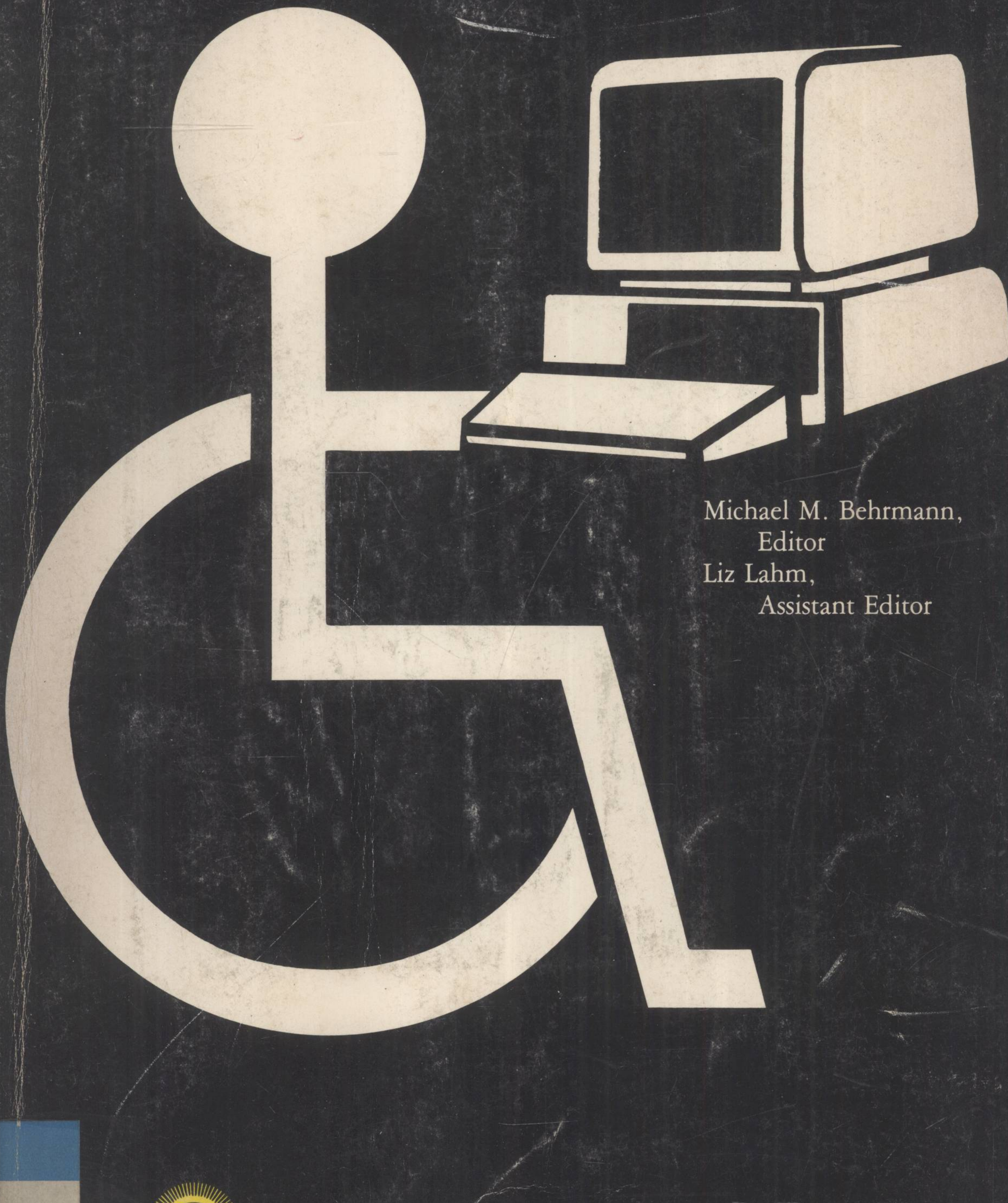
Proceedings of the National Conference on the Use of Microcomputers in Special Education

