DOCUMENT RESUME

ED 274 868 CE 045 325

AUTHOR Shelly, Richard W.
TITLE Microcomputer Applications in Secondary Health Occupations Education: State of the Art.
INSTITUTION Henrico County Public Schools, Glen Allen, VA. Virginia Vocational Curriculum Center.
SPONS AGENCY Virginia State Dept. of Education, Richmond. Div. of Vocational Education.
PUB DATE 85
NOTE 74p.
PUB TYPE Reports - Research/Technical (143) -- Tests/Evaluation Instruments (160)

EDRS PRICE MF01/PC03 Plus Postage.
DESCRIPTORS Academically Gifted; Administrator Attitudes; Allied Health Occupations; *Allied Health Occupations Education; *Computer Assisted Instruction; *Courseware; Educational Practices; Instructional Materials; Medical Record Technicians; *Microcomputers; Nursing Education; Physical Disabilities; Secondary Education; Special Education; State of the Art Reviews; Teacher Attitudes; Vocational Education
IDENTIFIERS Special Needs Students

ABSTRACT

A study was undertaken to identify the different ways and the extent to which microcomputers are being used in secondary health occupations education (HOE) programs, the amount and types of applicable software and level of support for microcomputer-based HOE, and available literature reflecting or supporting the development of computer-assisted instruction in HOE. Data were collected from a literature review and surveys of 180 vendors of microcomputers and related courseware and 150 teachers and 35 supervisors of HOE programs. It was discovered that although commercially produced software that is appropriate for use in secondary HOE programs does exist, the selection is quite limited. Commercial educational software developers were largely unaware of the existence of a need for HOE courseware, and most HOE teachers surveyed were unaware of the magnitude of the software gap that exists in HOE. No single commercial software development company whose primary focus was HOE software was found. Drill-and-practice software was used most frequently, whereas simulation courseware (the one that appeared to be the most effective) was the least used and least available. Only 1 in 10 teachers surveyed was using microcomputers in an HOE program. (This report includes a taxonomy of microcomputer software for HOE teachers, a 67-item reference list, and appendixes containing the letter sent to vendors to solicit information for the study and the teacher and supervisor survey instruments.) (MN)

MICROCOMPUTER APPLICATIONS IN SECONDARY HEALTH OCCUPATIONS EDUCATION: STATE OF THE ART

Written by

Richard W. Shelly, Ed.D.
Virginia Polytechnic Institute and State University
Blacksburg, Virginia 24061

Produced by

Virginia Vocational Curriculum Center
Department of Vocational and Community Education
Henrico County Public Schools
Glen Allen, Virginia 23060

In cooperation with

Commonwealth of Virginia
Department of Education
Vocational and Adult Education
Richmond, Virginia 23216

1985

ACKNOWLEDGMENTS

This publication is a combination of two monographs written by Dr. Richard W. Shelly of Virginia Polytechnic Institute and State University. A Taxonomy of Microcomputer Software for Secondary Health Occupations Teachers has been inserted as Section VII of this report. Dr. Shelley's dedication of time and effort in researching and presenting the information is greatly appreciated.

Dr. Kay B. Brown, Supervisor of Vocational Curriculum Development, Virginia Department of Education, coordinated the final publication process. The organizational and editorial revisions necessary to prepare the manuscript for publication were performed by the Virginia Vocational Curriculum Center, administered by the Henrico County Public School, Department of Vocational and Community Education:

Flora C. Armstrong, Center Director
Elizabeth R. Casey, Writer/Editor

Dr. William C. Moore, Director
Division of Vocational Research and
Adult Services
Virginia Department of Education

Carol A. Stickney, Supervisor
Health Occupations Education
Virginia Department of Education

CONTENTS

Section I

Study Overview

INTRODUCTION

> The truth is that the world is about to move on from the era where knowledge comes locked up in devices known as books...in the era it is about to enter, the books will come down from their shelves, unlock and release their contents, and cajole, even beseech, their owners to make use of them.
>
> Christopher Evans
> The Micromilennium, 1979

Microcomputer technology, an innovation that began less than ten years ago, is an alternative that offers many opportunities for health occupations educators. While the cost for this technology has steadily decreased, the possibilities for useful application in the classroom have risen. The adolescent has been introduced to microcomputer technology at home and in video arcades. It is now time to capitalize on that interest in the classroom, coupling it with sound instructional strategies to allow the technology to reach its fullest potential in education.

Microcomputers have found their way into schools and industry, but few are found in secondary Health Occupations Education (HOE) classrooms. One may find the apparent causes for this deficit by looking primarily at the issues of cost, lack of software, and inadequate computer literacy; however, to explain this deficit fully involves looking closely at some generic questions facing health occupations educators today. These questions require educators to ascertain where they are at present and what direction they intend to take with respect to implementation of computer technology. The impetus for initiating this study was provided by these generic questions concerning need and direction, and through the desire to explore the important issues concerning this technology.

RESEARCH PROBLEM AND QUESTIONS

With the advent of microcomputer technology and its impact on instruction, little concommitant investigation existed concerning the status of computer-assisted instruction (CAI) in secondary health occupations programs. The central problem was, therefore, the lack of a generalized database from which to guide subsequent investigations or to direct implementation in the field. Answers were sought to questions in the following areas of concern:

1. What applicable software is available for secondary HOE and what are the needs for development of software?
2. To what extent are microcomputers being used in this field?
3. How are microcomputers being used?
4. What levels of support for microcomputer-based instruction are evident or planned?
5. Is there a body of literature which reflects or supports the development of CAI in HOE?

DEFINITION OF TERMS FOR THIS STUDY

Health Occupations Education (HOE). Career exploration and training (aide/assistant level occupational preparation) provided below the baccalaureate level, for service in disciplines related to medicine, nursing, dental care, and the allied health professions. This study involves efforts at the secondary and vocational school only, and the specific definitions.

Computer-Assisted Instruction (CAI). A programmed instructional package which uses the microcomputer as the method of delivery.

Beginners All Purpose Symbolic Instruction Code (BASIC). A programming language that is common to most microcomputers and which enables the user to direct the activities of the computer. A single or universal version does not exist, and several variations of the language can be found.

PARAMETERS OF THE STUDY

1. The study samples consisted of HOE teachers from Virginia and other states, state supervisors of secondary HOE, and members of the educational software industry.

2. The major focus of the study was on secondary HOE programs; therefore, the data gained may not reflect on other areas of health care or health occupations education at the postsecondary, university, or postgraduate level.

LIMITATIONS OF THE STUDY

Those interpreting the data from the teacher survey should note that the pool of teacher data came from two sources. The first source consisted of all of the secondary HOE teachers in the state of Virginia; the second source was composed of a nationwide sample of teachers who were identified by their respective state supervisors. It was felt that the approach of combining these two populations would provide a valid representation for the survey and would provide a broad view of the teacher's perspective. Subsequent studies may serve to provide further useful results by separating the information received from the two groups into distinct groups of data.

THE RESEARCH DESIGN AND METHODOLOGY

The purpose of the study was to define a database and to describe microcomputer applications in secondary health occupations education classrooms. The design of the study was comprised of four components, as follows:

1. The literature search
2. The survey of software developers and vendors
3. The supervisors' survey
4. The teachers' survey.

The literature search was undertaken to investigate the theoretical, conceptual, and operational microcomputer applications in HOE at the secondary level. The survey of software developers and vendors provided information on current hardware and software which is commercially available to school systems. A survey of teachers both outside and within the Commonwealth of Virginia provided a glimpse of current practices, as well as indications of teacher support for microcomputer use. Suggestions for specific topics for software development were also provided. A survey of state supervisors of HOE provided a contrasting view of the quantity and quality of microcomputer use, as well as a perspective on the extent of supervisory support for CAI as a function of actual state-level administrative plans for that purpose.

A descriptive research design was used for this study, with reliance on substantive significance for analysis of observations and variables. A distinct research hypothesis was not suggested, and there were no comparisons made. The literature search used several databases, including the ERIC database using the DIALOG Information Retrieval Service. The Resources in Computer Education (RICE) database, which is in the Biographic Retrieval (BRS) System, was searched. The Microcomputer Software and Information for Teachers (MicroSIFT) clearinghouse, established through the Northwest Regional Education Laboratory, was also consulted.

The basis for the survey of software developers and vendors was provided by a list of 488 software firms specializing in the production and distribution of educational software. It was anticipated that these firms could provide information on products that are available on the commercial market, as follows:

1. The price of available products
2. The level of sophistication of the products
3. The compatability of products with specific operating systems and hardware
4. The content category of the products.

State supervisors of Health Occupations Education Service were considered to be an important data source. The names of the 78 individuals in this position in the 50 states were drawn from the June 1983 listing in the Directory of State Officials with Supervisory Responsibility for Vocational Health Occupations Education, which is published by the U.S. Department of Education, Office of Vocational and Adult Education. As a part of the questionnaire, these supervisors were asked to identify teachers who "maximize the use of microcomputers in the HOE classroom." The teachers identified by the supervisors were added to the pool of HOE teachers to be surveyed.

The responses of actual HOE classroom teachers provided crucial information required to help define the state-of-the-art of microcomputer applications. The list of out-of-state teachers was pooled with the current list of secondary HOE teachers (for the 1983-1984 academic year) from the Commonwealth of Virginia. Each teacher in the pool was then sent a questionnaire which elicited data and opinions pertaining to current and anticipated use of microcomputers, characterizations of their respective student populations, and preferred topical areas for future software development.

Materials received from vendors, including catalogs, software descriptions, and reviews, were examined for applicability in the secondary HOE setting. Recommendations for inclusion in the "Taxonomy of Microcomputer Software for Secondary Health Occupations Teachers" (Section VII of this report) were based upon several predetermined criteria. In order to be included, a particular software program must:

1. Have applicability to the curriculum of at least one of the career development or career exploration programs listed by the Health Occupations Education section of the American Vocational Association at the secondary level

2. Have applicability in classroom management or administration (e.g., recordkeeping, databanks, enhancing communications with parents or administrators, keeping attendance, etc.)

3. Offer the HOE teacher the opportunity to author his/her own software, providing lessons, drills, and tests simply and without elaborate programming.

Additionally, an effort was made to screen for the more moderately priced courseware (usually under $100.00), unless the material involved was unique to a particular subject matter area or was priced at an amount that was typical of the price range of software offered to a particular program. Medical assisting, for example, often requires programs for student learning which are routinely used in physicians' offices and are significantly more expensive than most other software.

Section II

Review of the Literature

COMPUTER-ASSISTED INSTRUCTION

Computer-assisted instruction (CAI) was unveiled in 1958 in the form of an instructional package written to teach binary arithmetic (David, 1978). In 1960, research was initiated at the University of Illinois to develop and implement an automated computer teaching system known as Programmed Logic for Automatic Teaching Operations (PLATO) (Lyman, 1974; Hallworth and Brebner, 1980). Subsequent attempts to implement CAI in the schools during the '70s generally met with failure. Resistance by teachers who felt threatened by their potential "replacement" was a significant factor (Sojka, 1981). Other reasons for the early failure were costs of hardware, lack of appropriate software, the time required to produce adequate instructional software, and the lack of access of most schools to terminals connecting with the large mainframe computers (Sojka, 1981; Hon, 1980). Although many of these problems still plague the future of CAI, the software problem appears to be the most pressing in HOE. While there is an immediate need for large amounts of software in most fields of education (Boraiko, 1982; Lu, 1982), it appears that HOE, especially at the secondary level, has a particularly acute need for software (Shelly, 1984).

The number of microcomputers in the American public schools seems to be illustrated by the steep upward side of a logarithmic curve. In 1982, it was estimated that microcomputers were in place in approximately 15% of the public schools (Zweig and MacMillan, 1982). Becker (1984) reported that in January 1983, approximately 53% of American schools had at least one microcomputer. Further, he reported that programming and computer literacy activities occupied 66% of the instructional time in secondary schools, and drill and practice activities took up another 18%.

The remainder of the time was split between learning games, word processing, science work, and business courses. Becker further reported that the median number of microcomputers in public schools in January 1983 was 5.3, with the median ratio of students per microcomputer being 125:1, or approximately 10% of the student body using a micro during a single week. HOE student use was not mentioned in this or any other study currently available.

In January 1984 it was reported that more than 325,000 microcomputers, an average of 11 in every high school, were present in America's public schools. Of that number, it was estimated that 160,000 of them were Apples; 68,000, Radio Shack TRS-80s; and 49,000 were Commodores (Market Data Retrieval Service, 1984).

The number of computers in America's schools has more than doubled in the last year. In a survey of the nation's school districts, Market Data Retrieval Service found that more than 55,000 schools now use microcomputers. In fact, only 14% of school districts are not using computers. Some 68% of all elementary schools, 62% of all middle schools, and 86% of all high schools have computers for student use (Market Data Retrieval Service, 1984).

CAI IN GENERAL VOCATIONAL EDUCATION

Several studies of CAI versus non-CAI instruction in vocational education programs have not revealed that a significant difference in student achievement exists between control and experimental groups (Cokewood, 1980; Shaw, 1978; Wolcott, 1976). Studies of time-on-task for CAI use in vocational education programs have reported, however, that CAI students completed the instructional units in less time than did traditional students (Larson, 1981; Ford, Walkington & Bitter, 1981; Shaw, 1978; Wolcott, 1976).

Rodenstein and Lambert (1982) produced an excellent collection of papers and information related to the use of microcomputers in vocational education. This collection outlined microcomputer applications and emphasized integration into many of the vocational specialties, including health occupations. Regrettably, the section on HOE was merely a list of sources that supply information on programs for allied health. This is noted only to point out the dearth of publications in the area of microcomputer applications in HOE.

