DOCUMENT RESUME

ED 222 769 CE 034 309

AUTHOR Jaffe, J. A., Ed.; And Others.
TITLE Technologies of the '80s: Their Impact on Home Economics Occupations.
INSTITUTION Conserva, Inc., Raleigh, N.C.
SPONS AGENCY Office of Vocational and Adult Education (ED), Washington, DC.
PUB DATE Sep 82
CONTRACT 300-81-0352
NOTE 49p.; For related documents, see ED 219 527, ED 219 586, and CE 034 303-313.
PUB TYPE Viewpoints (120) -- Reports - Descriptive (141)

EDRS PRICE MF01/PC02 Plus Postage.
DESCRIPTORS Consumer Education; *Diffusion (Communication); Electrical Appliances; *Home Economics; *Homemakers; Home Management; Job Skills; Microcomputers; Postsecondary Education; Secondary Education; *Technological Advancement; Videotex; *Vocational Education
IDENTIFIERS *Impact; Microelectronics

ABSTRACT

This report is one of seven that identify major new and emerging technological advances expected to influence major vocational education program areas and describe the programmatic implications in terms of skill-knowledge requirements, occupations most directly affected, and the anticipated diffusion rate. Chapter 1 considers technology as process, the relation of technology and productivity, and technology as the arbitrator of work. The first of three sections in chapter 2 presents the procedures used to identify and clarify the most innovative, new, and emerging technologies with implications for vocational education. Brief descriptions of the technologies expected to affect home economics occupations are included in section 2. Section 3 contains four essays describing these new and emerging technologies with implications for home economics occupations: microelectronic monitors and controls for the consumer, personal computers and the homemaker, advances in household appliances, and videotex in home management. Chapter 3 is an annotated bibliography with citations descriptive of new or emerging technologies, their diffusion, or insights as to their vocational implications. (YLB)

ED222769

TECHNOLOGIES OF THE '80s: THEIR IMPACT ON HOME ECONOMICS OCCUPATIONS

J. A. Jaffe
E. H. Oglesby
D. W. Drewes

Editors

CONSERVA, Inc.
401 Oberlin Road
Raleigh, NC 27605

September 1982

Contract No. 300810352
U.S. Department of Education
Office of Vocational and Adult Education

CE 034 309

The preparation of this report was supported in whole by the U.S. Department of Education, Office of Vocational and Adult Education. However, the opinions expressed herein do not necessarily reflect position or policy of the Department of Education, and no official endorsement by the Department of Education should be inferred.

FOREWORD

Productivity is a critical economic concern. Sagging productivity growth coupled with rising costs and heightened foreign competition are placing American business and industry in an increasingly vulnerable position. In an effort to strengthen its competitive position, American business and industry is investing heavily in capital-intensive technology. However, productivity is people-dependent and its improvement conditioned upon their possessing the technical and organizational skills necessary to utilize technology to its fullest advantage. The development of the work skills required to contribute to the revitalization of America is the central challenge to vocational education.

This report is the result of a contract with the U.S. Department of Education, Office of Vocational and Adult Education to investigate the changing role of vocational education resulting from new and emerging technologies. It identifies the major technological advances expected to influence each of the major vocational education program areas and describes the programmatic implications in terms of skills-knowledge requirements, the occupations most directly affected and the anticipated diffusion rates.

An associated project report, "Working for America: A Worker-Centered Approach to Productivity Improvement," is devoted to an examination of worker-centered productivity and a discussion of the organizational and educational strategies for its improvement. A companion monograph entitled "Vocational Education: Its Role in Productivity

Improvement and Technological Innovation" describes the relationship between productivity and technology and presents mechanisms for state vocational education agency use in productivity improvement and technological innovation.

Technologies described in this paper range from the "hard" technologies with industrial applications, (e.g, robotics and computer-assisted design and manufacture), to "soft" technologies such as alternative work scheduling; (e.g., flexitime, job-sharing); or worker participation in management; (e.g., quality control circles, quality of life groups). Both "hard" and "soft" technologies can be expected to bring rapid and radical change to workers involved in their use. Some technologies may affect only one vocational education instructional area. The effects of other technologies will be felt in several or all of the vocational education instructional areas in varying degrees. In either case, vocational educators must take action to assure the inclusion of the skills demanded by these technologies in their instruction in order to meet the job challenges of the near future.

TABLE OF CONTENTS

CHAPTER I

TECHNOLOGY--THE FORCE FOR CHANGE

TECHNOLOGY AS PROCESS

Technology means many things to many people. Some see technology as the driving force propelling society into the future. Others view it as evidence of an engulfing mechanistic materialism that threatens to destroy our humanistic values. Workers fear that technological advancements will take away their jobs and render their skills obsolete.

All of these are in part true. Undoubtedly, technology influences the future growth and direction of society. Technology is mechanistic and may be used to the detriment of human dignity. Indeed, technological advancements do render certain job skills obsolete. These conditions, however, speak more to the results of technology than to the nature of technology itself.

Technology in essence is the application of information, techniques and tools to material resources so as to achieve desired ends. At the societal level, these desired ends translate into a mix of material goods and services required to satisfy society's wants. Technology provides the ways and means for producing the desired stock of goods and services. Since production implies the use of resources to create products of value, technology provides the means to convert natural resources into material wealth.

Technology, then, can be regarded in the abstract as the process used by a work system to convert inputs into outputs. A work system can be defined as any organization that expends energy (work) to convert resource inputs into outputs in the form of goods and services. Work systems may be defined at any level from society as a whole to a work group at the department or subdepartment level of firms and organizations.

The notion of a work system as an input/output system is shown in Figure 1.

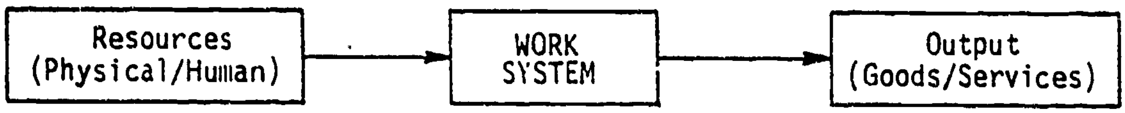

Figure 1. Input/Output Model

As indicated, inputs enter the work system, work in the form of energy expended is performed, and inputs are translated into outputs in the process. The process or rule for translating inputs into outputs is in the essence what is meant by technology. Thus, for any work system, the prevailing technology determines what outputs will be produced as a function of inputs. In the most general sense, technology can be regarded as an input/output function. Technology is not to be equated to either the inputs nor the output products of the work system. Rather, technology is the correspondence rule that determines the outputs resulting from a specific level of input.