Hartford, CT March 10-12, 1983



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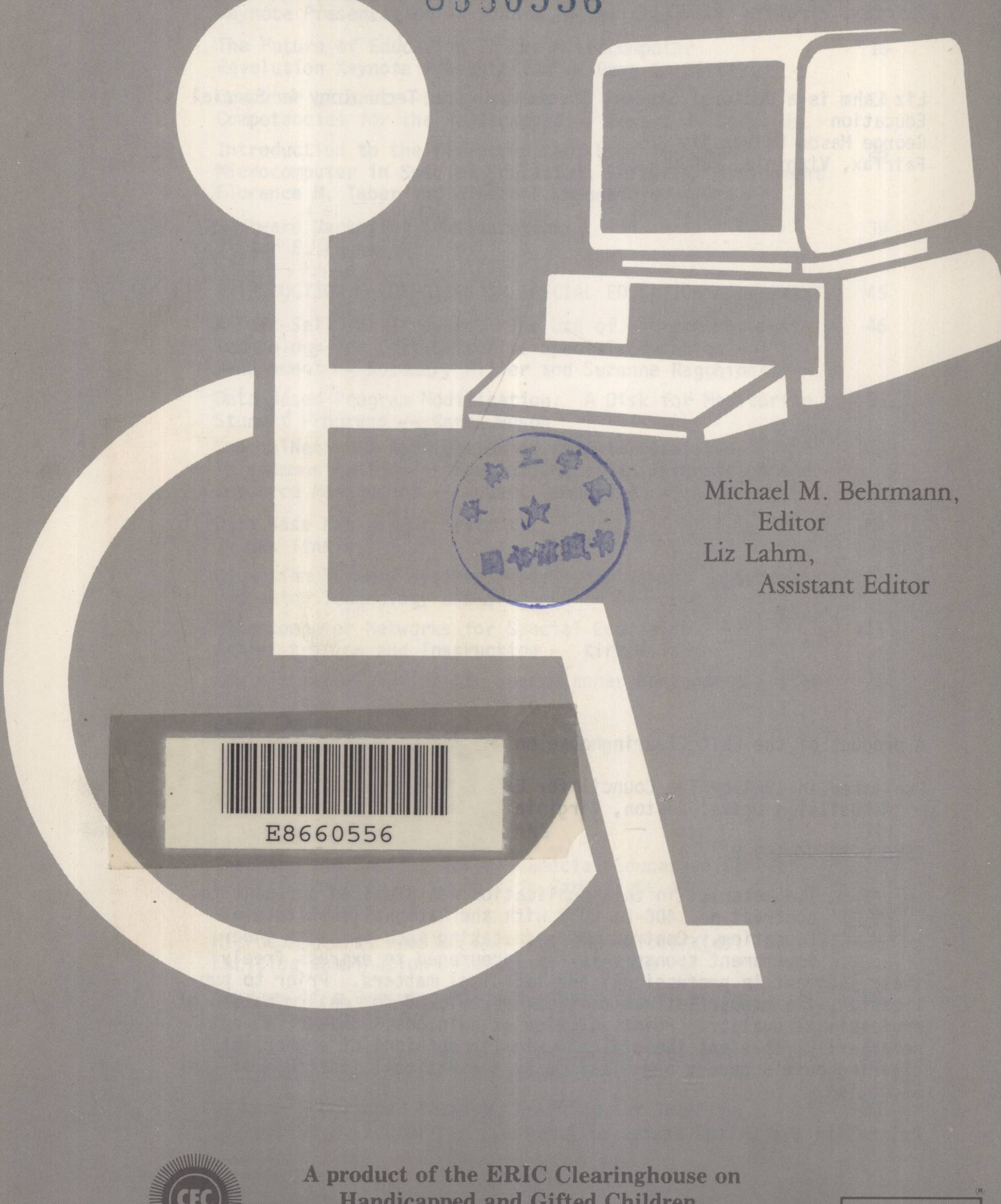

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A product of the ERIC Clearinghouse on
Handicapped and Gifted Children

The Council for Exceptional Children

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FOREWORD

The Proceedings from the Council for Exceptional Children's First National Conference on the Use of Microcomputers in Special Education reflects much of the state-of-the-art application of microcomputer technology. The need for basic workshops on microcomputer use and for information on practical applications of computers in special education was reflected by the overwhelming turnout at the March 1983 conference in Hartford, Connecticut. People from all over the United States as well as Canada, Australia, and Europe attended this conference. The turnout was so large that many presentations were repeated at least once and many twice during the conference.

Primarily due to the proliferation of low-cost computers in education and society, it is not surprising that there is an enormous demand for information regarding the applications and use of computers in the field of special education. These proceedings provide up-to-date information in a different format than other recently published books. These are specific applications rather than theory. It will serve as a sourcebook rather than a textbook.