Beversdorf (1983) offered an excellent review of microcomputer use in education generally and in vocational education specifically. Sections addressing applications in each of the major vocational programs areas, including HOE, were presented. Again, this collection did not include any articles or information relating to classroom use of microcomputers in the secondary (or postsecondary) setting. There appears to be a severe lack of literature relating to the specific planning, implementation, and evaluation of the instructional uses of microcomputers in the secondary HOE classroom.

CAI IN HEALTH OCCUPATIONS EDUCATION

The use of microcomputers in HOE, either at the secondary or postsecondary level, is a relatively new phenomenon. An otherwise comprehensive review of the HOE literature by Gillespie and Redford (1980) does not contain any references to microcomputer use. A survey of vocational-technical facilities in Michigan indicated that only 4% of the centers surveyed use microcomputer software in the secondary HOE setting (Harris, 1983).

The existing literature concerning CAI with postsecondary health occupations students is, as indicated in this report, both scarce and less than impressive in terms of the significance of any findings. It does not appear that overwhelming support exits for CAI use as an instructional tool. Many comparative studies find no discernable difference to exist between the effectiveness of CAI when compared to previous instructional methods.

In looking at instruction of first-year nursing students in intravenous flow rates (Larson 1981), a comparison of CAI versus traditional approaches did not demonstrate a significant difference in student learning for either method. Boettcher, Alderson, and Succuci (1981) studied the effects of CAI use with nursing students and noted no significant differences between CAI and printed instruction. Coupled with the findings of Avner, Moore, and Smith (1980), there appears to be support for the contention that learning effectiveness is determined to a great extent by <u>how</u> CAI is used, rather than the fact that it <u>is</u> used.

Vsalish and Boyd (1975) indicated that there were no differences on performance measures between experimental and control groups of nurses in a continuing education course. They concluded that CAI produced evidence of verification of previously learned clinical knowledge, but did not augment knowledge. Likewise, Huckabay, Anderson, Holm, and Lee (1979) demonstrated no significant differences between groups on measures of cognitive learning and transfer of learning to the clinical setting. Nevertheless, impetus for CAI trials in the secondary HOE classroom may be gained from the wide support found in similar health-related settings.

In a study on the use of CAI in teaching surgical nursing, Conklin (1983) noted that the CAI group demonstrated greater gains in learning than a control group which used traditional methods. Further, she asserted that there was no significant difference in attitude scores and that attitudes toward the use of CAI increased in both the CAI and non-CAI groups. Thomas (1979) provided a similarly positive perspective in stating:

> CAI, when used as a supplement to ongoing instruction, usually produces greater achievement regardless of teaching strategy, computer system, testing method, or level of instruction.

Conklin (1983) elaborated as follows:

> Very few studies have been designed to determine the effectiveness of CAI in the health professions but the general consensus seems to be that it is at least as effective as most means of teaching.

Due to its great number of practitioners and to the professional and academic maturity levels, nursing appears to provide the most fertile ground for documentation of CAI in the health care instructional setting. Reports of CAI use in nursing were found in the nursing literature as early as the 1960s. Only recently has there been significant interest shown in various nursing applications which may serve as a model for microcomputer research in HOE.

The use of CAI in hospital inservice courses for nurses was documented by Hoffner, Mathewson, Loughrey, and Barnett (1975). Its use in nursing refresher courses was first reported in 1975 by Levine and Weiner. The earliest reported use of microcomputers in nursing education was reported in 1969 by Bitzer and Boudreaux. Subsequent reports by Bitzer and Bitzer (1973), Olivieri and Sweeney (1980), and Timpke and Janney (1981) illustrate other studies that were undertaken to document the efficacy of the CAI approach in nursing education. These and other reports provide models for beginning studies to generate a body of similar literature for secondary HOE. The articles cited range from information on using microcomputers to teach drug dosages to a model for evaluating clinical learning by computer.

Applications of microcomputers in the health care setting, including hospitals, clinics, and medical and dental offices, are being reported in the literature with increasing frequency. Vose (1982) reviewed current uses of microcomputers in the medical workplace, noting that they are being used to diagnose, educate, and gather information. The examples cited included the following:

1. Keeping patient accounts and records
2. Keeping records on medication, nutritional analysis, and diet control
3. Scheduling of hospital and office visits
4. Recording patient billing and general ledger information
5. Testing of pulmonary functions
6. Analyzing blood gases
7. Providing information systems on drug interactions and poison control.

Other applications of microcomputers in health care settings which Voss cited include development of profiles of psychiatric patients and their probability of suicide, the use of microcomputers and videotapes in marriage counseling, and microcomputer use in rural health care settings to record primary and secondary ailments of patients, where visits to the doctor are rare. Use of CAI has also been reported in the training of surgical residents (Halverson and Ballinger, 1978). Hicock and Wiggers (1983) have reported successful use of CAI in the training of medical technologists.

CLINICAL SIMULATIONS AND PATIENT MANAGEMENT PROBLEMS

The theoretical and conceptual principles of clinical simulation as a teaching and testing mode were defined largely by McGuire, Solomon, and Bashook in 1976. Since that time, the use of written simulations for teaching problem-solving and data-gathering in a protected setting has been expanded to include computerized clinical simulation (Jones and Keith, 1983). The use of microcomputer simulations is believed to enhance the richness and realism of learning experiences, decrease risks to the patient, increase exposure of students to "unusual cases," and allow students to explore unusual solutions without disrupting the real care of patients (Jones and Keith, 1983; Hicock and Wiggers, 1983).

Vose (1982) documents the use of microcomputers in computer-assisted medical problem solving, a teaching application used in medical schools. Commercial computerized clinical simulations are available for medical students, respiratory therapists, medical technologists, and to a lesser extent for nursing students. The patient-management format of simulation is reported to build skills in the areas of data gathering and problem solving, an application which may be extremely helpful for the learner in the secondary HOE classroom.

LACK OF SOFTWARE: "THE SOFTWARE GAP"

The lack of quality software has been and continues to be a major issue as teachers and administrators approach the task of planning for microcomputer instruction (Boraiko, 1982; Lu, 1982; Merton, 1983; Vasek, 1983). Commercial software that is available for use in the development of specific skills in vocational programs is rare (Tidnall and Gugerty, 1983). The lack of applicable software in secondary HOE is but a reflection of the problem experienced elsewhere in vocational education, but magnified many times (Shelly, 1984). Teachers are presently faced with the tasks of teaching computer literacy (to themselves and their students) and writing software, all without a great deal of assistance from the microcomputer field (Vasek, 1983).

CAI AND THE GIFTED STUDENT

A great deal of support can be found in the literature for the use of CAI with the gifted child (Walkington & Babcock, 1984; Kulm, 1984; Dover, 1983; Overall, Howley, & Leventhal, 1981; Ford, Walkington, & Bitter, 1981; Milner & Wildberger, 1977). However, it has been pointed out that it is not necessarily the most academically successful child who is skillful with the computer (Overall, Howley & Leventhal, 1981). With the relatively low number of gifted students enrolled in secondary HOE classes, it is to this average group and the special needs group that studies of CAI in HOE will be most efficiently targeted.

CAI AND THE SPECIAL NEEDS STUDENT

As with the gifted students, there is a growing body of evidence in the literature supporting the idea that students with disabilities, handicaps, and other special needs may profit from use of CAI (Tindall and Gugerty, 1983). Davis (1984) suggested that the following advantages accrue to teachers who find themselves involved with new microcomputer technology and with students who are "special":

1. Special students approach CAI use with an open mind.
2. Students experience successes with CAI and are encouraged.
3. Students' ability to control the machine tends to increase self esteem.
4. There is a decrease in "difficulty" of learning.
5. CAI takes the drudgery out of drill and practice.

Turkell and Postell (1984) investigated computer-assisted learning for the mildly handicapped. Their assertion was that the use of CAI and elementary programming skills allows the microcomputer to be used in a manner compatible with Piaget's philosophy of experimental learning (Piaget, 1976), a philosophy in which children are viewed as actively constructing their own knowledge.

CAI has been shown to be effective with several different groups of special needs students (Merton, 1983; Hallworth and Brebner, 1980). This has particular significance to health occupations in light of the high percentage of teachers who reported in this study that they had students with special needs enrolled in their classes. Jenkins (1983) reviewed the possibilities for the use of microcomputers with the handicapped student in the vocational classroom. However, there has been no literature found to date which documents or supports the use of CAI with secondary HOE students who have handicaps or other special needs.

Tindall and Gugerty (1983) suggested that the visual mode is a significant learning style for a large percentage of handicapped students. Their preliminary conclusion strongly suggested that the microcomputer is an appropriate instructional tool for students inclined to have a learning style using the visual mode.

One of the more overt problems cited when working with special populations is the "distractability" and deficits in the attention span manifested by these students when they are presented with learning tasks (Bryan & Wheeler, 1972). It is felt that the use of a microcomputer, which is both novel and visually stimulating, can help to fix attention, minimize distractability, and keep these students on task. Zeaman and House (1979) investigated attention deficits in mentally handicapped students, and Hallahan and Reeve (1980) documented attention deficits in learning disabled students. This is especially important in view of the fact that, in the present study, 72% of the HOE teachers reporting the presence of disadvantaged or disabled students in their classes indicated that they taught learning disabled students. Of that same group, 22% taught educable mentally retarded (EMR) students in their HOE classes. Thus, there appears to be a sound basis for the hypothesis that CAI use with secondary HOE students who have disabilities or special needs is likely to improve attention span and time-on-task.

CAI IN CAREER GUIDANCE

Career exploration is a vital part of many secondary HOE programs. As is true in many other areas of the vocational literature, the use of microcomputers in vocational career guidance is documented in a small but growing number of articles (Chapman, 1983; Pulvino and Lee, 1983; Lambert, 1983; Treichel, 1983; Dunn, 1983; Maze, 1983). Chapman (1983) reported that computerized career guidance and information systems were available in only 24% of the secondary schools nationwide. This figure may also reflect the situation in HOE in the secondary school as well, although no specific studies appear to exist which document the quantity and quality of career guidance and information systems available for secondary HOE students.

Lambert (1983) delineated the advantages of microcomputer use in career guidance. Items such as student access, organization and quick retrieval of information, use of a "high interest" technology, and the extension of available information were offered as advantages to computer use. Lambert further pointed out that occupational information is not the only kind of information available to students using a computer. Additional areas of available information suggested were education, financial aid, interests, values and decision-making skills, life skills, and prior experience assessment. It is this kind of information that HOE students need to assist them with career decision making; however, it is this kind of information that is available only through microcomputer use and only in a relatively small number of HOE classrooms at present.

AUTHORING PROGRAMS

In order to facilitate the development of appropriate software by the classroom teacher, several "authoring" programs are available on the commercial market. Basically, they allow any teacher to present information, ask questions, give feedback regarding correct and incorrect answers, and reinforce lesson content in a standardized format (Kleiman and Humphrey, 1982). Articles are available which can assist instructors who wish to learn how to write their own instructional packages using a commercially produced authoring program (Beebe, 1983). The advantage to using authoring programs is that the teacher does not have to be trained in BASIC or other languages.

Authoring programs will help to satisfy the short-term needs for software in HOE programs; but it is unrealistic to view this approach as the remedy for the dearth of usable HOE software. There does not appear to be any available literature regarding the use of authoring programs in secondary HOE.

MULTIPLE-CHOICE TESTING

Generally, multiple-choice is an established testing format in education, and in HOE it is common to use multiple-choice tests to evaluate the cognitive components of skill development. There are several commercial microcomputer programs available to HOE teachers which allow them to accrue a "test pool" of items for use in their classes (Shelly, 1984), and the advent of the microcomputer has brought new and unique applications to ability testing (McKinely and Reckase, 1980). A particularly innovative application of the computer in testing is confidence testing, used with the PLATO system (Anderson, 1980; 1982), which is based on the manner in which an examinee responds to an item.

GAMING

The use of computer games as an instructional mode in CAI is well documented (Vasek, 1983; Caldwell, 1980). Malone (1980) studied the features of computer games which attract students and looked at how those features can be used to make learning with microcomputers more interesting. As games and simulations become more sophisticated, it is felt that students will probably be less aware of the underlying technical and pedagogical strategies (Anderson, 1980).

There appears to be no literature addressing microcomputer gaming in HOE, in spite of the fact that there are several commercial games available that are appropriate in format for HOE students. The contents of these games can be adapted and tailored to the specific needs of the drill-and-practice lesson by the HOE teacher, without the required knowledge of a programming language.

INTERACTIVE VIDEO

An extension of present available microcomputer technology and applications for the HOE classroom is the integration of a microcomputer and a videodisc system (Bejar, 1982). Such an integrated system allows student involvement in clinical problem solving through a branching logic approach. The particular advantage this "interactive video" format has over a simple microcomputer simulation is the addition of a video segment. This segment portrays actual patient care situations in which the student can see for himself or herself the condition of the patient, signs and symptoms, and results or consequences of previous management decisions.

DeChenne and Evans (1982) reviewed the results of using interactive video to simulate medical emergencies. It was pointed out that this instructional approach could be successfully implemented on either an individual or large group basis. Hon provided further information in a report (1982) on the development of an interactive video program for teaching cardiopulmonary resuscitation.

COST EFFECTIVENESS

While the present study indicates that costs of hardware and software act as significant barriers to the implementation of CAI in the secondary HOE classroom, no literature exists at present to document either the cost effectiveness of implementation or the acuity of the problem. Studies have been done, however, which would provide a model for studying cost effectiveness in the secondary school setting (Avner, 1978; Kearsley, 1977).