Inputs into a work system are the resources used in the process of production. These resources in the most general sense are labor, capital, materials and energy which are frequently referred to as the factors of production. Output of a work system is measured in terms of goods and/or services produced. Using these definitions of input and output, technology can be regarded as the function that maps or transforms the factors of production into goods and/or services produced. In economic terms, this function is called a production function and expressed as:

Technology = Production function

= F(labor, capital, materials, energy)

Technology, considered as a production function, constrains the way the factors of production combine to produce an output of goods and/or services. For example, technology as process determines the unique contribution of each factor of production with the other factors held constant and determines the impact of substituting one factor for another. Factor substitution occurs when one factor such as capital is used in increasing amounts as a substitute for another factor, such as labor. The important point is that it is the current technology that determines how the factors are inter-related and the relative output contributions of each factor.

Suppose now that an increase in the output of the work system was observed even though all factors of production were held constant. The only way this could occur would be for the production function itself to change. Since technology is equated with the production function, this is defined as <u>technological change</u>. Technological change occurs when efficiencies in the production process allow for increased output without the necessity for more input resources to be used. Thus, if a change in output accrues from training workers to work smarter, but not harder, then a technological change can be said to occur, provided that the increase resulted from more output per unit of labor expended rather than more units of labor being expended (working harder). In a similar manner, technological change can result from any alteration in the production process that results in more output per unit of factors of production used.

Typically, technological changes result from the introduction of labor saving devices. These devices, in the form of equipment and/or tools, make it possible to glean increases in output per hour of labor input. The effect is to alter the production function so as to reflect the increased contribution of labor to production output. Technological change can also result from changes in the managerial and work structure that result in improved output contributions from one or more factors of production. Because of the multitude of sources, the technology of a work group is in a continual process of change. Thus, technology evolves through incremental changes as the work system seeks to fine tune the process through improved production efficiencies.

Periodically, conditions arise that substantially alter the organization of work systems. Responsiveness to these conditions requires that the work systems, to survive, must adopt a new production function. Production functions that differ in form are termed <u>techno-</u>

logical innovations and are to be differentiated from technological changes. Whereas technological change is associated with incremental evolutionary changes in the production function, technological innovation signals a discrete shift from one form of production function to another. This discrete break with the past generally is associated with the introduction of a revolutionary new process that allows resource inputs to be combined in an unprecedented manner. Many of the "necessary" appliances in today's home can serve as illustrations. The refrigerator, for example, which today exists in almost every American home, made possible a great latitude in food-buying choices and usage not practical with the older "ice box" and not even possible before that. The impact of this and other significant inventions is to recombine the factors of production in a totally new and significantly more productive fashion. Thus, whereas technological change is evolutionary, technological innovation tends to be revolutionary in its effects.

TECHNOLOGY AND PRODUCTIVITY

Productivity of a work system is typically defined as the ratio of system outputs to system inputs. Productivity increases when more outputs are produced per unit of input. Increased productivity makes possible an increased amount of goods and services per unit of factors of production used and results in an improved standard of living, increases in real income and strengthened price competitiveness. For an expanded discussion of productivity, see the companion project report "Working For America--A Worker-Centered Approach to Productivity Improvement" (CONSERVA, 1982).

The relation of technology and productivity flows from an examination of the definitions of the two concepts. Productivity of a work system can be defined for all factors of production used simultaneously, or each individual factor of production can be considered separately.

(a) Total Factor Productivity = $\frac{\text{Work System Output (goods/services)}}{\text{Total Resources Used (labor, capital, materials, energy)}}$

(b) Labor Productivity = $\frac{\text{Work System Output (goods/services)}}{\text{Labor Resources Used}}$

(c) Capital Productivity = $\frac{\text{Work System Output (goods/services)}}{\text{Capital Expended}}$

(d) Materials Productivity = $\frac{\text{Work System Output (goods/services)}}{\text{Materials Used}}$

(e) Energy Productivity = $\frac{\text{Used System Output (goods/services)}}{\text{Energy Consumed}}$

Recall that technology was defined as the production function F(labor, capital, materials, energy). Whereas technology is the function itself, a specific output corresponding to an input of L-units of labor, C-units of capital, M-units of materials, and E-units of energy is dictated by the technology and designated as f(L,C,M,E). By substituting for the output, the productivity definitions can be rewritten as:

(a) Total Factor Productivity = $\frac{f(L,C,M,E)}{L+C+M+E}$

(b) Labor Factor Productivity = $\frac{f(L,C,M,E)}{L}$

(c) Capital Productivity = $\frac{f(L,C,M,E)}{C}$

(d) Materials Productivity = $\frac{f(L,C,M,E)}{M}$

(e) Energy Productivity = $\frac{f(L,C,M,E)}{E}$.

Technological change influences the productivity of all factors of production by altering the value of the production function f(L,C,M,E). If the change in technology results in a positive increase, then productivity will also increase accordingly. The explanation is that technological change makes possible increased outputs of goods and services without a corresponding increase in resources used. This increase in the stock of goods and services available is translated into an increase in the standard of living as more wealth is available for distribution. An expanded standard of living creates demand for additional products and services which provides work for more people. Additionally, increased productivity allows goods and services to be priced more competitively since increased productivity lowers per unit production costs. Price stability is beneficial in that it is anti-inflationary and contributes to our ability to compete on the international market.

TECHNOLOGY AND WORK

Technology is the great arbitrator of work. It is technology that specifies how capital goods can be used by workers to convert raw materials into finished products. It is technology that determines the range of human skills and abilities necessary to use the capital goods as production tools. It is technology that specifies the appropriate materials for which the tools can be used and the energy required for their use.

Whereas technology sets the stage and writes the script, it is management that directs the production. Management's decisions determine the desired mix of labor and capital, the rates at which labor and capital will be utilized, the quantity of labor, capital and materials used and the extent of substitutability between elements of labor, capital and energy. It is also management's responsibility to maintain a management climate that facilitates the most efficient and coordinated use of labor and capital. For a discussion of the impact of management climate on productivity and suggested strategies for development of a worker-centered approach to productivity, see the companion project report "Working for America--A Worker-Centered Approach to Productivity Improvement," Chapter III, (CONSERVA, op. cit).