Computer usage in special education is a natural extension of instruction because of the many similarities among the characteristics of computers, instructional methods used in special education, and the learning characteristics of handicapped children. These similarities include the ability to individualize and to provide needed repetition and the computer's infinite patience in drill and practice. The computer can also be programmed using the principles of applied behavioral analysis to provide consistent and systematic feedback and reinforcement for children. Another similarity is in the logical sequencing used in programming computer software and the special education instructional methods of skill sequencing and task analysis. The computer is an ideal medium for defining and objectively measuring progress toward mastery criteria in instructional tasks, allowing teachers to collect and analyze more data on student performance than previously possible within the parameters of their classroom.

These proceedings represent an initial attempt to provide special educators with current information regarding microcomputers and their utilization in special education. Presenters were asked to submit information for inclusion in this book. Two levels of submissions were available for presenters. They could either provide a brief abstract of their session or provide a more detailed paper for the proceedings. Commercial presentations and information from exhibitors were requested as well as information from program participants. ED numbers at the end of some papers indicate that the paper is also in the ERIC Data Base. ERIC documents may be ordered in microfiche or paper format from the ERIC Document Reproduction Service (EDRS) P.O. Box 190, Arlington, VA 22210.

In organizing the proceedings we have presented them thematically for several reasons. First, this format provides a practical means of information retrieval, because most readers will be interested in a particular application of microcomputers in special education. Second, thematic categorization of the papers helps provide a basis to compare and synthesize the information available in the proceedings. We have also chosen to present detailed papers at the beginning of each section followed by input and output briefs. The input and output portion of each section includes brief abstracts of information presented at the conference. The Table of Contents provides an overview of the thematic categories included in the proceedings. These sections are "Overview of Microcomputers in Special Education"; "Computers in Special Education Management"; "Teacher Training"; "Instructional Applications with Computers"; "Computers as Tools"; and "Commercial Resources."

The overview section presents broad topics of microcomputer applications in special education. It includes the two keynote presentations from the conference as well as other presentations of wide interest. The management section presents material directed toward computer-assisted management and computer-managed instruction; it should be of interest to both teachers and administrators. The teacher training section is directed specifically toward teacher literacy in the use of microcomputers, as opposed to "Instructional Applications of Computers," Section 4, which discusses training children in computer literacy and presents some of the instructional uses of microcomputers with exceptional children. The tools section discusses the use of computers as tools by handicapped individuals. Although teaching exceptional children to use the microcomputer as a tool could be incorporated in the previous section, the use of the computer as a prosthetic or adaptive tool differentiates this material from instructional applications in computers.

The sixth and final section of the proceedings is the commercial resources section. This section provides information from commercial developers and presenters related to their particular hardware and software and provides information on how to obtain these materials.

Michael M. Behrmann
Liz Lahm
March 1984

TABLE OF CONTENTS

SECTION 1

INTRODUCTION: OVERVIEW OF MICROCOMPUTERS IN SPECIAL EDUCATION

Section 1 includes five articles providing generic information regarding computer use in special education. Included are the two keynote addresses, a discussion of the need for computer literacy in special education, an introductory paper regarding the uses of computers in special education, and finally some software marketing considerations for special education software.

The first article is the first keynote speech for the conference. Hofmeister begins by trying to place the microcomputer and the computer into perspective in the current social environment. He discusses the broad educational implications of computers and microcomputers in society and the impact of computers on the learning process. The major portion of this document addresses the special education applications of microcomputers, including tool applications of microcomputers. Topics included are (1) computer-assisted instruction, highlighting drill-and-practice programs and tutorial programs; (2) general implications of computer-assisted instruction; (3) management and administrative implications of computers in special education; (4) computer-managed instruction; and (5) computer literacy. The paper closes with a discussion of the computer and the changing role of the teacher in special education.

The second keynote presentation addresses the future of education and the microcomputer revolution. Bitter begins with a review of recent developments and the increasing momentum of technological change facing society. Current computer applications in special education are highlighted, using a variety of specific examples of programming implemented in the author's state. A discussion of computer literacy and the need to develop a school-based curriculum for computer literacy follows. In closing, thoughts on future innovations that are likely to affect education in general and special education in particular are presented.