MINICOMPUTERS

Limited use of minicomputers (those computers with a larger memory capacity than is found in microcomputers) in the allied health instructional setting has been reported. Mullen and Love (1980) reported favorable responses to the use of CAI and minicomputer hardware by allied health students. No other reports on minicomputer use in secondary or postsecondary HOE settings were found.

SUMMARY

The literature base supporting specific applications of microcomputers in the secondary HOE classroom is virtually nonexistent. One suspects that most of the information relative to CAI in secondary health occupations has not been published. Therefore, it is difficult to assess the quality and quantity of CAI available in HOE programs (at either the secondary or postsecondary level) across the country.

One can look at the support that exists for CAI in secondary education generally, in vocational education, or in specific health science programs (which are predominantly in baccalaureate-level nursing). However, there appears to be a total lack of any literature regarding CAI instruction in secondary HOE. This can be viewed as both a blessing and a curse for educators interested in the educational justification and documentation of the use of microcomputers in this very special educational setting.

While it is a blessing to those who wish to contribute to the literature base in a meaningful fashion, it is also a curse to those who seek to implement CAI from a sound theoretical base which has been documented and can stand up to the rigors of scientific method. Recommendations regarding what can or should be done are, therefore, necessary. The following recommendations are drawn from the examples shown to health occupations educators by other members of the academic community who have published on CAI:

1. Begin by publishing surveys, accounts of specific experiences, viewpoints, etc.

2. Provide justification for observations and/or opinions about why CAI does or does not work with students.

3. Document learning effectiveness with specific kinds of software (drill-and-practice, tutorial, simulation, etc.) in specific settings: Introduction to Health Occupations, Nursing Assistant, Licensed Practical Nurses (LPN), Dental Assistant, etc.

4. Document how CAI is used, citing content, conditions, purposes, and the levels of cognitive learning.

5. Provide data on the cost effectiveness of CAI use in the secondary classroom.

Section III

Surveys and Their Results

THE VENDOR SURVEY

In an effort to identify software which would be available for HOE programs at the secondary level, vendors were contacted by mail and asked to supply specific information. The letter asked for information on available software programs in the following areas:

1. Career exploration in entry-level health occupations (i.e., nursing, dental health, medical, and radiologic technicians)

2. Classroom and clinical competencies in the occupations noted

3. Supplementary basic sciences content, such as anatomy and physiology, pharmacology, microbiology, and nutrition appropriate for grades 9 through 12.

Using as many vendor lists as possible, a final survey database of 488 educational software vendors was developed. Of the 488 vendors listed, 180 (24.6%) forwarded materials and catalogs for review in the belief that their offerings would meet a need in the HOE market. Of the 180 vendors responding, only 49 were found to market one or more pieces of software which would be appropriate for secondary HOE classes. Thus, 10% of the original list of 488 vendors, or only 27.2% of those who initially perceived their products to be applicable actually had pertinent software. This information demonstrates the exceedingly small number of educational software vendors who deal, or feel they deal, with applicable HOE software.

Of the 180 vendors who responded, only 30 offered examination or demonstration copies of their software materials. Most of those who did offer disks for examination required a signed agreement indicating an automatic purchase of the materials if not returned within a specified period of time.

There were no commercial software vendors found having a primary focus in the area of health occupations at either the secondary or postsecondary level.

THE TEACHER SURVEY

A total of 340 questionnaires were sent to HOE teachers in Virginia and the remaining 49 states. The initial responses totaled 188, or 48.8 %. Of that group, there were 150 usable questionnaires, for a response rate of 44.4%. Follow-up requests for additional responses were not initiated due to the fact that a reasonable regional sample was received from across the nation. The following summation reflects the information that was received, according to each question from the teacher survey.

Are you currently using microcomputers in your classroom or laboratory?

Only 20 teachers responded affirmatively to this item. Stated more significantly, 86.6% (130) of the teachers responding to this question indicated that they were not currently using microcomputers.

If you are not using microcomputers, please identify the reasons from the list that follows (check all that apply: cost of hardware; cost of software; lack of applicable software; computer literacy of teachers; computer literacy of students; no personal interest; other.)

The cost of microcomputer hardware was the leading factor militating against their use in HOE classrooms, with 60.50% (72) of the teachers responding that this was a barrier. The cost of software was the second leading barrier cited, with 52.10% (62) of the teachers identifying this factor. The lack of teacher computer literacy was reported as the third most important impediment to microcomputer use, with a response rate of 50.42% (60) in this category. Occurring with a response rate that fell below the 50th percentile of respondents, the following items were cited: lack of computer literacy of students 40.34% (48); lack of applicable software 31.93% (38); and lack of a personal interest in microcomputer use on the part of the teachers 10.08% (12). A total of 15.97% of the teachers cited various other barriers, as follows:

1. Microcomputers on order.
2. The school does not make them available.
3. No interest cited by staff.
4. The decision to use microcomputers lies with the administration.
5. Microcomputers in next year's budget.
6. Ignorance of application.
7. Don't know enough to answer.
8. So many other things that we need.
9. Vocational director and superintendent don't feel that they are necessary.
10. Insufficient time to develop the concept.
11. I've just learned to use the computer myself.
12. I never considered it.
13. No funds available at this time.
14. County refused to purchase it even when grant funds were offered.
15. The administration won't buy one.
16. The computer we have is not available for classroom use.
17. Our computer is used only for basic computer classes.
18. We have never requested a computer for our program.
19. We don't get the community and school support to survive.
20. Doubt that we would ever be considered for microcomputers.
21. Would have to change my style of teaching.

What type of computer(s) are you using in your classroom or laboratory or are available in your school system? (Apple; Radio Shack; Commodore; IBM; Other.)

One hundred teachers responded to this item, a total 63.2% of the teachers who submitted returns (N=158). An overwhelming 62% (62) of the teachers who responded indicated that they used or had available for use the Apple computer (models not specified). The second most frequent response was for Radio Shack (TRS) at 35.0% (35). Commodore was third at 13.0% (13), and the IBM models fourth at 12.0% (12). This rank order is the same as that reported by Harris (1983) in his survey of hardware inventories in Michigan. Other types of microcomputers totaled 14.0% of the population, and those mentioned included Texas Instruments, Franklin, Bell & Howell, Sanyo, Hitachi, Epson, and Atari.

Are you using any of the equipment listed? (Indicate "yes" or "no," and specify type: printer, modem, disk drive(s), other.)

Regarding the use of peripherals, 38.38% (52) of the teachers who responded indicated they did use them, while 61.76% (84) responded negatively. Of those indicating some use of peripherals, 36.54% (19) used a printer, 53.85% used a single disk drive, 7.69% (4) used two or more disk drives, and only 1.92% (1) claimed to use a modem.

In what way are you using microcomputers? (Estimate percent of each specified use: drill and practice; tutorial; simulations; administrative; clinical applications; other.)

Of the 33 teachers responding to this item 33.33% (11) claim to use the "drill-and-practice" method, which includes repetition, question and answer formats, and practice exercises. The "tutorial" method, which includes the introduction of new material in small increments according to the skill and learning style of the learner, was the first choice for computer use of only 12.12% (4) of the respondants. Use of the microcomputer in the "simulation" format was the first choice of 3.03% (1) of the respondents. (The simulation format involves a modeling of a "real life" situation, requiring input from the student to effect various outcomes. Examples of simulation are branching logic problems, clinical simulations, and patient-management problems.) Administrative application was indicated as the first choice of 24.24% (8) of the secondary HOE teachers. (Administrative applications included recordkeeping, grades, testing, and report generation by teachers.) The use of actual diagnostic, treatment, or clinical management programs in teaching health occupations (denoted "clinical applications" on the survey) was reported to be the first choice for computer use of only 3.03% of the teachers.

Other uses of microcomputers were reported by 24.24% (8) of the teachers who responded to the question noted above. These uses were reported as follows: career counseling and information, gaming, and curriculum development.

In what type of classes are you using a microcomputer? (career exploration or career development; skill development; other.)

The first portion of the question categorized the classes in broad strokes: exploration, skill development, and career development. Forty percent (40%) of the teachers responding to this item (14 of 35) claimed to use microcomputers in career exploration classes; 5.71% (2) of the teachers reported using them for isolated skill development. The widest use of the microcomputer was reported in career development classes; 54.29% (19) of those responding cited this use.

The second portion of the question regarding classes in which microcomputers are employed asked teachers to specify the type of career program and/or the type of skill(s) being taught with the aid of the micro. The nursing aide (assistant) programs had the highest use, with 28.56% (10) of those reporting. Dental aide programs accounted for 8.57% usage, as did the LPN programs. These were followed by pharmacy aide at 5.71%, and a group of programs with a reporting total of 2.86%, which includes ward clerk, respiratory therapy assistant, occupational therapy aide, child care aide, and medical assistant.

The specific skills and topics taught in HOE classes with the aid of a microcomputer were reported as follows: nutrition, anatomy and physiology, patient classification systems, basic nursing procedures for nurses aides (including vital signs), first aid, pharmacology, medical terminology, and metrics.

Please identify the following characteristics of students using microcomputers: class level (ninth, tenth, etc.); average age(s) per class.

Naturally, most teachers taught more than one grade level. The highest proportion of teachers using the microcomputer taught 12th grade students, with 65.63% (21 of 32) of the teachers reporting. The remaining proportions were as follows: 10th grade with 40.63% (13 of 32); 11th grade with 34.38% (11 of 32); adult education with 15.63% (5 of 32); 9th grade with 9.40% (3 of 32); and 8th grade with 6.25% (2 of 32).

The average ages of those students being taught in classes using microcomputers were sought in an effort to get a clearer picture of the type of student with whom microcomputers were being employed. The percentage of teachers using the microcomputer with 16- and 17-year-olds was the same for both ages--38.71% (12 of 31). The percentage of those teaching 15-year-olds was 6.45% (2 of 31), and this was identical to the data received on those teaching 13-year-old students. The percentage of teachers using micros with 14- and 18-year-olds was 3.23% (1 of 31) and was identical to that reported for adult students (21 years of age).

Are any of your students learning disabled? ("yes" or "no"; please indicate type of disability.)

Of the 111 teachers who responded to this question, 76 (68.47%) reported that they did have these students in attendance, while 35 (31.53%) did not.

When asked to identify the nature of the disability or handicapping condition, 45 of the 76 teachers who reported having these students in class responded; 26 of the 45 answered that they taught a learning disabled (LD) student. Educable mentally retarded (EMR) students were reportedly taught by 8 of the teachers. A total of 7 teachers reported teaching emotionally disturbed students, and 4 reported teaching students with physical disabilities.

What steps are you taking or have you taken to become competent in microcomputer usage, as an individual? (literacy courses; programming courses; independent study of computer applications, products, software, etc.; using microcomputer for personal applications; other.)

This question was posed in an effort to ascertain the major directions that teachers are taking to attain or improve microcomputer literacy. Of the 116 teachers responding to this question, 37, or 31.90%, reported that they have taken no steps at all to improve their computer literacy; 43, or 37.07%, reported attendance in computer literacy courses; and 21, or 18.10%, reported having a programming course in their background. Independent study of computer applications, products, or software was reported by 23 teachers (19.83%). Independent use of a microcomputer for personal applications was reported by 17 (14.66%) teachers; 18 reported some "other" steps being taken to improve their literacy, including attendance at short in-service presentations initiated by their school or local school district and presented by other teachers or microcomputerware vendors.

What specific topics or topic areas would you like to see developed for instructional purposes (classroom, laboratory, clinical) or software programs for the microcomputer?

Fifty-four percent (81) of the teachers who responded to the survey suggested specific topics or topical areas which they would like to see developed as software programs for the microcomputer for instructional purposes. While the suggestions were numerous, indicating widespread support for future software development in HOE, the topics which were requested by at least 2.5% of the teachers were as follows:

1.	Nursing Skills and Procedures	22.2%
2.	Pharmacology	9.3%
3.	Clinical Simulation/Patient-Management Problems	8.0%
4.	Medical Terminology/Medical Abbreviations & Symbols/Spelling	7.4%
5.	Basic Human Anatomy	7.4%
6.	Nutrition/Meal Planning/ Dietary Requirements	6.2%
7.	Basic Math Skills.	4.3%
8.	General Career Information in HOE	3.1%
9.	Dental Assisting Skills	2.5%
10.	Attendance & Grades.	2.5%

THE SUPERVISOR SURVEY

A survey instrument was used to assess the supervisors' perceptions regarding the extent of microcomputer use. The following summation reflects the information that was received.

Please identify two secondary HOE teachers in your service area who maximize the use of microcomputers in the HOE classroom and/or laboratory (provide name and address).

This question was included in an effort to identify those HOE teachers who are presently making use of microcomputers in the classroom or laboratory.

What percentage of the HOE teachers in your service region use microcomputers in their classroom/laboratory? (check one: 0-5%; 6-10%; 11-15%; 16-20%; greater than 20%).

The results confirm the initial belief that the level of microcomputer use is quite low overall. None of the 35 supervisors who responded to this item reported greater than 20% use rate. Only 2.86% (1) reported a 16-20% use by teachers in the service area. An additional supervisor (2.86%) reported 11-15% microcomputer use. Three supervisors (8.57%) reported 6-10% of their teachers used microcomputers in their classrooms. Significantly, a full 85.71% (30) reported 0-5% use.

Of all types of microcomputers used by HOE teachers in your service area, please estimate the percentage of the types currently in use (indicate percentage, make and model(s): Apple, Atari, Bell and Howell, Commodore, DEC, Franklin, IBM, Kaymo, Osborne, Radio Shack, Victor, other).