Innovations incorporated in new capital goods tend to spearhead technological change and innovation. The latest advances in knowledge and theory tend to be embodied in the design and structure of new capital equipment. Innovations and capital goods design have direct implications for labor as a factor of production.

These implications affect not only the human skills requirements, but also the very organization of work itself. Human skills requirements may be relatively unchanged in those cases where new advancements were made without basically altering the production process. A typical example might be the development of pilot lights in gas ranges, eliminating some of the danger involved in lighting the stove. In this case, the advancement could be basically incorporated into the existing process and would require minor alterations in human skills requirements. Contrast now the development of the microwave oven, so widespread today and yet unknown but a few years ago. In this example, the very organization of work itself has been drastically changed with consequent changes in the nature and intensity of human skills requirements. This represents a dramatic illustration of the distinction to be drawn between technological change and technological innovation.

The press for technological innovation is strong and mounting in intensity. Productivity growth is sagging in the country, having fallen from an average annual rate of increase 3.1 percent in the period 1948-58 to a mere 0.7 percent for the period 1974-81. (Statement of the Chamber of Commerce of the United States on Productivity, April 2, 1982). There is near universal agreement that the lack of capital has been one of the major causes of this decline. As Lester Thurow, a noted expert on productivity, states,

> The amount of equipment per worker--the capital-labor ratio--is a key ingredient in productivity growth. Better-equipped workers can produce more output per hour, but new capital is also a carrier of new technologies. To put new, more productive technologies to work, workers must be provided with the equipment that embodies those new technologies. Without this additional hardware, or "physical capital," it is impossible to translate new knowledges into new output (Technology Review, November/December 1980, page 45).

In the area of foreign trade, the United States is in the process of moving from being a net exporter to a net importer in major categories of industrial output. As shown by a study recently conducted by the Department of Labor, of the top 17 U.S. export commodities, losses in the world market were experienced in 14 of the commodities. Between 1962 and 1979, the U.S. trade position had deteriorated such that market losses had been experienced in all 17 of the top export commodities. (Congressional Hearings, December 1980 and January 1981).

The report attributed the decline in U.S. international competitiveness to changing supplies of world resources and diminished technological capabilities. The rate of growth of the capital-labor ratio, a measure of the amount of capital available per worker, declined to such an extent that the United States fell from first to sixth in terms of capital available per worker. The United States' share of world capital fell from 42 percent in 1963 to 33 percent in 1975. During the same time, Japan doubled its capital from 7 to 15 percent of the world's share. As the U.S. stock of physical capital fell, so did its human capital. According to Department of Labor analyses, the United States fell from second to seventh in terms of percentage of skilled workers in the labor force-with the U.S. share of skilled workers falling from 29 percent to 26 percent. (Congressional Hearings, December 1980 and January 1981, op. cit.).

As a compounding problem, the United States is reported to be experiencing a severe shortage in skilled labor. In a widely quoted report, the Department of Labor projects average annual training shortfalls in excess of 250,000 persons per year for the next decade (U.S. Department of Labor, 1980). These are regarded as minimum estimates since they result from inclusion of only the 13 occupations with the greatest projected shortages. The Task Force on the Skilled Trade Shortages, which represents a coalition of 13 metalworking industries, estimates an anticipated need for 240,000 journeyworkers in the metal trades by 1985. (America's Skilled Trade Shortage: A Positive Response, 1981). The American Electronics Association, in a survey of its members, projects a need over the next five years for approximately 113,000 technical professionals in eight job categories and an additional 140,000 technical paraprofessionals in 13 job categories. (Shortages in Skilled Labor, November 3, 1981).

America stands at an economic crossroad. In the face of impending labor shortages, American business and industry can follow one of two major courses--one will be business as usual. If that philosophy prevails and a labor shortage materializes, per unit labor costs can be expected to increase, leading to increased prices as businesses seek to maintain their profit picture. Continued sluggishness in capital investments, coupled with the shortage of skilled labor, will dim any prospects for productivity improvements. As a result, inflation can be expected to escalate, our standard of living to diminish, our foreign competition to increase, and the United States will be well on its way to becoming a second-rate power.

As an alternative, the United States can make a significant investment in labor-saving capital in an effort to reverse the productivity trends and to regain the competitive edge. If the strategy is undertaken with vigor, the implications can be profound. Unlike the early '60s when the concern for the effects for technology proved to be unfounded, the United States currently stands on the brink of a technological revolution drawing its force from the emergence of the microprocessor and its ubiquitous applications. Ovens and ranges, washers and dryers and other major appliances can now be "programmed" by the contemporary homemaker to perform a series of discrete tasks while not under direct human control.

America is rapidly shifting from a manufacturing to a service-based economy. In 1950, nearly one out of three non-agricultural workers was employed in manufacturing, and only one out of eight employed in services. By 1980, only 22 percent of the non-agricultural work force was in manufacturing as opposed to nearly 20 percent in services. In terms of percent change in employment for the three decade period, manufacturing increased a scant 33 percent in contrast with a 231 percent increase for services (Impact of Technological Change, 1981). The shift is being experienced both in international as well as domestic markets. While we are becoming a large net importer of manufactured goods, the United States now exports about $60 billion worth of services a year. This qualifies the United States as the largest exporter of services in the world, exporting nearly 25 percent of the world's service base. (Presentation of Dr. David L. Birch to the Council of Upper Great Lakes Governors, March 5, 1982). As a consequence of our changing service base, capital investments to facilitate handling and communication of office information can be expected to increase. New capital innovations can be anticipated in the areas of advanced word processors, electronic methods of reproduction and transmission of images and other electronically-augmented telecommunication devices.

The impending technological revolution will not be expected to be entirely bloodless. The transition from a manufacturing to a service economy can be expected to have severe short-run implications for those whose skills have become obsolete because of changes in technological demands. Whereas job displacements may be regarded as but minor perturbations in society's overall growth, they represent crises of major proportion in the lives of those who are experiencing them. In order to ease the transition and to contribute to the more effective and best productive use of our human resources, it is incumbent that quality skills training be provided that is attuned to the demands of emerging technology needs and available to all those who can profit from its exposure. The extent to which vocational education rises to meet these needs will determine the contribution that vocational education makes to the revitalization of the economy and the continued prosperity of society.