The last three articles in this section address computer literacy, implementation, and software development. Cain discusses the importance of providing daily computer literacy skills activities for mildly and moderately handicapped individuals. He highlights how handicapped people use the computer as a communication tool, a prosthetic device, a problem-solving tool, and finally a recreational tool. In a series of presentations Taber and Hannaford discuss literacy, microcomputer systems, requirements for implementation of the microcomputer into educational systems, and specific uses for the microcomputer in special education. They include methods of evaluating microcomputer hardware and software. Fuchs looks at computer software marketing considerations for potential software developers. He notes the factors that commercial producers of software are aware of when reviewing software for possible commercial publication. These include marketing distributions, patterns for software, analysis of consumer demands for the software, analysis of what is quality, and how quality affects software. The implications of future developments in technology and planned obsolescence of today's software is also discussed.

THE SPECIAL EDUCATOR IN THE INFORMATION AGE

KEYNOTE PRESENTATION

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INTRODUCTION: THE UMBRELLA PHENOMENA

The major purpose of this conference is to share information on the applications of the microcomputer to special education. Before we can discuss microcomputer applications, we must place the computer in perspective. Contrary to many statements in the press and notwithstanding Time's award (Time, 1983) to the computer as the machine of the year, the major phenomenon that we are witnessing is not a computer revolution. The major phenomenon is the birth of the information age. We represent the last generation of the industrial age. The pupils coming to school are the first generation of the information age. When today's eighth-graders take their place in society, 75 percent of them will be involved in information-related industries.

We are participating in a massive change in the structure of society. For those of us whose life span will include the transition between these two ages--the industrial and the informtion age--this is indeed a time of wonder, challenge, and confusion. Like the adolescent caught between childhood and adulthood, we are experiencing that strange mixture of excitement and confusion as some of our traditional reference points dissolve and we try to determine which of the new directions has substance and which are shallow seductive facades.

By assigning the information age the role of umbrella phenomenon, I in no way want to belittle or minimize the impact of the computer. The computer is the major tool of the information age. By a serious study of the computer we can get glimpses of the nature of the coming information age and of the potential impacts on us as individuals and society as a whole.

BROAD EDUCATIONAL IMPLICATIONS

One of the lessons that we have learned from P.L. 94-142 is that we are educators first and special educators second. We cannot hope to serve the handicapped population effectively if we lose sight of the overall mission of the educational profession. One of the primary impacts of the information age on the education profession as a whole is tied to a dramatic change in the way we approach the storage, retrieval, and application of information. We were raised in an age when much of the critical knowledge that we gained in school could be contained in a few textbooks. Most of this knowledge stayed viable for years after we finished the formal education process. The rapid expansion of our knowledge base is such that the notion of the textbook as a source of information for future use is both obsolete and debilitating for the pupils taught under such assumptions.

The challenge of all educators is to help our pupils survive in a world where the information that they will need does not exist. The preparation of pupils to access and apply information that does not exist is a task that is new to most educators.

As special educators, we face the same problems as regular educators. We do not know for sure what the societal challenges will be for the population of special education students presently in our charge. The advent of the industrial age created major changes in the life style of individuals in the late nineteenth century. These changes had a profound impact on the quality of life of the handicapped in society. With the industrial age came the emphasis on asylums, state hospitals, and centralized facilities. Such facilities were necessary to care for handicapped individuals whose traditional support systems had been dissolved or disrupted as the more flexible, rural life styles disappeared and previous caretakers moved to full-time employment in the factories.

What changes will occur as a result of the information age? We can only hypothesize. We can gain only glimpses. There are those who would suggest that the massive emphasis on technology and science associated with the information age will make society so complex that the power in society will be vested in that percentage of the population that has the knowledge and skills to manipulate information management tools such as computers. There are others who suggest that the technology will make life so simple that everything will be user-friendly; we will not have to think that hard, and the computers will take care of many of the stressful activities occupying our time. This latter vision chills the blood of some individuals concerned about the intrusive nature of the information age. They view the abdication of our faculties to think, plan, and search as an abdication of our humanity.

How can we prepare to fulfill our professional obligations in the face of such conflicting projections? As we receive these messages from the futurists, we should be wary of developing a sense of inevitability and helplessness. We should view the process as an evolution and not a revolution. There is one clear course of action that is open to us. If we build our information management skills, if we develop our ability to manage the tools of the information age, we will be much better prepared not only to develop and assess future courses of action, we will be able to direct the course of the future.

It is the development of these skills related to the computer that is the major reason for our participation in this conference. The term commonly applied to the acquisition of these skills is computer literacy. The possession, or lack, of such computer literacy as it applies to our own profession will determine whether we are passive recipients or active participants in the information age.