In order to make the best analysis of the data received from this question, the microcomputer with the highest percentage of use was counted as one observation. Of the 39 supervisors responding to this item, 17, or 43.59%, indicated that Apple computers were used most frequently. The Radio Shack models ranked next with 25.64% (10) of the supervisors reporting their use. The IBM and Commodore models were reported as having the third highest percentage of use, with 12.82% (5) for each. Atari and Franklin computers were fourth, with 2.56% (1) each. No other types were mentioned by the supervisory group.

Please prioritize (rank order) the potential barriers to implementation of microcomputers according to the practical realities found in your service.

The supervisors were asked to employ a rating scale of 1 to 5 with a 1 being given to thoses barriers that pose the biggest problem, and a 5 assigned to those barriers viewed as the smallest problem. The potential barriers were as follows: cost of hardware; cost of software; lack of applicable software; computer literacy of teachers; and computer literacy of students.

Of all the ways that HOE teachers in your area are using microcomputer software, please estimate the percentage of each specific use, as follows: drill and practice; tutorial; simulations; administrative; clinical applications; others.

This question was designed in an effort to gain a perspective on the manner in which microcomputers are being used in the HOE classroom. Due to the wide disparity of responses received in each category when the supervisors were asked to estimate the percentage of use for each specific application, it was decided to choose only one data point--that category which received the highest rating by each supervisor responding. Of the 13 responses to this item, 53.85% (7) indicated the "drill-and-practice" category was the format most often used by teachers. The "tutorial" approach was cited by only 1 of the 13 supervisors (7.69%), and the "simulation" format was not designated to be first by any of the supervisors. "Administrative" uses were the first choice of two supervisors (15.38%), and "clinical applications" were cited by a single supervisor (7.69%). In the "other" category, the two responses were "question bank for exams" and "career information," constituting 15.38%.

What are your administrative plans over the next three years relative to HOE microcomputer use (check all that apply: no increased effort; increased financial support; increased teacher literacy; sponsoring research and development; other).

Supervisors were asked to respond to this question in an effort to gather information regarding the future directions for administrative support from the state level for microcomputer applications. Only 9.38% (3 of 32) of those supervisors responding indicated that they were making no plans for increased effort or support. Exactly 50% of the supervisors indicated that increased financial support would be forthcoming. A significant 93.75% (30) agreed that their administrative plans called for increased efforts toward teacher computer literacy. Finally, 18.75% (6) indicated that they would sponsor research and development in microcomputer applications in HOE.

Section IV

Miscellaneous Survey Findings and Discussion

1984 PRICES FOR SOFTWARE

The prices for software materials listed in the accompanying taxonomy (Section VII) range from $14.00 for one diskette to $2100.00 for a multiple-diskette package with study guides, review tests, and associated courseware materials. The typical price (Spring-Summer 1984) for a single diskette with a reasonable instruction packet was $30.00-$50.00. It is important to note that simple, usable programs in the range of $20.00-$25.00 are not unusual, however.

ALTERNATIVES FOR MEDICAL RECORDS SOFTWARE

Demonstration diskettes and training units were found to be available from several manufacturers of some of the more high-priced application programs. Where it would be desirable for students to have extensive, hands-on practice time with programs used to manage patient data in hospitals, offices, and clinics, the staffs in these actual settings are understandably reluctant to allow students to enter, change, or delete data. To complicate matters, these systems, which have the capacity for a large number of patient records, are quite expensive for most local school systems to justify. During the course of the study, several teachers shared the information that vendors would sell (at significantly reduced cost) or donate an abbreviated version of these programs (with perhaps a 50-patient capacity instead of 5000 patients) for student use. The result was a low-cost means of duplicating the actual software available in the service area for student practice.

MAXIMIZING MICROCOMPUTER CAPABILITIES: CLINICAL SIMULATION

Several of the "drill-and-practice" programs found for HOE use were nothing more than "high-tech flash cards." Teachers should be aware that less expensive methods may be available for teaching the same task. While computer-assisted drill-and-practice programs may be a boon to a particular teaching-learning situation, special attention should be paid to the reasons for electing to use a microcomputer to teach material which could, perhaps, be taught more cheaply and efficiently with other media. It seems apparent that the application of microcomputers is particularly justified when they are used to teach tasks in a manner that is not otherwise possible. An example of a particularly efficient and effective use of microcomputers in HOE is in the teaching of clinical simulation exercises. Under the controlled circumstances available, students may practice their problem-solving and decision-making skills in an environment which protects both the student and the patient from any harm or embarrassment. Further advantages of simulation exercises are found in the occurrence of a smoother conceptual transition than normally occurs from the cognitive learning of the classroom to the psychomotor and affective realities of the clinical setting.

Unfortunately, the availability of clinical simulation programs for HOE are, at present, quite limited. However, the quality of those clinical simulations which do exist is quite high and affords an excellent model for future development. Coincidentally, the simulations available from Medi-Sims Inc. include a unique and effective tabulation and self-scoring system for students. The scores are then automatically stored for teacher review and recording at a later date.

Teacher-authoring of clinical simulation programs is best accomplished by two or more teachers working cooperatively. While they are time-consuming to write, they represent one of the most educationally effective and cost-efficient uses of microcomputers available to HOE programs. The data from this study demonstrate quite clearly that simulation programs presently have the most limited use of all software available for secondary HOE.

HARDWARE FOR PHYSICALLY HANDICAPPED STUDENTS

In view of the fact that 11.11% of the teachers responding to the survey reported that they taught physically handicapped students, any special hardware or software that was found to be available was of particular interest. It was found that special voice input modules, or "speech command systems," are available and are compatible with several of the microcomputers commonly used in the secondary schools, so students with handicapping conditions which prevent the manual use of a microcomputer keyboard can participate fully in CAI.

Also available on the market is a briefcase-sized, battery-operated system with a Braille keyboard and a memory unit which converts Braille into text, or vice-versa. Other programs use a synthesizer board to convert text into speech. Students who have severe physical handicaps and are nonvocal may enter data into a computer via a variety of physical motions--breath control, muscle contraction, or sound utterance. A device may be connected to an Apple Keyboard Interface for the purpose of converting it to a keyboard compatible with the Apple. Generally, such aids are known as "assistive" devices.

THE "PLATO" SYSTEM

For the sake of completeness, it should be mentioned that Control Data Corporation markets an elaborate set of lessons, courses, and curricula for application in schools, colleges and universities, using the PLATO system. There is a rather extensive list of CAI lessons for health science students, some of which may have applicability to secondary HOE students who show themselves to be particularly bright and talented. The topics are catalogued under "medicine" and "nursing" and are targeted at medical students, nursing students, and "health professional students." The software is available from Control Data Corporation (Minneapolis, Minnesota 55440), on a purchase or rental basis. However, the prices appear to be more expensive than is realistic for most school divisions.

THE TEACHER SURVEY: COMMENTS

It is interesting and important to note that in the teacher survey instrument, slightly less than one-third (31.93%) of the teachers responded that a "lack of applicable software" was a barrier to their use of microcomputers. It appears, then, that one interpretation of this data is that approximately two-thirds of HOE teachers believe that adequate quantity and quality of software is available to them for student use, subsequent to purchase of a microcomputer for their classroom. Unfortunately, such is not the case. Those teachers who are actively using microcomputers were the most vocal with their suggestions for further software development.

From the list of suggested topics for software development in HOE content areas noted in a previous section of this study, it is clear that many areas are deficient, if not devoid, of software that is appropriate to secondary students. Specific topical areas of competencies and skills which are in need of software development can be noted in virtually every HOE program area. It is, therefore, of critical importance that HOE teachers, program directors, and vocational administrators realize that the purchase of microcomputer hardware must be predicated upon an understanding that commercially available courseware for implementation with certain HOE classes may not be readily available. The market for appropriate software is wide, and the titles from which to make selection may be few indeed.

While 63.2% of the teachers reported having a computer "available" in their respective schools, only 13.3% were currently using microcomputers in their classrooms. This finding is in line with others (Becker, 1984) and would appear to indicate that the computers are being used for other priorities.

The question regarding the use of equipment and peripherals caused some confusion among the teachers. While only 20 teachers originally indicated that they used microcomputers in the classroom or laboratory, 52 reported use of peripherals. This number, therefore, must include those who use computers in school but not in the classroom, or those who use their personal computers at home, but for school use. Similarly, the question on that survey regarding the manner in which microcomputers were used led to some confusion. While only 20 originally reported micro use in the classroom or lab, 33 teachers reported on the manner in which micros were used. Again, there may have been an interpretation of the question which included non-classroom use or intended classroom use.

It is significant to note that approximately two-thirds of the teachers responding to the item on the teacher survey regarding computer literacy are doing something to improve their familiarity with the use and operation of microcomputers. This represents a positive step for secondary HOE which will assist in the implementation of microcomputer use during the next several years.

NURSING CONTINUING EDUCATION

Somewhat peripheral to the issue of microcomputer use in the HOE classroom but nevertheless important to nurses is the fact that continuing education credit is now being granted for individual CAI use. MediSim, Inc., a corporation of Edwardsville, Kansas, has now received approval of its CAI programs in nursing for continuing education credit by the Central Regional Accreditation Committee of the American Nurses Association. Their clinical simulation programs (at $200.00 each) are excellent examples of patient management problems in microcomputer format. Also available are computer simulations in clinical nursing available through W. B. Saunders Company.

SPECIAL NEEDS STUDENTS IN HOE

The finding that 68.47% of HOE teachers served special needs students was startling initially. It was later found, however, that 70.4% of all special education students are mainstreamed (Phelps, 1983). Of those HOE teachers reporting the presence of special needs students, 72.22% further reported that their students were learning disabled. The Phelps study noted that 1.4% of all special needs students enrolled in HOE programs are learning disabled (1983). The percentage of learning disabled students nationwide was reported to be 3.0% of the total school population (Marsh and Price, 1980).

QUANTITY OF MICROCOMPUTER USE IN HOE

There was no state or region for which a supervisor reported more than one teacher in five as using microcomputers in the HOE classroom. Supervisors of HOE reported an overwhelming 85% of their service region were without significant (or any) microcomputer use. This perspective is confirmed by the teachers themselves, who reported 86.67% non-use. Thus, one may conclude that on a nationwide basis, the use of microcomputers in the HOE classroom is limited to only 13 to 15% of secondary HOE teachers. That estimate is in line with those made by Becker (1983), who estimated that 10% of public high school students use a microcomputer in the period of one week.

Many indicators point to a significant upswing in the use of microcomputers in secondary HOE. During 1984, the legislature of the state of Florida mandated that all vocational exploratory courses, including those in HOE, address computer literacy. Approximately 91% of the state supervisors responding to the question concerning increased effort or support for microcomputer use indicated that state-level administrative support would be forthcoming over the next three years.

HARDWARE USED IN HOE

It would appear that the hardware used is largely a straightforward set, including a keyboard, microprocessor, black and white (or "green screen") monitor, and a single disk drive. The data derived from the teacher survey indicated a relatively low percentage of classrooms with a printer, modem, color video, or two or more disk drives. These findings should be considered before subsequent development of software in order to maximize the use and dissemination of the materials.

Section V

Conclusions and Recommendations

CONCLUSIONS

The following conclusions are derived from the findings of the study and are based upon the review of the literature and nationwide surveys of HOE teachers and state supervisors, and a survey of the educational software industry. Recommendations will follow, based upon these conclusions:

1. Commercially produced software is available which is appropriate for secondary HOE students in some programs. Selection is quite limited. The "Taxonomy of Microcomputer Software for Health Occupations Teachers" (Section VII) summarizes the findings as of May 1984.

2. Teachers appear to use drill-and-practice software far more than any of the other formats.

3. Commercial educational software developers are largely unaware of the existence of a need for courseware in health occupations, especially at the secondary level. Additionally, the data in the present study support the contention that a large percentage of those software vendors who claim to have software that would be applicable for secondary HOE actually do not.

4. Most HOE teachers are unaware of the magnitude of the "software gap"; they do not cite the lack of applicable software as a significant barrier to microcomputer use. The evidence seems to suggest that they would experience difficulty in finding sufficient software on the market to provide instruction on more than just a few of the topics related to their particular need in HOE. Furthermore, few, if any, diskettes exist that relate directly to clinical skill development, which constitutes the core of most career development courses.

5. The study found no single commercial software development company whose primary focus was the development of software to serve the needs of secondary or postsecondary health occupations education.

6. Many of the existing software programs which deal with subject matter relevant to HOE are poorly written and include spelling errors, incorrect responses, or poor error-trapping. Many are simply lacking in the student control necessary for progressing through the program at a reasonable pace, allowing students to review or correct mistakes without a great deal of frustration. Several pieces of software purchased for review during this project "hung up" or ended inappropriately after the initial boot. Other programs listed for a particular age or ability group are not appropriate for their intended audiences. Teachers must learn the essentials of reviewing and evaluating software for student use, realizing that "caveat emptor" applies to purchases of educational software in HOE.

7. It appears that the kind of program that makes the most efficient use of microcomputer technology, specifically the simulation format, is the one that is least used and has the fewest options on the commercial market. The power inherent in the clinical simulation scenario to teach and to measure students' ability to perform at the higher cognitive levels makes the simulation format especially attractive for use in HOE. However, the complexity of the design, the time involved in planning the scenario and in programming for microcomputer use, plus the price of commercially prepared simulations, make them expensive commodities at the present time.

8. This study found Apple, Radio Shack, and Commodore to be the three most popular microcomputers in the secondary schools across the country (in the order cited). This finding is supported by the other studies; thus it appears that future software development would be best targeted to these brands. It should be noted, however, that IBM has made significant initiatives in recent months. Consequently, there may be a significant ascendance in sales to the public school market during the period from 1984-1986.

9. Widespread support from state and local educational agencies for development of CAI in HOE appears to be forthcoming over the period 1984-1986.