CHAPTER II

NEW AND EMERGING TECHNOLOGIES

Vocational education to be responsive to the demands of forthcoming technology must become increasingly aware of the nature of these technologies and their associated training requirements. In recognition of this need, CONSERVA, Inc. was awarded a contract by the U. S. Department of Education to identify the most innovative, new or changing technologies and to assess their occupational implications for specific vocational education program areas. The procedures used to identify and clarify technologies are presented in the first section. Brief descriptions of the identified technologies are included in the second section. Cameo reports describing the major new and emerging technologies with implications for Home Economics occupations are provided in the third section.

IDENTIFICATION AND SELECTION PROCEDURES

In order to identify new or changing technologies with implications for vocational education, project staff reviewed recent years' issues of several hundred different business, trade/industrial, and technical periodicals seeking information concerning technological change or its impact.

In reviewing published articles for possible relevance, three basic characteristics were considered. First, there must have been evidence that the technology is currently being used in the "real world"--i.e., that it is not still "on the drawing board" or futuristic. Second, the technology must have appeared to have direct or indirect implications for the way work is performed, and must impact skills within the training domain of vocational education. Finally, trend projections or other indications were sought as evidence that the technology was being increasingly used, implying greater numbers of jobs affected and resulting importance to vocational educational programming.

Having identified a set of technologies which are new or emerging, which promise growth, and which appear to impact job training, project efforts focused on the possible vocational implications of the technology. The implications were defined in terms of job activities affected, knowledges and skills required to carry forward these job activities, and special equipment or facilities (cost considerations) which might be necessary to instruct vocational students in the technology.

As a means of obtaining technology-specific information, outside experts were sought whose backgrounds and performance records qualified them to speak with authority about specific technologies and their training implications. For each of the identified technologies within a specified vocational education program area, a knowledgeable individual was invited to author a brief, nontechnical essay oriented to vocational education.

Since certain technologies have rather broad occupational implications, authors were allowed discretion as to which occupations or tasks they would emphasize. In making their decisions, authors were requested to consider the developing technology from a training and instructional perspective. Specifically, authors were asked to address the following areas:

- Work activities which involve the technology --

  The kinds of major duties or activities that may be new, changing, or developing as a result of the new or changing technology, with reference to the occupations under discussion.

- Knowledges and skills essential or important for productive completion of such activities --

  Knowledges are awareness of facts and process details, understanding of principles, etc., and "skills" are "hands on" abilities actually to carry out functions. The knowledges and skills to be covered were to relate to the work activity demands of the new or developing technology.

- Special equipment or facilities that would be required to teach such knowledges and skills --

  Aside from books, other usual instructional media, and standard educational facilities, any special devices (e.g., simulators or prototypes) or other capital that might be needed for instruction in identified knowledges or skills.

- Growth and trends in the diffusion or expansion of the technology --

  Observations of recent growth, and projections concerning likely near future expansion, of the technological innovations or changes, in business/industry/other applications that involve occupations under discussion.

TECHNOLOGIES EXPECTED TO IMPACT HOME ECONOMICS OCCUPATIONS

Technologies selected for inclusion are those determined by application of the criteria to have programmatic implications for Home Economics occupations. Brief descriptions are presented below. The purpose of these descriptions is to generally and summarily define the technologies being discussed by the experts.

By Microelectronic Monitors and Controls is meant those components of larger systems which may automatically control parts of the larger system, or which can monitor and display to human operators indications of what's going on within the system and transmit operators' instructions to the system. New graphics, voice recognition and synthesis, and sensor capabilities are among the advances in this technology area.

Microcomputers or Personal Computers, also called "desktop" computers, are by now somewhat familiar to us all. Small-sized and affordable by comparative standards ($5,000 or less will buy a sophisticated system), these machines incorporate many of the logical capabilities of larger computers and can be programmed to perform many of the same sorts of tasks. This is made possible by microprocessor technology. Microprocessors, based on large and very large scale integrated circuits, have sometimes been called "computers-on-a-chip." Microprocessors are used not only in microcomputers but in many other "hardware" systems which can then perform computer-like functions.

New technologies are influencing the development of Household Appliances. Improvements in energy efficiency, new appliance categories such as convention ovens and induction ranges, and advances in user control capability (for example, the ability to "program" a defrost and cooking cycle within a microwave oven) are of particular interest.

Videotex systems use modern television technology, broadcast and cable, to provide information selectively to subscribers--and sometimes to receive information back from them directly. Videotex is used as a generic term for such systems, and incorporates "teletext" and "viewdata." Teletext systems provide information to the viewer, while view-data systems, which depend on cable networks, allow information (such as consumers' product orders) to be sent back to the central system by the subscriber at home.

TECHNOLOGY ESSAYS

The following essays describe the new and emerging technologies identified as impacting Home Economics occupations. The essays, while edited for consistency, remain basically the products of their authors. Sincere appreciation is expressed to the following experts who have so generously contributed of their time and expertise:

LIZA LOOP, B.A., is President of the LO*OP Center, Inc., a non-profit educational corporation involved in instruction design and technical assistance, Technical Coordinator for "ComputerTown, U.S.A.!" a computer literacy research and dissemination projected funded by the National Science Foundation, and Director of ComputerTown International, a companion project. Ms. Loop has been teaching and writing about education and computers since 1975, and has authored or produced several user manuals and guides for commercial computer and software vendors.

AUDREY S. STEHLE, M.S., is an independent consultant specializing in consumer education and product evaluation. With former positions in corporate home economics and consumer divisions, Ms. Stehle's present professional activities include the development of educational materials and programs, product sales training, and the development of consumer-oriented use and care information for new product lines.

FRANK A. VIGGIANO, Jr., Ph.D., is an Associate Professor of Consumer Services with the School of Home Economics, Indiana University of Pennsylvania. Consultant to a number of firms, Dr. Viggiano has also written articles on modern products in popular media, produced and appeared on consumer-oriented television shows and series, and developed curriculum outlines and materials for Consumer Electronics.

ANNE L. McKAGUE is Manager of Information and Educational Services for NORPAK, Ltd., a Canadian firm. Ms. McKague was formerly a project officer with the TVOntario Telidon and Education Project, with responsibilities including management of the Telidon videotex database and technical assistance to educators working with the system.

