce this lag. School systems require assistance, and soon, to exploit the personal-computer technology they already own.

Teacher preparation must be revolutionized to incorporate recent advances in the science of instruction. We must demand better courseware from commercial sources.

To do less would relegate personal computers to museums with the Edsels, hula hoops, duck-tail haircuts and other fads that came and went.

Some Work Needed To Make Computers Valid in Schools

By DAVID L. PASSMORE

The electronic chip is it. Advances in microprocessor technology have made personal computers inexpensive, portable, accessible and adaptable. And let's not forget faddish.

No one walks into a friend's home and exclaims, "Wow! I see you're into telephones." A home computer, though, draws looks of awe and envy.

Many personal computer purchases are motivated by little more than vague notions of computer benefits ("I want it to run my budget"). Most ads highlight bug-eyed young video freaks sampling the latest computer games.

Sandwiched into these ads are scenes of serious looking adults and children learning things from computers.

Nothing since pet rocks has stirred consumers and the business world so much as personal computers. Can they be helpful? Sure. Fun? Yep. Educational? Well, maybe.

And that's the rub.

Personal computers in education are big business, but I'm not too sure they're good business. And I'm not the only one who feels this way.

A group calling itself the Ad Hoc Committee on Basic Skills Education was created in California last year to halt what it calls "the bandwagon effect" to put personal computers into America's classrooms.

In a recent Education Times article, the Committee characterizes the rush to computers in classrooms as "clumsy, inefficient (and) expensive."

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Also, the committee asserts that many educators adopt personal computers merely to embellish their careers by appearing to be "front runners" in educational technology.

The committee wants more attention to curriculum strengthening, teacher improvement and use of established, simple and effective techniques and technologies.

Dwindling budgets, the committee says, are being spent for a high-priced technology that "in no way has been proved effective in the teaching of reading comprehension, spelling or arithmetic.

The committee's position, however, seems extreme. Few educators deny the great potential personal computers show for improving education. And, in spite of the committee's plea for caution, educators already are stuck into personal computers.

Nearly 22,000 educational institutions, for example, had at least one personal computer in 1981. About 60 percent of U.S. school districts used computers in instruction. And 15 percent of the nation's instructional materials monies were spent on computers.

The retail value of personal computer shipments to educational institutions could exceed one billion dollars between 1980 and 1985, with 75 to 100 million dollars in computer program sales in 1981 alone.

IBM estimates that 40 million personal computers would be required to deliver just 20 minutes of instruction daily to each of the nation's elementary and secondary school students.

Given that computers are with us to stay, the concerns of the Ad Hoc Committee on Basic Skills should be directed toward how schools actually are managing to adapt to computers. It seems that answer is "not very well."

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Frequently, the computer is used as an automatic page turner. A number of pages of text are displayed sequentially to the student, and the computer is relegated to advancing its display, page by page.

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Of course, teachers can write their own programs. Even good teachers, however, may find this difficult. Instruction through computers is different from what most teachers do every day.

If a student falls asleep, appears confused or looks out a window during a lesson, the good teacher adjusts. Correction is given, analogies are tried, a different approach is taken.

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Mr. Passmore is associate professor of vocational education in the College of Education at Penn State.

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TAKING AN EDUCATIONAL BYTE OUT OF PERSONAL COMPUTERS

by David Lynn Passmore**

The electronic chip is it. Advances in microprocessor technology have made personal computers inexpensive, portable, accessible and adaptable. And let's not forget faddish.

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