10. There does not appear to be any literature available as of this writing which specifically addresses the planning, implementation, and/or evaluation of CAI applications in secondary HOE.

11. The large percentage of teachers reporting the presence of disabled, handicapped, or other special needs students deserves fresh consideration of the effects it has upon the methods employed in the instructional process in the HOE classroom. This is especially true for the development and design of new software for teaching concepts needed in HOE. Special care and consideration in formatting, design, presentation, graphics, user-friendliness, student learning styles, and other variables relevant to disadvantaged and/or handicapped students will be necessary if new software is to produce positive, measurable results.

12. Based upon the findings of the teacher survey, a profile of the typical secondary HOE teacher who uses the microcomputer for instruction may be developed. He or she is the only one of ten HOE teachers who is attempting the use of micros. (The other nine teachers cite the cost of the hardware as the primary reason for their nonuse. In fact, three of the remaining nine teachers are taking no steps to improve their understanding of microcomputers or to explore possible methods for using them in instruction. The other six teachers are taking a "computer literacy" course.) The computer used by this "profile" is most likely an Apple, and there is only a one-in-three chance that he or she uses any other peripherals in addition to the basic system (there is probably only one disc drive and a green-screen monitor). The computer is used with a career development type of HOE class, probably a nursing assistant course. It is used to supplement instruction in nutrition, anatomy, and physiology. This teacher is teaching twelfth grade students, most of whom are 17 years old. There is a two-in-three chance that he or she teaches at least some students who are disadvantaged or have some special need. Finally, those students who do have a special need are most likely to be learning disabled.

RECOMMENDATIONS

Based on the findings of the surveys of vendors, state supervisors, and teachers ıtionwide, and on the search of the supporting literature and other available :sources, which the following recommendations are made:

1. Teachers should be encouraged and supported to produce and share their own software through use of basic programming skills and commercially prepared authoring programs. This effort should emerge over the next two to four years as the lag in commercially available software continues. The term support may be construed to mean the time and financial resources necessary to train those teachers with a particular interest in the fundamentals of programming in BASIC and PASCAL languages. Educational uses and programming skills for teachers should be available through local teacher education institutions and should satisfy credit toward teacher certification requirements.

2. Where possible, a close liaison should be established between the HOE teacher and the computer resource person at the school or the local educational agency. Such a relationship has been shown to be beneficial in facilitating development of new software and in the implementation of similar programs in other vocational areas.

3. Competencies relative to teacher literacy and use of microcomputers in instruction should be identified and validated for teacher certification requirements in HOE. It is clear, however, that commercially prepared software is available and that it can be used productively in the classroom without the necessity of teacher programming skills (Tindall & Gugerty, 1983, 243). Actual programming skills for teaching HOE is of course, an extra advantage but the ability to operate a computer in successful instruction is a basic ingredient.

4. A statewide clearinghouse should be established for specific program areas such as HOE to facilitate communications among teachers across the state relative to locally produced programs (either through authoring programs or teacher-programmed software) or newly available commercial programs, which could be shared. Documentation of the subject matter, specific topic, hardware specifications, target population, etc., should be straightforward and easy to submit and access. Examples may include a microcomputer database, a phone-in hotline, or a simple file of available contributions. With the significant amount of time involved in software production (approximately 134 hours of preparation to one usable hour of instruction; Gailey, 1973; Vasek, 1983), any possible efforts should be made by HOE teachers to make this available to others.

5. Commercial educational software developers should be advised of the need for HOE software through organized state, regional, and national efforts involving teachers, vocational administrators, professional organizations, and professional publications. Industry cannot respond to a need if they do not know that it exists.

6. Expected increases in financial resources available to local educational agencies should alert HOE teachers to the need for well thought-out and justifiable requests for microcomputer hardware and software. Carefuly prepared prospective plans for microcomputer use, integration into the curriculum, and systematic evaluation will increase the likelihood of obtaining the equipment and course work desired.

7. In the development of software for HOE programs, special attention should be paid to the needs of disadvantaged or disabled students. Commercial developers who develop software for these students should expand into the secondary HOE market.

8. Commercial software development should be designed to be used with the simplest forms of microcomputer hardware. For instance, this survey has shown that the vast majority of HOE users have only one disc drive available and most do not have a printer.

9. University programs specializing in HOE teacher education must provide the leadership in CAI by providing programming and teacher authoring classes targeted solely at the HOE teacher. Such an effort will provide an additional alternative to help fill the "software gap," which is particularly acute in this area.

10. Teachers using microcomputers in the classroom should be encouraged by supervisors, peers, and university faculty to evaluate their efforts systematically. Subsequent to classroom trials and evaluation, every effort should be made to encourage the publication and/or sharing of these efforts and findings. Cooperative partnerships between local school systems and university faculty should be sought to complete these tasks. This kind of relationship will begin to ameliorate the significant gap in the literature regarding secondary HOE generally, and CAI specifically.

Section VI

References

Anderson, Richard I. A PLATO Probabalistic System. Champaign: University of Illinois, 1980. (ERIC No. ED 200614)

Anderson, Richard I. "Computer-Based Confidence Testing: Alternatives to Conventional Computer-Based Multiple-Choice Testing." Journal of Computer-Based Instruction 9(1), 1982, pp. 1-9.

Anderson, Ronald E. "Computer Simulation Games." The Guide to Simulations/Games for Education and Training, 4th edition (Robert E. Horn and Anne Cleaves, eds.). Beverly Hills, California: Sage Publishing Co., 1980.

Avner, A.; Moore, C.; and Smith, S. "Active External Control: A Basis for Superiority of CBI." Journal for Computer Based Instruction, 6(4), 1980, pp. 115-118.

Avner, R. A. "Cost-Effective Applications of Computer-Based Education." Educational Technology, April, 1978, pp. 24-26.

Becker, Henry J. "School Usage of Microcomputers." Database, 2(2), 1984, pp. 6-7.

Beebe, T. H. "How to Write Your Own Instruction, Using a Computer Authoring System." Instructional Innovator, 28(6), 1983, pp. 34-48.

Bejar, Isaac I. "Videodiscs in Education: Integrating the Computer and Communication Technologies." Byte, 7(6), 1982.

Bitzer, M. D., and Bitzer, D. L. "Teaching Nursing by Computer: An Evaluative Study." Computers in Biology and Medicine, 3(3), 1973, pp. 187-204.

Bitzer, M. D., and Boudreaux, M. C. "Using a Computer to Teach Nursing." Nursing Forum, 8(3), 1969, pp. 234-254.

Boettcher, E. G.; Alderson, S. F.; and Saccucci, M. S. "A Comparison of the Effects of Computer-Assisted Instruction Versus Printed Instruction on Student Learning in the Cognitive Categories of Knowledge and Application." Journal of Computer-Based Instruction, 18(1), 1981, pp. 13-17.

Boraiko, Allen. "The Chip." National Geographic, 162(4), 1982, 421-456.

Bryan, T. S., and Wheeler, R. "Perceptions of Learning Disabled Children: The Eye of the Observer." Journal of Learning Disabilities, 5, 1972, pp. 484-488.

Caldwell, Robert M. "Guidelines for Developing Basic Skills Instructional Materials for Use with Microcomputer Technology." Educational Technology, 20(10), 1980.

Chapman, Warren, and Katz, Martin R. "Career Information Systems in Secondary Schools: A Survey and Assessment." The Vocational Guidance Quarterly, 31(3), 1983, pp. 165-177.

Cokewood, Daniel B. "A Comparison of the Effectiveness of Computer-Assisted Instruction and Programmed Instruction in Improving Problem-Solving in College-Level Basic Electronics." (Doctoral dissertation, Rutgers University, 1980). Dissertation Abstracts International, 41(4), 1980, pp. 1445A-1446A (University Microfilms No. 8023588)

David, Austin. "Computer-Assisted Instruction: Yesterday, Today, and Tomorrow." Momentum. 9(2), 1978, pp. 16-20.

Davis, N. "Computer Literacy for the Special Student: A Personal Experience." Teaching Exceptional Children, 16(4), 1984, pp. 263-265.

DeChenne, James A. and Evans, Robert. "Simulating Medical Emergencies." Instructional Innovator, 21(1), 1982, p. 23.

Dunn, Wynonia. "Microcomputer-Based Career Guidance." Microcomputers: Applications in Career Counseling and Career Education (Roger Lambert and Judith Rodenstein, eds.). Madison: Vocational Studies Center, University of Wisconsin-Madison, 1983, pp. 265-269.

Ford, M. S.; Walkington, P. A.; and Bitter, G. G. "Gifted Education—Enrichment or Acceleration? Computers Provide Both." Microcomputers in Education: Getting Started (N. Watson, ed.). Tempe: Arizona State University, College of Education, Conference Proceedings, 1981.

Gailey, Frances H. "An Analysis of Development/Use Time for a Computer-Assisted Instruction Unit on Basic Household Electricity." (Doctoral Dissertation, The Ohio State University, 1973). Dissertation Abstracts International, 34(8), 1974, p. 3895B. (University Microfilms No. 74-3172).

Gillespie, Wilma, and Redford, Jeanette. Health Occupations Education: A Review of the Literature. Columbus, Ohio: ERIC Clearinghouse on Adult, Career, and Vocational Education, The National Center for Research in Vocational Education, 1980.

Hallahan, D. P. and Reeve, R. E. "Selective Attention and Distractability." Advances in Special Education, Vol. 1 (B.K. Keogh, ed.). Greenwich, Connecticut: J.A.I. Press, 1980.

Hallworth, Harold J., and Brebner, Ann D. Computer-Assisted Instruction in Schools: Achievements, Present Developments, and Projections for the Future. Alberta, Canada: University of Calgary. 1980, p. 243. (ERIC ED 200-187)

Halverson, J. D., and Ballinger, M. D. "Computer-Assisted Instruction in Surgery" Surgery, 80(6), 1978, pp. 633-640.

Harris, Richard. Microcomputer & Software Use in Michigan's Vocational-Technical Facilities: A Status Report. Big Rapids, Michigan: Center for Occupational Education, Ferris State College, 1983, p. 36.

Hicock, Paul I., and Wiggers, Thomas B. "PACOR and CASES: Two Programs for Computer-Assisted Instruction in Allied Health." Educational Computer, 3(4), 1983, pp. 26-28.

Hoffner, E. P.; Mathewson, H. O.; Loughrey, A.; and Barnett, G. O. "Use of Computer-Aided Instruction in Graduate Nursing Education: A Controlled Trial." Journal of Emergency Nursing, 1(2), 1975, pp. 27-29.

Hon, David. "The Videodisc, Microcomputer, and the Satellite." Training and Development Journal, 34(12), 1980, pp. 28-34.

Hon, David. "Interactive Training in Cardiopulmonary Resuscitation." Byte 7(6), 1982, pp. 108-138.

Huckabay, L.; Anderson, N.; Holm, D.; and Lee J. "Cognitive, Affective and Transfer of Learning Consequences of Computer-Assisted Instruction." Nursing Research, 28(4), 1979, pp. 228-233.

Jenkins, Sam L. "Microcomputers for the Handicapped." Microcomputers: Applications in Vocational Education (Judith Rodenstein and Roger Lambert, eds.). Madison: Vocational Studies Center, University of Wisconsin: Vocational Studies Center, University of Wisconsin-Madison, 1983, pp. 181-191.

Kearsley, G. P. "The Costs of CAI: A Matter of Assumptions." AED Journal, 10, 1977 (Summer), pp. 100-112.

Krupski, A. "Attention Process: Research, Theory, and Implications for Special Education." Advances in Special Education, Vol. 1, (B. K. Keough, ed.). Greenwich, Conneticut: J.A.I. Press, 1980.

Kulm, Gerald. "Team Spirit: A Computer Math Course for Parents of Gifted Children." Teaching Exceptional Children, 16(3), 1984, pp. 168-171.

Lambert, Roger. "Using Microcomputers for Career Guidance Information." Microcomputers: Applications in Career Counseling and Career Education (Roger Lambert and Judith Rodenstein, eds.). Madison: Vocational Studies Center, University of Wisconsin-Madison, 1983, pp. 225-254.

Larson, Donna E. "The Use of Computer-Assisted Instruction to Teach Calculation and Regulation of Intravenous Flow Rates to Baccalaureate Nursing Students." (Doctoral dissertation, Michigan State University, 1981). Dissertation Abstracts International, 42(8), 1982, p. 3459A. (University Microfilms No. 8202467)

Larson, Lee E. "Microcomputers--How Do You Get Started?" Journal of College Science Teaching, 57, 1981, pp. 231-33.

Levine, D., and Weiner, E. "Let the Computer Teach It." American Journal of Nursing 75(8), 1975, pp. 1300-1302.

Lu, Cary. "Microcomputers: The Second Wave." High Technology, 2(5), 1982, pp. 36-52.

Lyman, Elisabeth R. Plato Highlights. Urbana: The University of Illinois, 1974, p. 31.

Malone, Thomas W. What Makes Things Fun to Learn? A Study of Intrinsically Motivating Computer Games. Palo Alto, California: Xerox Corporation, 1980.

Market Data Retrieval Service. "Only 14% of Schools Don't Have Computers." Virginia Journal of Education, 77(1), 1984, p. 11.

Marsh, George E. II, and Price, B. J. Methods for Teaching The Mildly Handicapped. St. Louis: C. V. Mosby, 1980, p. 8.

Maze, Marilyn. "Computerized Career Planning Inventories." Microcomputers: Applications in Career Counseling and Career Education (Roger Lambert and Judith Rodenstein, eds.). Madison: Vocational Studies Center, University of Wisconsin-Madison, 1983, pp. 271-280.

McKinley, R. L., and Reckass, M. D. "Computer Applications to Ability Testing." AEDS Journal, 13, 1980, pp. 193-203.