MICROELECTRONIC MONITORS AND CONTROLS FOR THE CONSUMER

by
Frank A. Viggiano, Jr.
Indiana University of Pennsylvania
Indiana, Pennsylvania

The Microelectronics industry has grown rapidly due to the technical advancement of the integrated circuit developed in the late 1950's. The silicon "chip" (once the size of a typewriter, and now smaller than a dime) has revolutionized electronics and provided the impetus for microelectronics to be interfaced in every conceivable consumer product. Never before has man been able to monitor, control, document, communicate and troubleshoot a product with the same set of integral electronics.

Consumers and homemakers will soon be experiencing the use of microelectronics in all products due to its reliability, execution command rate, versatility, serviceability, and cost. It seems that the only point in question is the acceptance or the reluctance to accept these new technologies by consumers.

Therefore, substantial effort must be directed toward consumer attitudes. Unfamiliar technology often seems to affirm the statement that "The old way is better." Familiarity breeds this attitude. The consumer/homemaker of the future will need a basic understanding of electronics and its operating characteristics. A curriculum in the area of Consumer Electronics/Home Equipment would provide this need.

Currently, we are interacting with computers and microelectronics through billing, food purchase (UPC--Universal Product Code), touch panels in major appliances, programmable video recorders, videodiscs, and home computers. The future will find even more sophisticated consumer electronic products such as flat screen television, wireless audio, mobile cordless telephones and voice controlled products.

Many consumer products in the future will communicate with the user by voice. Voice Recognition, Voice Speech Synthesis, and Telesensory Speech are technologies currently developed to "control" consumer products. The voice controlled product will provide quick, easy, hands-free operation of many devices. Each product will contain a voice identifier which will permit designated individuals or family members to access the product by voice commands. Voices desired to operate the products will be programmed into the product and coded by a digital unit which will then "Read" and "Listen" to speech pronunciation, diction, tone, and pattern. Each individual voice command will go through the ID process allowing only those commands from designated individuals to be accepted. Thus a system operated only by those who should operate it exists. Also, a margin of safety necessary to keep small children from activating the equipment will be provided. And, a manual override would be necessary for house guests, and unexpected bouts of laryngitis, etc. The product will be able to perform all current commands through voice and provide a multitude of information such as, user "ON" time, kilowatt hours used to date, potential component malfunction, and failure. Perhaps we may not initially feel comfortable sliding an entree into a microwave, closing the door and begin washing vegetables while we verbally command the microwave. On the other hand, the consumers using these appliances will be our sons and daughters who have interacted and have been educated with computers and electronic equipment, games, and music. These consumers will readily welcome the electronics revolution. Finally, the voice controlled products will be a major positive factor in the lives of handicapped individuals.

In the future manufacturers plan to institute a "Self-Repair" program where consumers can repair appliances and products with the assistance of a videodisc and a personal "toll-free" call to the company, if necessary. Consumer/homemakers desiring an understanding of "Self-Repair" will need to develop a task approach. Understanding the following would be essential:

- Disassembly and assembly of consumer products
- Identification of component parts
- Use of measurement devices
- Diagnosis of components or sub-systems
- Removal and replacement of parts or components
- Testing and evaluation

Manufacturers will offer "kits" including basic equipment, tools, and measurement instruments which consumers can purchase at a reasonable cost. Using the kit a few times will more than offset the service call. Consumers will become involved in the entire consumption process: research before purchase, purchase, set-up and maintenance. These products will be considered as necessary "investments" requiring the attention of the owner. Consumers will better understand the term "ownership."

Products which provide services, information, entertainment and above all "free time" for the consumer/homemaker will be imperative as more homemakers join the work force.

"PERSONAL COMPUTERS" AND THE HOMEMAKER

by
Liza Loop
LO*OP Center, Inc.
Palo Alto, California

PERSONAL COMPUTER TECHNOLOGY

A "personal" or "home" computer is a small electronic information processing, storage, and retrieval system. These computers are marketed and priced for individual and very small business use.

There are few features that distinguish the technology of personal computers from modern computers designed for larger business, scientific or engineering use. When you lift off the cover, a personal computer contains circuits and switches very similar to those found in its larger brothers. From one perspective, it is the objectives of the user which make a computer "personal," not the technology. From another perspective, it is the small size, low price, and modest educational level needed to learn how to use the computer system which make it a practical tool for non-professionals.

Two basic categories describe most applications for personal computers to date. One is as a development tool for "intelligent appliances" such as burglar alarms, teaching machines, information access terminals (for videotex and electronic mail) and residential energy monitoring systems. The other major use of personal computers is for data processing of small or medium amounts of information, for example, balancing checkbooks or planning a simple business venture. To manipulate large amounts of information, small computers can be connected to large computers, functioning as sophisticated terminals.

ACTIVITIES WHICH INVOLVE THE TECHNOLOGY

Will the homemaker need to be "computer literate" with the general purpose home computer? The answer is a qualified yes.

Food, shelter and furnishings, clothing, health care, household financing, child rearing, and recreation--these combine to form the domain of the homemaker. It matters not whether the home is an institution for a large group of people, a family residence, or a single person's dwelling. The homemaker is responsible for identifying the needs of the resident(s), determining which products can satisfy these needs, and procuring the products in the most cost effective manner. In addition, the homemaker must often use and maintain these items over a period of years. In order to do this job well, a homemaker must juggle larger and larger amounts of data each year. Effective use of a home computer can make the homemaker able to meet the needs of more people, able to manage more complex households containing more items, able to budget and buy more economically, often in less time.

People with less than college education will be able to perform these more complex tasks with the help of well-designed personal computer systems. This, in turn, changes the nature of the tasks they choose to take on and often leads to an expansion of the homemaking role. Consider managing of a household budget. For some families, the cash flow is simple enough to handle in one's head. But, especially if planning ahead for extraordinary expenses, the homemaker resorts to paper, pencil, calculator, and file drawer. When the collection of papers becomes too large to thumb through easily or when three or more alternatives to financing a purchase must be considered, the personal computer, running household finance software, becomes practical for the small nuclear family. For large families, or group homes--whenever one must juggle more than 100 items at a time or solve the same information problem more than once a month--the homemaker's productivity can probably be improved with a personal computer. Programs which aid in keeping track of inventories, product costs and suppliers, appointments and scheduling, tax accounting, and health records are all available. There is also a growing collection of educational and recreational software for sale to the general consumer.