THE LEARNING PROCESS

It has been a well-documented fact that many of the handicapped individuals in our society assume their greatest visibility during their school years. There have been a number of explanations given for this. Some would say that it is a function of our statistical processes in that we tend to keep better statistical data on school-age pupils than other members of the population. Some skeptics would say that it is understandable in view of the special education profession's propensity for empire building. I prefer to think that a major reason for the visibility of so many handicapped individuals is that we have placed them in a substantial learning environment. Many of these individuals are handicapped because they do not adapt to the learning process as well as their peers.

A developing characteristic of the information age is an emphasis on a lifelong learning process. One of the more perceptive observers of technological impacts on society is O. K. Moore, the developer of the "talking typewriter" in the middle 1960s. With regard to the impact of the new technologies on society he and Andersen (Moore and Andersen, 1969) made the following observations:

> We think that one important result of this technological leap is that we are in transition from what we have called a "performance" society to a "learning" society. In a performance society, it is reasonable to assume that one will practice in adulthood skills which are acquired in youth.. . . In contrast, in a learning society, it is not reasonable to assume that one will practice in adulthood the skills which were acquired as a youth. Instead, we can expect to have several distinct careers within the course of one lifetime. Or, if we stay within one occupational field, it can be taken for granted that it will be fundamentally transformed several times. In a learning society, education is a continuous process--learning must go on and on and on. Anyone who either stops or is somehow prevented from further learning is reduced thereby to the status of an impotent bystander.
>
> We assume that the shift from a performance to a learning society calls for a thorough-going transformation of our educational institutions--their administration, their curricula, and their methods of instruction. Education must give priority to the acquisition of a flexible set of highly abstract conceptual tools. . . . What is required is the inculcation of a deep, dynamic, conceptual grasp of fundamental matters--mere technical virtuosity within a fixed frame of reference is not only insufficient, but it can be a positive barrier to growth. Only symbolic skills of the highest abstractness, the greatest generality, are of utility in coping with radical change. (pp. 583-584)

SPECIAL EDUCATION APPLICATIONS OF MICROCOMPUTERS

With the broad implications of the developing information age in mind, I would like to turn to the specific applications of the microcomputer in special education. In special education there are four major areas of application: (1) tool applications, (2) computer-assisted instruction (CAI), (3) computer-managed instruction (CMI), and (4) computer literacy.

Tool Applications

The tool applications that I particularly want to address in special education are those where the pupil uses microcomputer technology as a personal assistive device. Examples of this include the gifted child using the computer to help solve a mathematical equation; the learning disabled child using word processing and related programs to analyze spelling and grammatical errors; the visually handicapped pupil using electronic aids to translate print into synthesized speech; the deaf child and the speech-impaired pupil using the microcomputer to translate typed-in information into synthesized speech; and the physically handicapped child using microcomputer technology to activate muscles that have damaged neural connections.

These electronic personal assistive devices have made dramatic changes in the quality of life of a number of special education pupils. This is an exciting and growing field that has already yielded rich returns for comparatively modest investments. As Vanderheiden (1982) observed:

> The past few years have witnessed a tremendous increase in the number of individuals and small groups involved in the development of special aids for disabled persons. Microcomputers have given individual designers who don't have access to extensive laboratory and production facilities, the capability of developing sophisticated electronic aids. (p. 136)

The major contribution of these electronic aids has been to the sensory and motor handicapped members of the special education population.

Computer-Assisted Instruction

Without wishing to detract or minimize the value of the personal assistive devices to which I have just referred, it should be noted that the special education groups who benefit most from these devices represent approximately 7 percent of the school-age handicapped population. The visually impaired, the deaf, the hard of hearing, the physically and otherwise impaired, and the multiply handicapped comprise approximately 7 percent of the school-age handicapped population. The remaining 93 percent is made up of the learning disabled, the speech impaired, the mentally retarded, and the emotionally disturbed (U.S. Department of Education, 1982).

Of primary concern for the majority of the special education pupils in our care will be the relationship between the instructional applications of the computer and the needs of the special education pupil. The most prevalent application of the microcomputer in instruction is in computer-assisted instruction. CAI programs are generally discussed in two categories: drill-and-practice and tutorial programs.