Merton, Andrew. "Computers in the Classroom." Technology Illustrated, 3(9), 1983, pp. 38-46.

Milner, S. D., and Wildberger, A. M. "Determining the Appropriate Uses of Computers in Education." Computers and Education, 1977, pp. 117-123.

Mullen, Eloise M., and Love, Robert L. "An Evaluation of the Use of Mini-Computers for Computer-Assisted Instruction in Allied Health Curricula." Journal of Allied Health. 9(1), 1980, pp. 33-40.

Olivieri, P., and Sweeney, M. A. "Evaluation of Clinical Learning: By Computer." Nurse Educator, 5(4), 1980, pp. 26-31.

Phelps, L. Allen. Selected 1980-81 Data on Special Needs Populations. (U. S. Department of Education, National Center for Educational Statistics, Vocational Education Data System, Table 1109). Champaign: University of Illinois, 1983.

Piaget, J., The Grasp of Consciousness: Action and Concept in the Young Child. Cambridge: Harvard University Press, 1976.

Pulvino, Charles J., and Lee, James L. "Computer-Assisted Developmental Guidance." Microcomputers: Applications in Career Counseling and Career Education (Roger Lambert and Judith Rodenstein, eds.). Madison: Vocational Studies Center, University of Wisconsin-Madison, 1983, pp. 219-224.

Rodenstein, Judith, and Lambert, Roger. Microcomputers in Vocational Education. Madison: Vocational Studies Center, University of Wisconsin, 1982.

Shaw, Leonard W. "A Study of Empathy Training Effectiveness: Comparing Computer Assisted Instruction, Structured Learning Training and Encounter Training Exercises." (Doctoral dissertation, Syracuse University, 1978). Dissertation Abstracts International, 39(10), 1979, pp. 5957A-5958A. (University Microfilms No. 7908563)

Shelly, Richard W., A Taxomony of Microcomputer Software for the Secondary Health Occupations Teacher. Blacksburg: Virginia Polytechnic Institute & State University, 1984.

Sojka, Deborah. "CAI Catches On." Datamation, 27(3), 1981, pp. 188-190.

Thomas, D. B. "The Effectiveness of Computer-Assisted Instruction in Secondary Schools." Association for Educational Data Systems Journal, 12(3), 1979, pp. 103-116.

Timpke, J., and Janney, C. P. "Teaching Drug Dosages by Computer." Nursing Outlook, 29(6), 1981, pp. 376-377.

Tindall, Lloyd W., and Gugerty, John J. Effective Microcomputer Assisted Instruction for the Vocational Education of Special Needs Students. Madison: Vocational Studies Center, University of Wisconsin-Madison, 1983, pp. 242-43.

Treichel, Janet. "Career Information Resources in Secondary Schools." Microcomputers: Applications in Career Counseling and Career Education (Roger Lambert and Judity Rodenstein, eds.). Madison: Vocational Studies Center, University of Wisconsin-Madison, 1983, pp. 225-264.

Valish, A. U., and Boyd, J. M. "The Role of Computer-Assisted Instruction in Continuing Education of Registered Nurses: An Experimental Study." The Journal of Continuing Education in Nursing, 6(1), 1975, pp. 13-15.

Vasek, Jeffrey, R. "Using Formative Evaluation to Develop a Microcomputer Language Acquisition." (Doctoral Dissertation, Virginia Polytechnic Institute & State University, 1983). Dissertation Abstracts International, 44(11), 1983.

Vose, G. Michael. "Micros in Medicine." 80 Micro, November, 1982.

Wolcott, Jeanette M. "The Effect of Computer-Assisted Instruction, Traditional Instruction, and Locus of Control on Achievement of Beginning Typewriting Students." (Doctoral Dissertation, Temple University, 1976). Dissertation Abstracts International, pp. 1942A-1943A. (University Microfilms No. 76-22, 070)

Zweig, Franklin M., and Robert W. MacMillan. Testimony in HR 5573: The Technology Education Act of 1982, testimony submitted to the Subcommittee on Ways and Means, U. S. House of Representatives. June 14, 1982, p. 11.

Section VII

A Taxonomy of Microcomputer Software for Secondary Health Occupations Teachers

TAXONOMY: WHAT IT IS AND HOW TO USE IT

A taxonomy is actually no more than an orderly classification of items into appropriate categories with the application of suitable and correct names. The information that follows is a "taxonomy" of microcomputer software for use by vocational health occupations teachers.

The need for such a taxonomy appears to arise from the increasing number of microcomputers which are being purchased for use in secondary and vocational schools, with a concomitant awareness regarding the lack of applicable software. A microcomputer in a health occupations education (HOE) classroom is of no use without the appropriate software to make it operate to its potential. Once the decision is made to purchase a microcomputer, the next step must concern what software to buy and from whom. Before probing about to find software vendors who deal in educational software in HOE-related areas, the HOE teacher may find this taxonomy helpful. It provides a concise listing of software available in the content areas related to HOE. However, there is new software coming out on the market almost daily, thus the list of software vendors and software alike is likely to grow. This section is designed to help find the vendors who have software available for HOE use during the interim.

This taxonomy is arranged by content area. Each area includes an alphabetical listing of the educational software vendors who have software available on that topic; under each vendor listing is a list of titles of software programs. In order to get a complete description of the diskettes available from the vendor, the most recent catalogue from that company must be ordered. Addresses and phone numbers are listed at the end of this section.

Most of the diskettes cited in the taxonomy are moderately priced, ranging from $14.00 to $50.00 per item. A notable exception are the "utility" packages, the software actually used in hospitals, clinics, and offices for the purposes of patient recordkeeping, billing, and office management. These packages range in price from $600.00 to approximately $2500.00, usually prohibitive for a single HOE program. Many programs that need to teach skills related to the use of such software purchase or otherwise obtain demonstration copies from vendors wishing to donate these items. Recently, several producers of utility software (such as programs for patient recordkeeping, appointments, billing, etc.) have produced diskettes with abbreviated patient-record capacities (eg. 50 instead of 5000). Thus, there is the potential to use these programs for teaching purposes without including the attendant expense in an already meager software budget.

While a rigorous attempt has been made to include all appropriate items on the market which may be of interest to HOE programs, the lists are not all-inclusive. Nor is the inclusion (or exclusion) of a particular product to be construed as a promotion or comment on its quality. Items were included in the taxonomy if they were appropriate for use with vocational health occupations students, were generally moderate in price, offered instruction in content areas most closely approximating those commonly

taught in such programs, or offered promise for classroom management or teacher-authored materials to expand the software base in HOE. Unnecessary duplication in types of diskettes offered by a particular vendor was avoided. Thus, all of the anatomy and physiology diskettes from vendor A are not necessarily listed, nor would all of the authoring systems available from vendor B be listed. To know the name and address of the vendor and the representative types of software appropriate to HOE will help the teacher to obtain further information for selection and purchase. A better informed decision regarding software availability and purchase for HOE students is the objective of this taxonomy.

When ordering courseware (the software and the accompanying printed materials) make sure that the software will, in fact, be operable on the computer. Specify the make and model of the microcomputer (e.g., Apple IIe, TRS-80). Consider the type of disk needed (floppy or hard), the compatibility of the DOS version, and whether the vendor will send backup copies.

Careful evaluation of software is a necessity, especially with the commercially available packages which relate to the needs of the secondary HOE classroom. One quickly finds that the descriptive material provided in catalogs does not always represent the real capacity and utility of the software offered. One may also find that the content of the software advertised has only limited educational value for students, or is not entirely "user friendly," or that the material presented is not appropriate for the needs of HOE students. The watchword is "evaluate." However, the vendor or producer of the material in which the teacher is interested may not send diskettes for trial examination. As of this writing, only 32 of 488 educational software vendors questioned in the survey which led to this publication acknowledged or offered a trial software examination period. Once a copy is obtained, it is wise to evaluate it carefully according to the criteria specified in the excellent manual entitled Evaluator's Guide for Microcomputer-Based Instructional Packages, published by ICCE (International Council for Computers in Education), University of Oregon, 1787 Agate Sreet, Eugene, Oregon, 97403.

ANATOMY AND PHYSIOLOGY

Anatomy and physiology diskettes are more plentiful on the market than many other categories of interest to the secondary HOE student. There is considerable variance in the target audiences for which these programs were produced, however some (e.g. "Cells" from Educational Activities, Inc.) are for rudimentary learning appropriate for eighth- and ninth-grade Introduction to Health Occupations courses. Others, such as "Microbe: An Anatomical Adventure," are quite complex and powerful teaching programs for the most advanced students in senior level (and adult) programs, particularly in nursing. Screen these carefully according to the learning needs and abilities of students.

VENDOR: Avant-Garde Creations

PROGRAMS/DISKETTES:
- The Heart (also discusses causes of heart attack)
- The Digestive System

VENDOR: Brainbank, Inc.

PROGRAMS/DISKETTES:
- The Human Body: An Overview
- The Skeletal System

VENDOR: Educational Activities Inc.

PROGRAMS/DISKETTES:
- Heart Lab: Simulation Model of a Functioning Human Heart
- Genetics: A Study of Transmission of Traits
- Cells: Basic Cell Structure and Cell Division

VENDOR: Heinemann Computers in Education

PROGRAMS/DISKETTES:
- Physiological Simulation

VENDOR: Learning Technologies

PROGRAMS/DISKETTES:
- Building Blocks of the Body
- The Skeletal System
- The Nervous System
- The Senses
- The Skin
- The Muscles
- The Circulatory System
- The Digestive System
- The Respiratory System
- The Endocrine System
- The Reproductive System

VENDOR: Medi-Sim, Inc.

PROGRAMS/DISKETTES:
- Respiratory Anatomy

VENDOR: Micro Learningware/J. & S. Software

PROGRAMS/DISKETTES:
- Cells
- Transport: Blood, Lymph, Cells, Blood Types
- Excretion
- Endocrine System
- Biochemistry: Proteins, Carbohydrates, Atomic Structure
- Digestion
- Locomotion
- Respiration
- Animal Reproduction
- Nervous System
- Circulation/Organs
- Circulation System
- The Human Adventure
- Reproduction Process/Human
- The Heart

VENDOR: Micro Power and Light Company

PROGRAMS/DISKETTES:
- Reproductive Organs
- Circulation: Organs
- Reproduction
- Circulation System
- The Ear

VENDOR: Professional Computer Systems

PROGRAMS/DISKETTES:
- Anatomy Quiz, Vol. 1: Muscles of the Head & Neck
- Anatomy Quiz, Vol. 2: Muscles of the Trunk
- Anotomy Quiz, Vol. 3: Muscles of the Extremities
- Joints
- Nerves
- Arteries
- Veins

VENDOR: Scandura Training Systems Inc.

PROGRAMS/DISKETTES:
- Reproduction and Development
- Genetics
- Human Physiology
- Biochemistry

VENDOR: Synergistic Software

PROGRAMS/DISKETTES:
- Microbe: The Anatomical Adventure

VENDOR: Versa Computing Inc.

PROGRAMS/DISKETTES:
- Anatomy I

GAMES FOR HOE STUDENTS

Games appear to generate interest in learning while possessing the ability to present and reinforce both concepts and skills. The following are commercially available to HOE teachers. All are "user friendly"; most are ready to use. Others may require input from the teacher to create the subject matter or content desired for a particular lesson. Several of the medical terminology games, for instance, require entering terms that could be used for drill. None require knowledge of programming.

A particular good game for "Exploration" students is "Health Awareness Games," which draws on extensive tables of statistics about people's health, living habits, and other behaviors. Included are coronary risk, reasons for smoking, exercise and weight, and life expectancy.

CLASSIFICATION: Mathematics Games

VENDOR: Educational Activities Inc.

PROGRAMS/DISKETTES:
- Roundtable: Rounding Numbers to the nearest 10th, 100th, 1000th.
- Panzer Problems: Multiplying a Single Digit by a Single Digit
- Tic-Tac-Toe: Comparing Fractions
- Space Reducer: Reducing Fractions
- Spider-Web: Finding the Fractional Part of a Number
- Three In-A-Row: Changing An Improper Fraction to a Mixed Number
- Math Baseball

VENDOR: Educational Teaching Aids

PROGRAMS/DISKETTES:
- Alien Edition for Apple II
- Minus Mission for Apple II
- Meteor Multiplication Apple II
- Demolition Division Apple II
- Aligator Mix for Apple II
- Dragon Mix for Apple II

VENDOR: Micro Learningware

PROGRAMS/DISKETTES:
- The Playful Professor/A Mathematical Tutorial
- Arith-[illegible]-Tackle

CLASSIFICATION: Basic Computer Skills

VENDOR: Educational Teaching Aids

PROGRAMS/DISKETTES:
- Programs for Beginners on the TRS-80
- Computer Programming
- Computer Programming Course Two
- Ten Easy Pieces: Creative Programming for Fun and Profit
- What To Do After You Hit Return
- Creative Programming, Vols. I-VII
- Creative Programming, All Stars Series
- Speaking PASCAL

VENDOR: Muse Software

PROGRAMS/DISKETTES:
- Robot War (programming game)

CLASSIFICATION: Anatomy & Physiology Games

VENDOR: Focus Media, Inc.

PROGRAMS/DISKETTES:
- Your Body: Series 1 (blood, digestive, circulatory)
- Your Body: Series 2 (muscular, skeletal, nervous, endocrine)

VENDOR: Synergistic Software

PROGRAMS/DISKETTES:
- Microbe: The Anatomical Adventure

CLASSIFICATION: Career Exploration Games

VENDOR: Simulation Software

PROGRAMS/DISKETTES:
- The Doctor Game

CLASSIFICATION: Medical Terminology Games

VENDOR: Computer-Advanced Ideas

PROGRAMS/DISKETTES:
- The Game Show
- Tic Tac Show

CLASSIFICATION: Health Awareness Games

VENDOR: Science Systems Software, Inc.