KNOWLEDGE AND SKILLS ESSENTIAL OR IMPORTANT FOR PRODUCTIVE COMPLETION OF SUCH ACTIVITIES

Awareness of the computer products available, an understanding of information processing principles, a knowledge of how to solve homemaking problems without a computer, and hands-on experience in using a few specific computer programs--all these should be included in homemaker education. In addition, students should realize that one is always learning when using a computer. Homemakers will have to adjust to the fact that they will only be scratching the surface of the capacity inherent in this device. Their education will never be complete.

The computer software, or programs (sets of instructions which the computer follows) determine what the machine can do. A budgeting program running on a desktop computer can help homemaker and business person alike with the task of planning purchases in line with expected income. It is the "user interface" of that program, that is, the sequence of buttons and keys you must push combined with the messages the computer sends back to you via the display screen or speaker, that determines how easy it is to use. A distinction between a computer <u>user</u> (one who commands the machine to run programs) and a computer <u>programmer</u> (one who writers programs) can be made. Many special purpose programs, compatible with different computer brands, are marketed. Where a popular application (such as those just discussed) exists, there is going to be pre-programmed software available.

Therefore, writing computer programs in BASIC or any other general purpose language is not a skill that will be directly useful to the homemaker except as an enjoyable pastime. However, an understanding of the principles of programming in any language will help a computer user understand the limits of the computer system, dispel any tendency to attribute "magical powers" or "superintelligence" to the machine, and appreciate its real utility. They will need to approach computing intelligently, step by step.

Simple "machine literacy" will be necessary for successful use of desktop computers (and computer controlled appliances as well). This means an understanding of the contexts within which all electromechanical devices function. Connection to a power source, secure, clean, dry electrical contacts between devices, an unobstructed range of movement for all mechanical parts, proper ventilation, knowledge of fuses, switches, speakers, CRTs--this practical information will help solve the most common problems encountered by beginning computer users. Also, a mastery of simple maintenance principles should be developed. For example, when the main computer system switch is turned on and the screen fails to light up, the homemaker should be able to follow a logical check-out sequence to find out which part of the machine is malfunctioning. Is there power to the screen? It is turned on? Are the brightness and contrast controls within range? Is it connected to the computer? Is the computer itself turned on? Is the computer software properly installed?

Many computer programs include large amounts of information. For example, a nutritional analysis program might contain the vitamin and caloric content of standard servings of many common foods. This same information is available to the homemaker in many books and charts. It is stored in the computer program so that it can be read quickly by the computer for use in calculations specified by the programmer. When combined with details supplied by the homemaker typing on the computer keyboard, the computer appears to "know" what is good for this particular family. Whether the computer-delivered recommendations are valuable or not depends on the program used and on the knowledge and skill of the user. Homemakers must learn to evaluate such programs in terms of the accuracy and utility of their results as well as the efficiency of using computers for tasks normally done "by hand".

SPECIAL EQUIPMENT

Any personal computer will do. Access to several different brands will give students an experience of the variety currently available and permit them to generalize about the characteristics common to all types of small computer. Equipment should include stand-alone models designed for use by one person at a time, multiple-user systems which permit Junior to do his homework while Sis is composing music and Mom is planning the family-room addition, and telecommunications components for banking, shopping, and electronic mail.

A broad spectrum of software should be explored, including: personal data base management, budgeting, financial projection, word processing, over-the-phone communications, scheduling, tutorial, drill-and-practice, and games. If possible, a variety of application software packages designed to solve the same problem should be presented--several different information management packages, for example. Users should remain aware that there are many different approaches to each problem and that no one program will do everything. The homemaker should understand that a computer program itself is not a "problem solver." It is one out of many possible solutions created by the computer programmer to alleviate a stated problem.

GROWTH AND TRENDS IN THE DIFFUSION OR EXPANSION OF THE TECHNOLOGY

Personal computer systems are being heavily marketed for home use today and we can expect advertising to increase in the next three to five years. Systems will get smaller, cheaper, less fragile, and easier to use. However, the workload of the homemaker in charge of a nuclear family is not getting significantly more complicated. Thus, the need for even a small computer in such a setting is open to question.

In other homemaking-related settings such as group care homes, institutional and commercial food service facilities, government agencies and small businesses which serve homemakers, the use of both small and large computers will become essential to productivity. The problems encountered here are identical with clerical and office tasks in any business. Data will be stored and transferred electronically. Everything from cash registers to cafeterias will be "programmable". Each device will be different. Willingness to learn new procedures is the one skill that will prove most valuable to us all.

ADVANCES IN HOUSEHOLD APPLIANCES

by
Audrey P. Stehle
Chesapeake, Virginia

Household appliances, as the consumer of the 80's will know and use them, will incorporate the following changes and technologies:

A very large number of microwave cooking appliances. Presently about one-fourth of American households use a microwave appliance; this number is expected to increase to nearly 50% by 1985.

An increase in the number of convection cooking appliances. This technology in combination with surface units and microwave ovens will evolve into widespread use as consumers replace old, out-of-date equipment with applicances offering new combinations of cooking methods and processes.

Appliances, both portables and majors, will be more " intelligent", offering more precise control, self-cleaning capability, easy maintenance finishes, programmable functions, and other features to meet the demands of homemakers who are faced with shorter periods of time for homecare, maintenance activities, meal preparation, and storing of food and supplies.

Some specific examples of these more "intelligent" appliances are:

- Clothes washers with electronic soil sensors which add or delete cycles to prevent undercleaning or overcleaning.
- Room air conditioners with remote programming capabilities.
- Refrigerators and freezers that defrost "on demand" and alert the homemaker to unsafe temperature conditions.

Continued advancement energy efficient household appliances and equipment. This trend will continue as energy costs and operating figures continue to rise.

Appliances will become smaller and more compact to meet the needs of changing lifestyles, diminishing family size and a decrease in house size with concurrent decrease in kitchen and storage area.

As the household appliance industry incorporates these technologies into appliance features, and as the homemaker's role changes, vocational education needs and opportunities will also change. Educational systems must evaluate the impact of these changing technologies on the work performed in the home and find ways to educate homemakers about modern methods of managing personal finances, conducting consumer activities, and performing care and maintenance functions associated with homemaking.