Drill and Practice. Drill-and-practice CAI programs are the most used and probably the most criticized of the different types of CAI products. Some of the criticism is justified because many of the poorer software programs are drill-and-practice programs. Beginning CAI software programmers often begin with drill-and-practice programs because these programs are short and often do not require sophisticated programming skills. The result has been a large volume of poorly written products that confuse the naive user, anger the sophisticated user, and embarrass the authors as they become more skilled in CAI development.

Drill-and-practice programs are the flashcards of CAI; to the extent that there is a place for flashcard-like activities in the classroom, there is a place for good drill-and-practice software. Although few people would question the need for drill and practice in subject areas such as typing, some do object to the stimulus-response type of instruction in other curriculum areas. It should be remembered that to function at higher cognitive levels, certain preliminary skills must be automatic. Pupils cannot do quality creative writing if they are consciously fumbling with the subskills of spelling and punctuation. Long division cannot be done quickly and accurately if the subskill of subtraction is not mastered. Drill-and-practice programs have an important place and are most appropriately used (1) for subject matter that needs to be well mastered to facilitate the effective performance of higher level skills, (2) after the concepts related to the skill have been taught, and (3) just before the application of these skills to higher levels in the curriculum hierarchy.

The problems with drill-and-practice CAI are mostly problems of teacher management rather than computer-related problems. Drill-and-practice activities that are used as a substitute for the necessary teaching of the underlying concepts as well as drill that is not followed by meaningful applications of the skills are inappropriate uses of drill and practice, regardless of whether a computer is involved. The issues relating to the inappropriate use of drill and practice were well summarized in a study

(Alderman, Swinton, & Braswell, 1978) of the effectiveness of a CAI arithmetic skills curriculum. In concluding the study the authors noted that:

> The results do not call the curriculum itself into question, but instead, they challenge a fundamental assumption of any drill and practice approach. That students bring with them to the drill experience some prior understanding of the exercise topics. These results would seem to be a strong argument for closer integration of classroom teaching with any curriculum that provides drill and practice, and for a careful analysis and assessment of the prerequisites necessary for children to obtain maximum benefit from a drill-and-practice curriculum. Perhaps with exposure to fundamental concepts and models prior to extensive drill-and-practice, such curricula can exert even greater positive impact on student achievement. (p. 31)

The overlearning of skills is an important practice in special education. We have been highly dependent on good drill-and-practice activities. The microcomputer holds the promise of adding considerably more instructional resources. Here lies a dilemma. The more attractive and effective the activity, the more it frees the teacher, and the more the teacher will be inclined to overuse it. Furthermore, the more a teacher overuses drill and practice, particularly as a substitute for tutoring in the concepts underlying these activities, the smaller the contribution that the drill and practice will make. A good CAI drill-and-practice program is like a sharp axe. When properly applied in skillful hands, it will make a major contribution. Improperly applied by those who do not fully understand its role and contribution in the instructional process, it will make a mockery of good instructional practices.

<u>Tutorial Programs</u>. One of the characteristics that we generally attribute to the good special education teacher is that of an insightful, empathetic, and effective tutor. CAI tutorial programs should, therefore, be of major interest to the special educator. CAI tutorial programs hold considerable promise for the special educator. Because the majority of special education pupils are served in regular class settings, where teacher-pupil ratio is not as advantageous as it often is in separate special education classes, any technology that has the potential of increasing the level of personalized instruction should be thoroughly explored.

There are three different types of tutorial programs. The most common approach is to use the theoretical structures and procedures from programmed learning materials. In a <u>programmed learning</u> approach the subject matter is organized into instructional sequences, usually in a hierarchical manner. These programs stress active responding by the student and make extensive use of feedback and the branching to previous material or alternative sequences when student mastery criteria are not being met on specific objectives.

<u>Simulation</u>. Another approach, these programs typically include some elements of the programmed learning tutorial approach. Central to the program is some simulation of an environmental event. It may be a chemistry experiment, the movement of travelers on the Oregon Trail, or the prediction of a volcanic eruption. Such simulation of real events can create a powerful instructional experience. One of the best examples of the value of simulation is that used for flight trainers. This program is used in the initial stages of instruction, as an alternative to actual airplane flying. This program saves personnel time, equipment costs, and pilot lives. Simulation-based tutorials are invaluable where real-life events are too expensive, too dangerous, or too difficult to create or observe.

Artificial Intelligence-Based Systems. These are the third type of tutorial program. In these programs the researchers attempt to simulate the actions of an expert human tutor. Usually referred to as intelligent tutoring systems or intelligent computer-assisted instruction, these programs are popular in medicine, geology, chemistry, and education.