PROGRAMS/DISKETTES:
- Health Awareness Games

MEDICAL TERMINOLOGY

There is, as of this writing, only one commercially produced, "ready-to-use" medical terminology program appropriate for secondary HOE students. This is the "Elements of Medical Terminology" diskette noted below. The other programs allow for entering the words or concepts that will be used for drill. With very little study, however, powerful medical terminology lessons for students can be developed. Most of these programs are appropriate for a wide range of student abilities and learning rates.

VENDOR: Applied Micro Systems, Inc.

PROGRAMS/DISKETTES:
Elements of Medical Terminology

VENDOR: Computer-Advanced Ideas

PROGRAMS/DISKETTES:
The Game Show

VENDOR: Electronic Courseware Systems Inc.

PROGRAMS/DISKETTES:
Spell and Define

VENDOR: Hartley Publishing

PROGRAMS/DISKETTES:
Create Your Own Vocabulary

VENDOR: Random House

PROGRAMS/DISKETTES:
Customized "Flash" Spelling

NUTRITION

The software programs included in this section feature a wide array of levels of sophistication. All are appropriate for secondary-level students and many extend to the nutrition concerns of adult learners. They range in appropriateness from Health Occupations Exploration level to the senior LPN program and beyond. Most teach the basic nutrients in food groups. Others are sophisticated (and fun) programs for diet planning and nutritional analysis, including diet analysis.

VENDOR: Apple Computer Company

PROGRAMS/DISKETTES:
Diet Analysis

VENDOR: EMC Publishing

PROGRAMS/DISKETTES:
Nutrition Tutorial
Nutrition Simulation

VENDOR: Minnesota Education Computing Consortium

PROGRAMS/DISKETTES:
Nutrition Volume 1 (grade 7-adult)
Nutrition Volume 2 (senior high-adult)
Food Facts (junior high-adult)
Computing Your Way to Better Nutrition

VENDOR: Muse Software

PROGRAMS/DISKETTES:
The Eating Machine

VENDOR: PCD Systems Inc.

PROGRAMS/DISKETTES:
Nutri-Calc

VENDOR: Science Systems Software Inc.

PROGRAMS/DISKETTES:
Nutrition: A Balanced Diet

SAMPLE CLINICAL APPLICATIONS ("UTILITY") PROGRAMS

Most of these programs are meant for actual use in medical and dental offices. Typically they would be used in medical assisting programs. Beware, however, of the prices of these programs. Most are in the $600.00 range and up. As mentioned earlier in this monograph, there are ways of obtaining and using these programs for teaching at significantly reduced rates (or free). These should be checked out carefully before purchasing.

VENDOR: ABT Microcomputer Software

PROGRAMS/DISKETTES:
Medical Office Manager

VENDOR: Andent

PROGRAMS/DISKETTES:
Dental Billing System
Dental-Medical Office Data

VENDOR: Boardroom Executive Software

PROGRAMS/DISKETTES:
Automated Medical Administrator
Special Claims Form Creator System

VENDOR: Charles Mann & Assoc.

PROGRAMS/DISKETTES:
Medical Office Management I
Medical Office Management II
Medical Office Management IIC
Dental Office Management I
Dental Office Management II
Dental Office Management IIC

VENDOR: Monument Computer Service

PROGRAMS/DISKETTES:
Medical Secretary

VENDOR: Spectra Soft Inc.

PROGRAMS/DISKETTES:
COMMA (Comprehensive Medical Management for the Apple)

These items would be appropriate for HOE/LPN programs but they are rather expensive.

VENDOR: Saunders Software

PROGRAMS/DISKETTES:
DoseCalc

SPECIAL FEATURES: A computer-assisted course in drug dosage calculation including parenteral, oral and IV rates. Includes diagnostic math tests and additional math review as needed. Includes a testbank of over 1000 different questions separately packaged on its own disk. Twelve software disks. $795.00 for the package.

VENDOR: Medi-Sim, Inc.

PROGRAMS/DISKETTES:
The Nursing Process (IBM/PC only)
Module 1: Intro to Nursing Process
Module 2: Components of Assessment
Module 3: Planning Goals and Actions
Module 4: Plan Implementation
Module 5: Goal Evaluation

FIRST AID

These programs vary widely in their sophistication. The Medi-Sim programs are strictly for more advanced students. The others have wide applicability from the Health Assistant to LPN-level.

VENDOR: Learning Technologies

PROGRAMS/DISKETTES:

- Introduction to First Aid
- Burns
- Fractures
- Bleeding
- Wounds
- Shock
- CPR
- Choking
- Poisoning Part I
- Poisoning Part II
- Poisoning Part III

VENDOR: MCE Inc.

PROGRAMS/DISKETTES:

- Poison Proof Your Home (description, prevention, treatment)

VENDOR: Medi-Sim, Inc.

PROGRAMS/DISKETTES:

- Shock (IBM/PC)
  - Module 1: Pathophysiology of Shock
  - Module 2: Types of Shock
  - Module 3: Assessment of Shock
  - Module 4: Pharmacological Aspects of Shock
  - Module 5: Complications of Shock

PROGRAMS FOR AUTHORING LESSONS, QUIZZES, AND TESTS

A section on "authoring systems" is included in this taxonomy of HOE softwar because much of what the HOE teacher needs must be tailored to his or her ow students. There is simply not enough basic software to get at the skills and concept found in secondary HOE curricula. The answer, at least over the short term, is t take advantage of a relatively good market for teacher-produced software. This is no considered programming; software developers produce user-friendly programs whic enable the teacher to build lessons, create item pools, puzzles, games, multiple-choic tests, fill-in-the-blank tests, and vocabulary drills. Also included are programs tha will score tests and keep a record of results by creating tables and histograms.

VENDOR: Apple Computer Co.

PROGRAMS/DISKETTES:
- Apple Pilot
- Apple Copilot
- Apple Superpilot

VENDOR: A. U. Software

PROGRAMS/DISKETTES:
- Exam Builder: Exam Question File System

VENDOR: Bobbs-Merrill Educational Publishing

PROGRAMS/DISKETTES:
- Microcomputer Software Testbank System

VENDOR: Career Aids Inc.

PROGRAMS/DISKETTES:
- Create Lessons
- Time Saver (Teacher Created Puzzles and Tests)
- Micro Test
- Applying the Apple II: A How To for Instructors

VENDOR: Class 1 Systems

PROGRAMS/DISKETTES:
- Test Rite (Test Item Bank/Test Generation)

VENDOR: COMPress

PROGRAMS/DISKETTES:
- Test Generator
- PACOR: Multiple Choice Tester

VENDOR: Computations Inc.

PROGRAMS/DISKETTES:
- Tests Made Easy
- Study Quiz Files
- Multiple Choice Files
- The Lesson Planner

VENDOR: Eiconics Inc.

PROGRAMS/DISKETTES:
Text Writer
Educator

VENDOR: Fireside Computing Inc.

PROGRAMS/DISKETTES:
CAI Authoring
Computer Managed Instructions

VENDOR: Hartley Courseware Inc.

PROGRAMS/DISKETTES:
Create-Fill in the Blank
Create Skills/Intermediate (create drills, tests)
Create Your Own Lessons

VENDOR: Instant Software

PROGRAMS/DISKETTES:
Teacher's Aide (CAI Authoring)

VENDOR: Micro Power and Light Co.

PROGRAMS/DISKETTES:
The Adaptable Skeleton (store practice exercises & quiz questions)

VENDOR: Minnesota Educational Computing Consortium

PROGRAMS/DISKETTES:
Teacher Utilities: Vol. 1 (create crossword puzzles, tests, vocabulary drills)
Teacher Utilities: Vol. 2, 3, 4 (Q & A, word lists, edit lessons, etc.)
Practice Makes Perfect (drill & practice, Atari only)

VENDOR: Random House

PROGRAMS/DISKETTES:
Tutorial Quiz Master

VENDOR: Tamarack Software

PROGRAMS/DISKETTES:
Vanilla Pilot

VENDOR: TIES

PROGRAMS/DISKETTES:
Test Scoring

JOB-SEEKING SKILLS

One of the commonalities of all HOE programs is that they are vocationally directed, so that the end result is a well prepared entry-level practitioner. These programs assist the student in job-seeking skills, job readiness, the application process, interviewing skills, and the student's self concept. Most of the items listed here are appropriate for all of HOE students.

VENDOR: Aquarius Software

PROGRAMS/DISKETTES:

- How to Get and Hold a Job
- The Job and You
- Self-Concept and Your Work
- New on the Job
- Interviewing

VENDOR: Career Development Software Inc.

PROGRAMS/DISKETTES:

- The Worst Possible Interview in History
- The Four Stages of Interviewing
- Skill Identification
- Interview Stress
- The Values Option
- The Work Activities Inventory

VENDOR: Microcomputer Educational Programs Inc.

PROGRAMS/DISKETTES:

- Job Readiness: Assessment and Development
- Job Readiness: Attitude Assessment
- Filling Out Job Applications
- Successful Job Interviewing
- Resources for Job Hunting
- Personal Habits for Job Success
- Work Habits for Job Success
- First Day on the Job

BASIC COMPUTER LITERACY PROGRAMS

The software listed in this section is appropriate for both teacher and student. The list is not exhaustive but is representative of the kinds of materials available. The concepts range from keyboarding, to understanding basic computer concepts, to programming in BASIC language.

VENDOR: Career Aids Inc.

PROGRAMS/DISKETTES:
- Teach Yourself Apple BASIC: Apple II or IIe (48K)
- Meet The Computer: Intermediate BASIC, Apple II or IIe (48K)
- Basic Tutor
- Alpha Plot (high resolution graphics)
- Computer-Assisted Instruction
- How to Program in Applesoft BASIC

VENDOR: Educational Activities, Inc.

PROGRAMS/DISKETTES:
- Computer Literacy Instructional Program
- Keyboarding

VENDOR: Enclyclopedia Britannica Educational Corp.

PROGRAMS/DISKETTES:
- Understanding Computers
- Programming Your Apple

STUDENT RECORDS: GRADING AND ATTENDANCE

Many HOE teachers across the country who are using microcomputers hav found these programs to be quite helpful. They allow for use of a microcompute as a gradebook, as a record of attendance, or a total of grades and averages. Ther is even a program included here that can be used to keep schedules.

VENDOR: CMA Microcomputer Division

PROGRAMS/DISKETTES:
- Class Scheduling PC
- Grading System Program
- The Electric Gradebook
- Attendance

VENDOR: Disk Depot

PROGRAMS/DISKETTES:
- Gradebook II

VENDOR: Electronic Courseware Systems, Inc.

PROGRAMS/DISKETTES:
- ECS Computerized Gradebook

VENDOR: Learning Technologies

PROGRAMS/DISKETTES:
- Class Records

VENDOR: MARCK

PROGRAMS/DISKETTES:
- Gradisk (grade management)

VENDOR: Science Systems Software Inc.

PROGRAMS/DISKETTES:
- ApplePack Grader

VENDOR: Tamarack Software

PROGRAMS/DISKETTES:
- GradeCalc

HELPFUL REMEDIAL PROGRAMS

Many of the students who enter into HOE programs are somewhat deficient in math and language skills. As a result, teachers' efforts to teach the basic skills and concepts required in HOE are frustrated. The following programs are but a few selected items in math, science, and language skills which may be of help. These programs are best used on an individual or a small group basis. Examples of the topics found are fractions, metric equivalents, Fahrenheit conversions, common spelling errors, and punctuation reviews. There is also a brief listing of programs for handicapped students.

CLASSIFICATION: MATH COMPETENCY

VENDOR: BLS, Inc.

PROGRAMS/DISKETTES:
- Decimals: A Review Course (TRS-80 only)

VENDOR: Educational Activities, Inc.

PROGRAMS/DISKETTES:
- Addition and Subtraction of Fractions
- Addition and Subtraction of Decimals

VENDOR: Electronic Courseware Systems Inc.

PROGRAMS/DISKETTES:
- Elements of Mathematics

VENDOR: Learning Technologies

PROGRAMS/DISKETTES:
- Principles of Fractions
- Adding Fractions
- Subtracting Fractions
- Multiplying Fractions
- Dividing Fractions

VENDOR: Micro Learningware

PROGRAMS/DISKETTES:
- Prescriptive Math Drill
- Math Concepts I and II
- Metric Skills I and II
- Metric Conversion

VENDOR: Scandura Training Systems Inc.

PROGRAMS/DISKETTES:
- Celcius-Fahrenheit Equivalencies
- English-Metric Equivalencies: Weight, Length, and Volume
- Multiple Operations: Fractions
- Multiplication and Division: Fractions
- Multiple Operations: Percents
- Multiple Operations: Decimals
- Multiplication and Division: Decimals

VENDOR: Science Systems Software Inc.

PROGRAMS/DISKETTES:
- Metric System Tutor

CLASSIFICATION: LANGUAGE AND COMMUNICATION SKILLS

VENDOR: Aquarius Software

PROGRAM/DISKETTES:
- Our Language: An Individualized Approach

VENDOR: MicroEd Inc.

PROGRAMS/DISKETTES:
- Punctuation: APU-4
- Spelling
- Usage Boners: APU-1

VENDOR: Sublogic Communications Corp.

PROGRAMS/DISKETTES:
- Whole Brain Spelling

CLASSIFICATION: HANDICAPPED STUDENTS

VENDOR: Fullmer and Associates

PROGRAMS/DISKETTES:
- The Learning Box (General Purpose Authoring Program Tic-Tac-Toe Format with color and sound)

ADDITIONAL HELPFUL PROGRAMS

Following is a group of miscellaneous programs that are bound to be of help in the HOE classroom; the topics range widely.