KNOWLEDGES AND SKILLS

The creative homemaker will find innovative ways to meet family needs as she or he learns how to use tools and appliances which offer new technologies. Today's homemaker is likely to be a manager, guiding various activities, sometimes by phone or other communication systems, and a family member interested in personal and family health and fitness, directly involved in numerous activities related to these interests. In part due to change since house appliance technology, the work of homemaking will become more mental (and emotional and psychological) and less physical. To take full advantage of technical capabilities--and to most efficiently use homemaking time and resources--knowledge of both appliance use and care and of principles underlying modern home economics (nutrition, etc.) is required.

Generally, advances in home appliance technology coupled with a concern for resource conservation, make efficient use and care of appliances a greater challenge. Personal financial management, acquisition, care, and maintenance of appliances, and effective utilization will change as finishes, controls and functions performed by evolving appliance features take on new dimensions. Skills needed in this area include:

- How to program appliances to perform or delete cycles which are needed-or-not as the homemaker determines.
- How to utilize basic computer controls and electronically operated appliances to effectively manage personal and household resources.
- How to utilize existing technologies (VCR, disc and similar electronic equipment) to gain new information and data pertinent to home maintenance, food preparation, and other "how to" skills.
- How to manage money related to household appliance selection, operation and maintenance.

As technologically advanced appliances become more common, homemakers will need to expand specific knowledge areas related to these changes. For example, food preparation is one major area of advancement in appliances. Basic food management, nutrition, and preparation information will be needed. It should relate to the newer appliance technologies of the microwave oven, convection oven, and portable appliances such as the food processor. Skills needed in this area:

- How to utilize the programming capabilities in household appliances to maximize homemaker effectiveness.
- How to select and incorporate these appliances effectively into meal preparation activities.
- How to convert standard recipes for both microwave and convection capabilities.

- How to plan and prepare meals utilizing microwave technology.
- How to utilize convection and microwave appliances for maximum energy efficiency in meal preparation.
- How to utilize portable appliances for energy, time and personal efficiency when preparing meals for smaller families.

As another example, new refrigeration units with various temperature controls and other features will be available. At the same time, food selection and storage will become even more important as food costs rise, occasional shortages occur and homemakers' time and energy are demanded in other functions. Skills needed in this area include:

- How to plan nutritious well-balanced meals for families who eat in shifts.
- How to select food for best quality and value.
- How to store food for maximum quality retention, taking advantage of refrigeration capabilities as appropriate.

EQUIPMENT AND FACILITIES NEEDED

In this area, nothing works more successfully than learning on the actual equipment which consumers and homemakers will be using in their homes. Home economics educators are fortunate to have established teaching units which incorporate kitchen and other appliances found in actual settings. These offer an unparalled opportunity for educators to incorporate numerous programs at many different levels, depending on the needs of the students, the available space, funds and equipment and teaching techniques being utilized.

An interdisciplinary approach should be considered when plans are being developed to enhance the knowledge and skills needed by homemakers to meet these changing technologies. For example, work with industrial arts teachers to develop prototypes of storage units needed for portable appliances; consulting with computer firms or businesses locally to obtain effective electronic learning tools for teaching homemaking skills; utilizing a variety of techniques and formats to encourage maximum student participation. "Hands on" use of appliances and equipment is extremely effective in acquiring advanced levels of knowledge and degrees of skill.

There are two lists of household appliances which educators should consider for inclusion in a teaching facility.

MAJOR HOUSEHOLD APPLIANCES

Basic:

- Range, preferably gas and electric
- Microwave oven, either countertop or built-in
- Refrigerator-freezer

Optional:

- Convection ranges
- Laundry equipment

PORTABLE HOUSEHOLD APPLIANCES

Basic:

- Toaster oven
- Mixer
- Frypan
- Slow-cooker

Optional:

- Food processor
- Blender
- Speciality appliances

Videotex and Home Management

by

Anne L. McKague
NORPAK, Ltd.
Toronto, Ontario

"Videotex" is the generic term used to describe an electronic communications system which enables the user to receive and display graphics and textual information on a television screen. Sometimes it is a two-way system, with which the user may interact with the computer sending the messages. This is known as interactive or two-way videotex. In other configurations the user may only choose what information to view, but not send messages back to the computer. Usually this is because the information has been encoded onto a broadcast signal. This type of videotex transmission is known as broadcast videotex, or teletext.

For the consumer, homemaker, and other consumer and personal care applications, we should describe the typical videotex set-up as it would exist in the home. The potential videotex user needs a television set on which the information is displayed. For best results, it should be a color television set. If the user wishes to receive teletext, he/she requires a small box to attach to the TV set. This box is known as a "decoder," because it takes the coded videotex information from the broadcast signal and displays it as pictures and text on the screen. Usually a small keypad, like a hand-held calculator, comes along with the decoder. It is either connected to the decoder by a wire or communicates with it by infrared signal. To view teletext with this configuration, the user need only to tune to a television channel known to provide teletext (it is not visible to the average TV viewer), and turn on his decoder. He will then see a "menu" page, which lists the things he may view ("News Headlines," "Weather Forecast," etc.) and a number. If he presses the number on his keypad, he will receive that information.

For two-way videotex, a telephone is usually required. The user dials a special telephone number which connects him to a videotex computer database. He then views information in the same manner as described above, except that the computer can receive and record his responses.

Why is that significant? It is crucial to the homemaker/consumer. If a retail store has put pictures of its merchandise on a two-way videotex database, along with order codes, the consumer may look at and then order the goods directly from his own home. The computer simply receives the product code and account number which the user punches in on his keypad, sends the order to the shipping department, and bills the customer at the end of the month. The user would receive his goods by truck a day or two later. This activity is known as "teleshopping." It could be of tremendous value to shut-ins and those who don't have time to shop in person. It could very well bring back the old days of the grocery order.