One of the most popular artifical-intelligence-based approaches is the knowledge-based expert system. The intelligence of the human tutor is built into the system through the identification of specific rules or heuristics. Typically these rules are identified through observing or interviewing an expert. Some of these systems contain over a thousand separate rules that were identified after months of interviewing and observation of experts. These programs are expensive to develop, and the memory and speed requirements of the host computer are such that few were designed for microcomputers. However, within the last few years several intelligent tutoring programs have been transferred to microcomputers.

I would like to exemplify further the difference between the traditional approach to CAE and intelligent tutoring systems. At Utah State University we are completing an interactive videodisk program to assess the math skills of mildly handicapped pupils. The system consists of a microcomputer, a videodisk, and a touch-sensitive color monitor. Attached to the microcomputer are two disk drives and a printer.

The computer presents questions in audio and color video on the screen. The pupil responds by touching an object or answer alternative on the screen. The computer monitors pupil responses and, when a pupil makes three consecutive errors in one curriculum strand, branches to another. The microcomputer can be programmed to conduct the assessment in English or Spanish. The logic is a traditional approach in that decisions are made based on a standard formula, e.g., branch to another strand after three consecutive errors.

After we collect sufficient information about how pupils perform in different curriculum areas, it will be possible to make the decisions much more "intelligent." The computer, rather than branching after three errors, would assess the probability of future questions being productive. This would be done by collecting information on the skills the student brought to the testing, situation, performance to that point, as well as other variables related to performance. This pupil information would then be compared with the information stored in the computer on the behavior of other pupils who were previously tested. A decision would be made based on probability statistics, whether further testing in a given strand hierarchy would be productive.

In a similar manner the computer samples the pupil's performance on selected English and Spanish items and decides whether the pupil should be tested in English or Spanish.

One intelligent tutoring system with clear implications for special education is the "Buggy" program (Brown and Burton, 1981). This program helps individuals identify common arithmetic computational errors. Buggy and other intelligent tutoring systems offer promise for the following reasons:

1. They tend to focus on critical skills. Although not comprehensive like traditional programmed learning-based tutorial CAI programs, the skills on which they do focus are usually gateway skills.
2. Because these programs tend to focus on errors, they are of considerable interest to special educators who are looking for ways to clearly identify and remediate errors.
3. The development of an intelligent tutoring system requires an extensive study of tutor/pupil interactions. Information of this kind will not

only be useful for the development of intelligent tutoring programs but should also provide direction for other noncomputer interventions.

General Implications of CAI

A few general comments regarding the total field of computer-assisted instruction are in order. First, I become concerned when I observe educators relatively new to computers becoming overly impressed with and intimated by CAI to the extent that they start to lose confidence in their instructional techniques. There is nothing in the research literature to suggest that computer-assisted instruction is the best form of individualized instruction. Indeed the literature (Hartley, 1977) suggests that although computer-assisted instruction is generally better than other approaches such as programmed learning and individual learning packages, it usually comes in second to structured tutoring approaches such as peer, cross-age, and aide tutoring.

For many people, computer applications in education are synonymous with CAI. This misconception is unfortunate for at least two reasons. First, it fails to recognize the issue of computer literacy and the need for the computer to be seen in its full societal role as a tool of the information age. Second, computer-assisted instruction is a developing area and subject to considerable variation in product quality. To advocate or criticize all computer applications in education on the basis of the present state of the art of CAI would be most unwise. Advocates of CAI must realize that we will do a disservice to both student and CAI by suggesting that CAI is the best and only approach to individualized instruction. Critics must be sensitive to the fact that CAI is still in its infancy; to condemn because there are some poor products may inhibit the development of the field and our chance to learn what contributions are possible.

COMPUTER-MANAGED INSTRUCTION

Of the several applications of the computer to education, computer-managed instruction (CMI) is probably the least visible and least discussed. Although the fortunes of CAI have fluctuated, CMI has been making quiet but substantial contributions to education. With its emphasis on the management of instruction-related information rather than the direct teaching of pupils, CMI may be the most cost-effective example of the application of computers to instruction.

A basic responsibility of all teachers, and the special education teacher in particular, is the development of an individual program for each child and the monitoring of the child's progress through that individual program. The use of the computer to support the prescription and monitoring of individual programs of study represents one of the oldest and most extensive applications of the computer in education.