The teacher who needs a secretary to type notes and communications to the parents of students can try "Parent Reporting" or "Special Report to Parents."

There are programs to help students who suffer from test anxiety or who may have trouble following directions. There is a program to help determine the reading level of the texts and written materials used for students. A program to reinforce negative effects of drugs and tobacco is also included.

VENDOR: Career Aids Inc.

PROGRAMS/DISKETTES:
- Alpha Plot
- Program Your Own Graphics
- Computer-Assisted Instruction
- How to Program in Applesoft Basic
- Parent Reporting (Send Personalized Messages Home)
- Reading Level Analysis

VENDOR: Disk Depot

PROGRAMS/DISKETTES:
- Special Report to Parents (an aid to communications with parents)

VENDOR: Encyclopedia Britannica Educational Corp.

PROGRAMS/DISKETTES:
- Computers in The Workplace

VENDOR: MARCK

PROGRAMS/DISKETTES:
- Acid/Base Chemistry

VENDOR: Microcomputer Educational Programs Inc.

PROGRAMS/DISKETTES:
- Strategies for Test Taking
- Effective Study Skills: A Learning Style Approach
- Following Written Directions
- Managing Your Time

VENDOR: Minnesota Educational Computing Consortium

PROGRAMS/DISKETTES:
- School Utilities Volume 2: Readability
- Health Maintenance Volume 1: Facts
- Health Maintenance Volume 2: Assessment

VENDOR: VMI (Visual Materials, Inc.)

PROGRAMS/DISKETTES:
- Alcohol and Health (junior high, high school, adults)

VENDORS AND DISTRIBUTORS

ABT Microcomputer Software
55 Wheeler St.
Cambridge, MA 02138
(617) 492-7100

ANDENT
1000 North Ave.
Waukegan, IL 60085
(312) 244-0292

Apple Computer Company
20525 Mariana Ave.
Cupertino, CA 95014
(408) 996-1010

Applied Educational Systems
RFD 2 Box 213
Dumbarton, NH 03301
(603) 774-6151

Aquarius Software, Inc.
P.O. Box 128
Indian Rocks Beach, FL 33535
(813) 595-7890

A. U. Software
P.O. Box 597
Colleyville, TX 76034
(817) 267-5236

Avant-Garde Creations
P.O. Box 30160
Eugene, OR 97403
(503) 345-3043

Boardroom Executive Software
255 N. El Cielo Rd. Suite 240
Palm Springs, CA 92262

Bobbs-Merrill Educational Pub.
4300 W. 62nd St.
P.O. Box 7080
Indianapolis, IN 46206
1-800-428-3750

Brainbank Inc.
220 Fifth Ave.
New York, NY 10001
(212) 686-6565

Career Development Software, Inc.
207 Evergreen Dr.
Vancouver, WA 98661
(206) 696-3529

Charles Mann & Assoc.
55722 Sante Fe Trail
Yucca Valley, CA 92284
(714) 365-9718

Class 1 Systems
17909 Maple St.
Lansing, IL 60438
(312) 474-4664

CMA Microcomputer Division
55722 Santa Fe Trail
Yucca Valley, CA 92284
(619) 365-9718

COM Press
P.O. Box 102
Wentworth, NH 03282
(603) 764-5831

COMPU-TATIONS
P.O. Box 502
Troy, MI 48099
(313) 524-2317

Computer-Advanced Ideas
1442 Walnut St. Suite 341
Berkeley, CA 94709
(415) 526-9100

Disk Depot
731 W. Colorado Ave.
Colorado Springs, CO 80906

Educational Activities, Inc.
1937 Grand Ave.
Baldwin, NY 11510
(516) 223-4666

Educational Teaching Aids
159 W. Kinzie St.
Chicago, IL 60610

Eiconics, Inc.
P.O. Box 1207
Taos, NM 87571

Electronic Courseware Systems
P.O. Box 2374 Station A
Champaign, IL 61820
(217) 539-7099

EMC Publishing
300 York Ave.
St. Paul, MN 55101
(800) 328-1452

Fireside Computing Co., Inc.
5843 Montgomery Rd.
Elkridge, MD 21227
(381) 796-4165

Fullmer Associates
1132 Via Jose
San Jose, CA 95120
(408) 997-1132

Hartley Courseware, Inc.
P.O. Box 431
Dimondale, MI 4882
(616) 942-8987

Instant Software
Elm Street
Peterborough, NH 03458
(800) 258-5473

J & S Software
140 Reid Avenue
Port Washington, NY 11050

Learning Technologies
25041 Mackenzie
Laguna Hills, CA 92653
(714) 859-2865

MARCK
280 Linden Ave.
Branford, CT 06405
(203) 481-3271

Microcomputer Educational Programs, Inc.
157 S. Kalamazoo Mall
Kalamazoo, MI 49007
(800) 421-4157

Learningware
P.O. Box 2134
North Manakato, MN 56001
(507) 625-2205

Power & Light Co.
12820 Hillcrest Rd. 224
Dallas, TX 75230
(214) 239-6620

Minnesota Education Computing Consortium
2520 Broadway Dr.
St. Paul, MN 55113
(612) 376-1118

Monument Computer Service
P.O. Box 603
Joshua Tree, CA 92252
(800) 854-0561

MUSE Software
347 N. Charles
Baltimore, MD 21201
(301) 659-7212

PCD Systems, Inc.
P.O. Box 143
Penn Yan, NY 14527

Professional Computer Systems
318A Lincoln Court
Bloomington, IL 60108
(312) 351-8817

Random House School Division
400 Hahn Rd.
Westminister, MD 21157
(800) 241-6402

Saunders Software
West Washington Square
Philadelphia, PA 19105

Scandura Training Systems, Inc.
1249 Greentree Lane
Narberth, PA 19072
(215) 387-8451

Science Systems Software, Inc.
11899 West Pico Blvd.
W. Los Angeles, CA 90064
1 (800) 421-6636

Simulation Software
6035 N. Maplewood Ave.
Chicago, IL 60659

Spectra Soft, Inc.
P.O. Box 277
Chandler, AZ 85224

Synergistic Software
830 N. Riverside Dr. Suite 201
Renton, WA 98055
(206) 226-3216

Tamarack Software, Inc.
P.O. Box 247
Darby, MT 59829

TIES
1925 West County Road B2
St. Paul, MN 55113

VERSA Computing, Inc.
3541 Old Conejo Rd., Suite 104
Newbury Park, CA 91320
(805) 498-1956

VMI Visual Materials, Inc.
4172 Grove Ave.
Gurnee, IL 60031
(312) 249-1710

Appendices

Appendix A: Vendor Letter

Appendix B: Teacher Survey Instrument

Appendix C: Supervisor Survey Instrument

COLLEGE OF EDUCATION

VIRGINIA POLYTECHNIC INSTITUTE AND STATE UNIVERSITY

Blacksburg, Virginia 24061

DIVISION OF VOCATIONAL & TECHNICAL EDUCATION

Dear Sir/Madam:

As part of a state-funded research project I am investigating for the Virginia State Department of Education the applications of microcomputers in vocational health occupations programs at the secondary level. In an effort to evaluate such microcomputer applications it is necessary to identify software which is available to our programs. Subsequent to our evaluation, software will be considered for use among secondary school health occupations programs throughout Virginia. Your firm has been identified as a vendor of high quality educational software which can provide pertinent information to assist our research effort.

I am asking each vendor to supply lists, descriptions, and possible examination copies of software which may be related to health occupations education. Such programs include entry-level careers in licensed practical nursing, nursing assistants, dental aides, radiology assistants, medical assistants, health assistants, EMT's, respiratory therapy assistants, medical laboratory assistants, etc.

I am specifically interested in programs relating to:

(1) career exploration in the above occupations.
(2) classroom and clinical competencies in the occupations noted.
(3) supplementary basic sciences content such as anatomy and physiology, pharmacology, microbiology and nutrition appropriate for grades 9-12.

In the event that you are able to forward software for examination in addition to the descriptive information I can guarantee safety of materials and strict observation of copyright protection. Prompt

return of any materials will be assured as requested.

We look forward to your response and to the opportunity to review your materials for adoption in our programs statewide.

Sincerely,

Richard W. Shelly, Ed.D.
Assistant Professor
Health Occupations Education

pbo

APPENDIX B

MICROCOMPUTER SURVEY
FOR
HEALTH OCCUPATIONS TEACHERS

1. Are you currently using microcomputers in your classroom or laboratory?
_____Yes _____No

2. If you are not using microcomputers, please identify the reason (s) from the list below (check all that apply).

___cost of hardware
___cost of software
___lack of applicable software
___computer literacy of teacher
___computer literacy of students
___no personal interest
___Other (please specify)_____

3. What type of computer(s) are you using in your classroom or laboratory or are available in your school system?

___Apple
___Radio Shack
___Commodore
___IBM
___Other (please specify)_____

4. Are you using any of the equipment listed below? ___Yes ___No
(please specify type where applicable)
___Printer_____
___Modem_____
___Disk Drive(s)_____ How many are you using per computer?_____
___Other_____

5. In what way are you using microcomputers? (Please estimate the percentage of each specific use).

___Drill & Practice	Includes repetition question and answer practice exercises	% of total use_____
___Tutorial	Includes new material pre/post testing, feedback, etc.	% of total use_____
___Simulations	Branching, logic situations, clinical simulations, patient management problems	% of total use_____
___Administrative	Recordkeeping, grading list & report generation, etc.	% of total use_____
___Clinical Applications	Actual diagnostic, treatment, or management program	% of total use_____
___Other	_____	% of total use_____
	_____	
	_____	
	_____	

6. In what type of classes are you using a microcomputer?

___ Career exploration

___ Career development (Please specify type of career(s) example, nursing assistant, dental assistant, LPN, etc).

_____ _____

_____ _____

_____ _____

___Skill Development (Please identify skills) _____

_____ _____

_____ _____

___Other (Please describe)_____

_____

_____

7. Please identify the following CHARACTERISTICS OF STUDENTS USING microcomputers:

CLASS LEVEL (example, ninth grade, tenth grade, etc.)._____

_____

Average age(s) per class level_____

8. Are any of your students learning disabled? ____No ____Yes

Please indicate type of disability_____

9. What steps are you taking or have you taken to become competent in microcomputer usage, as an individual?

___literacy courses
___programming courses
___independent study of computer applications, products, software, etc.
___using a microcomputer for personal applications
___other (please specify)_____

10. What <u>specific topics</u> or topic areas would you like to see developed for instructional purposes (classroom, laboratory, clinical) or software programs for the microcomputer (please list)?

_____

_____

_____

_____

_____

_____

Thank you.

APPENDIX C

SUPERVISOR QUESTIONNAIRE
MICROCOMPUTER APPLICATIONS IN HEALTH OCCUPATIONS EDUCATION

I. Please identify two secondary HOE teachers in your service area who maximize the use of microcomputers in the HOE classroom and/or laboratory.

Name _____
Address _____
(city) _____ (state) _____ (zip) _____
Phone ( ) _____

Name _____
Address _____
(city) _____ (state) _____ (zip) _____
Phone ( ) _____

II. What percentage of the HOE teachers in your service region use microcomputers in their classroom/labs? (Check one)

_____ 0-5%
_____ 6-10%
_____ 11-15%
_____ 16-20%
_____ greater than 20% (specify_____%)

III. Of all types of microcomputers used by HOE teachers in your service area, please estimate the percentage of the types currently in use.

PERCENTAGE	MAKE	MODEL(S)
_____	Apple	_____
_____	Atari	_____
_____	Bell and Howell	_____
_____	Commodore	_____
_____	DEC	_____
_____	Franklin	_____
_____	IBM	_____
_____	Kaymo	_____
_____	Osborne	_____
_____	Radio Shack	_____
_____	Victor	_____
_____	Other	_____

IV. Please prioritize (rank order) the following potential barriers to implementation of microcomputers according to the practical realities found in your service region (1 = biggest problem; 5 = smallest problem).

_____ Cost of hardware
_____ Cost of software
_____ Lack of applicable software
_____ Computer literacy of teachers
_____ Computer literacy of students
_____ Other (specify) _____

_____

V. Of all the ways that HOE teachers in your area are using microcomputer software, please estimate the percentage of each specific use.

1.	DRILL AND PRACTICE	Includes repetition, question and answer, practice exercises.	% use _____
2.	TUTORIAL	Introduces new material, pre/post tests, supplies, feedback.	% use _____
3.	SIMULATIONS	Branching logic situations, patient management problems, problem-solving, decision-making.	% use _____
4.	ADMINISTRATIVE	Recordkeeping, grading, list generation, etc.	% use _____
5.	CLINICAL APPLICATIONS	Actual diagnostic, treatment, or management programs	% use _____
6.	OTHER (Specify)	_____	% use _____

VI. What are your administrative plans over the next three years relative to HOE microcomputer utilization? (Check all that apply.)

_____ No increased effort or support
_____ Increased financial support for microcomputer applications/instruction
_____ Increased teacher literacy efforts
_____ Sponsoring research and development in microcomputer applications
_____ Other (Specify)_____

_____

As required by federal laws and regulations, the Virginia Department of Education does not discriminate on the basis of sex, color, race, religion, handicapping conditions, or national origin in employment or in its educational programs and activities.

The activity which is the subject of this report was supported in whole or in part by the U. S. Department of Education. However, the opinions expressed herein do not necessarily reflect the position or policy of the U. S. Department of Education, and no official endorsement by the U. S. Department of Education should be inferred.