However, two-way videotex offers many more possibilities to the homemaker. Any course offered in a school or university could be relayed to the homemaker through videotex. After learning a lesson, the videotex user could actually take tests or answer questions because of his link-up to the computer. The college or institution offering the course would monitor the home student's progress, and could even re-program the computer to better suit the needs of the individual student. Therefore, the homemaker's traditional dilemma of having to choose between furthering her/his education and staying at home could finally be resolved through videotex. Job training, of course, could be taken in the same fashion. Homemakers, by devoting small parts of the day (and time would be unimportant, since the computer information is there all the time) to a videotex training course, could acquire some new skill in preparation for re-entering the workforce or just for self-improvement. Special training on the part of the homemaker would not be required, since using the decoder and keypad is no more complicated than using a microwave oven or a telephone.

Those rearing children could use educational videotex programs to enhance the child's day care. Further, experience has already shown that the use of videotex provides a painless introduction for children to the world of computers--a world for which today's children absolutely must be prepared.

Future developments and trends reveal an even more startling way in which videotex will enable the homemaker to actively participate and contribute to tomorrow's world. Microcomputers, popular devices which are equipped with keyboards and enable the operator to create programs and engage in interactive games and learning activities, to create his/her own software or use the software (programs) of others for tax planning, home budget management, or calculation, are merging slowly with the new information technologies such as videotex. We will see a time when a user will hook up his/her personal microcomputer to a videotex decoder, or even purchase a microcomputer which integrates a videotex decoder in its working parts. The consumer can then not only receive but create videotex information as a part of an interactive program. This information can then be relayed through the decoder directly to a host computer. From there it can be received and used by others. In this way, every individual will be able to share her/his own knowledge and skills with anyone else in the world. A homemaker could not only receive a course in Spanish from a homemaker in Puerto Rico, but contribute a cooking lesson or gardening advice in return. A true worldwide information exchange could develop, enhancing interracial and international understanding. Further, in the interconnected videotex world of the future, many jobs which today reuqire physical presence in an office will be able to be performed at home. The homemaker's world will broaden considerably, and the traditional office worker may begin to view working out of the home as an attractive and viable alternative.

CHAPTER III

BIBLIOGRAPHY

The following annotated bibliography includes citations descriptive of new or emerging technologies, their diffusion, or insights as to their vocational impacts. The bibliography is the product of considerable resource effort and is judged to be a useful beginning source for those interested in increasing their awareness and understanding of relevant technologies and their practical implications.

Jenks, M. E. Microwaves--The wave of the present. In Microwave ovens--what's cooking? (Proceedings of the National Technical Conference of College Educators in Home Economics). Chicago: Association of Home Appliance Manufacturers, 1978, pp. 12-16.

Overviews market penetration statistics for microwave ovens. Provides guidelines to industry for the development of maximally effective products in three areas: food products specifically for microwave ovens; packaging specifically for microwave reconstitution; and microwave cooking instructions on dry grocery and frozen food product labels. Describes problems with lack of standardization of ovens, and gives examples of recipe conversion.

Layton, W. C. Product service: A return to the offense. In New demands--New directions (Proceedings of the 29th National Home Appliance Conference). Chicago: Association of Home Appliance Manufacturers, 1978, pp. 78-79.

Discussing service technicians' interaction with new consumer appliances, points out efforts at accreditation of repair personnel and the systematic use of repair personnel input in the design of new items.

Myers, J.G. Marketing managers: Start assessing effects of computer video technology marriage, now. Marketing News, June 26, 1981, 14 (26), 1, 11.

Draws attention to videotex as a consumer information resource. Mentions computer/video systems as a new industry, as well as an advertising tool.

Owens, J. Computerized estate planning. Microcomputing, October 1980, pp. 31-35.

Describes a personal computer program for estate planning through projections.

Rhoades, R.J. Green thumb computing. Microcomputing, April, 1980, pp. 24-26.

Describes a personal computer program for garden planning.

Triplett, R. D. Current developments in induction cooktops. In Current developments in home appliances (Proceedings of the National Technical Conference of College Educators in Home Economics). Chicago: Association of Home Appliance Manufacturers, 1980, pp. 6-11.
Describes the principles underlying magnetic induction cooking. Predicts growth in market penetration. Describes energy-saving and convenience advantages of induction-based ranges.

Wennerberg, A. L. Current developments in electronic controls. In Current developments in home appliances (Proceedings of the National Technical Conference of College Educators in Home Economics). Chicago: Association of Home Appliance Manufacturers, 1980, pp. 12-14.
Discusses applications and trends in electronic and microprocessor controls for appliances. Functions that are in place or can be expected in the near future are listed for appliances

REFERENCES

"America's Skilled Trades Shortage: A Positive Response." Prepared by the Public Affairs Committee of the Task Force on the Skilled Trades Shortage, Brecksville, Ohio, March 3, 1981.

Ayres, R. U. and Miller, S. "Robotics, CAM, and Industrial Productivity." National Productivity Review, 1,1, Winter 1981-82, p. 54.

Birch, D. L. Presentation to the Council of Upper Great Lakes Governors, delivered at the Symposium on Small Business, Green Bay, Wisconsin on March 5, 1982.

Drewes, D. W. "Working for America--A Worker-Centered Approach to Productivity Improvement." Raleigh, NC: CONSERVA, Inc., September 1982.

John Paul II. "Laborem Exercens: On Human Work." The Third Encyclical of Pope John Paul II reprinted as a supplement in the North Carolina Catholic, September 27, 1981.

Riche, R. W. "Impact of Technological Change." Paper presented at OCED's Second Special Session on Information Technology, Productivity, Working Conditions and Employment, Paris, France, October 19-21, 1981.

Thurow, L. C. "The Productivity Problem." Technology Review, November/December 1980, p. 45.

U.S. Chamber of Commerce. Statement of the Chamber of Commerce of the United States on Productivity, presented to the Senate Committee on Labor and Human Relations by Dr. Ronald D. Utt on April 2, 1982.

U. S. Congress. 97th Congress, 1st Session. Joint Economic Committee. "Shortages in Skilled Labor." Hearing before the Subcommittee on Economic Goals and Intergovernmental Policy, November 3, 1981. Washington: GPO 1982.

U. S. Department of Labor. "Occupational Outlook Quarterly: Computers." Washington: DOL, Summer 1981.

U. S. Department of Labor. "Occupational Projections and Training Data." Washington: DOL, September 1980.

U. S. Senate. 97th Congress, First Session. "Industrial Growth and Productivity," Hearings before the Subcommittee on Industrial Growth and Productivity, December 3 and 5, 1980; January 26, 27, and 28, 1981. Washington: GPO, 1981.