Burke (1982) has defined CMI as "the systematic control of instruction by the computer. It is characterized by testing, diagnosis, learning prescriptions, and thorough record keeping." We can see in this definition a clear and strong relationship between computer-managed instruction and the special educator's IEP responsibilities.

I became most impressed with the potential of CMI after serving as an external evaluator for the GEMS project. GEMS is an anachronym for goal-based educational management system. It was developed in the Jordan School District, a large, rapidly developing, urban school district south of Salt Lake City.

The district described the project as a computer-supported management system developed to support diagnostic prescriptive teaching for mastery learning. Each curriculum was structured into strands, goals, and specific objectives. For example, GEMS reading contained strands of phonics, structure, vocabulary, comprehension, study skills, and affective reading. Within these strands were some 200 goal units. Each goal unit was further divided into specific objectives. As the students completed units of study, they were tested; if mastery were achieved, they moved on. If mastery were not achieved, alternate learning strategies were identified and implemented. Because the computer contained all the preassessment and postassessment information on each pupil, the teacher could call for a range of computer reports on the progress of individuals or groups.

The reference to the computer providing an essential research base reflects a major value of CMI. By analyzing the progress of students through the specific curriculum units, staff at the school and district level were able to identify areas of weakness. The information was used to remediate these weaknesses. Alternative teaching strategies were developed, curriculum sequences were revised, instructional materials were changed, and in-service training programs were developed. The effect of these changes was then monitored by using the computer to analyze the achievement gains of pupils. Ineffective practices and materials were replaced. What resulted was a continuous process of intervention, evaluation, and program revision. In the GEMS project the effect of this process was substantial. Within a two-year period, the average reading comprehension score had jumped 10 percentile points, from 45 to 55, and the average vocabulary score jumped 21 percentile points, from 45 to 66. One of the impressive findings in the data was that all populations--the high performing pupils, the Title I, and those with learning problems--benefited.

The GEMS project was able to demonstrate impressive accomplishments at a modest cost and has been replicated in a host of other districts and states. It must be remembered that the presence of computerized banks of data on pupil achievement is of little value by itself. There must be a commitment by the teachers and administrators to use the data to help direct improvements. This sense of self-evaluation and professional accountability was present in the Jordan School District staff and was the major factor responsible for the success of GEMS. The computer was a tool--a tool that was used with skill and sensitivity to make a significant improvement in the achievement levels of thousands of pupils.

One of the interesting aspects of the GEMS project was the generalizability of the model, which followed a classical computer-managed instruction model and was designed basically for all students. The characteristics of the model and its implementation were such that it followed closely the requirements of an individualized educational program.

The success of a CMI program is highly dependent on the manner in which the staff view the data generated by such a program. There are two ways that we can approach that data. We can view the data as an end product in itself. For example, under P.L. 94-142 we have a requirement to monitor individualized education programs. The presence of data is evidence that monitoring has occurred. The other alternative is to view the data not as an end product but a stepping stone to program improvement. In special education we have a large number of computerized programs designed to facilitate the management of individualized education programs. Some of these computerized IEP programs have been instituted to reduce the paper work burden.

We should remember that when a special educator complains about the paper work burden of the IEP, there are at least two possible interpretations. One interpretation comes from the teacher who has a sense of accountability and conducts the necessary record keeping for the establishment of individualized programs of study and the monitoring of these programs. An interpretation of the extra paper work complaint from such a teacher is essentially that an effective record keeping-system is already installed and the teacher does not wish to be bothered with additional record keeping.

Another interpretation of the extra paper work complaint comes from the teacher who is not conducting functional record keeping and feels highly uncomfortable with the accountability pressures associated with IEP paper work. The interpretation of the extra paper work complaint from this teacher is essentially one of "I don't want to be involved in any activities that will force me to be accountable for my instructional behaviors."

Given the existence of these two approaches, it should come as no surprise that the implementation of some computerized IEP programs has not facilitated the professional accountability spirit behind the law. In some implementations the computerized IEP has facilitated the segregation of record-keeping and classroom practices.

One advantage of many computerized IEP systems is that, for those who care to look, some interesting information can be found. Some skeletons in the professional closet become alarmingly visible. As a profession, we have some large gray areas in our practices relating to identification, assessment, placement, and program preparation. This has little to do with P.L. 94-142 but reflects rather the infant nature of special education as a discipline. If you care to analyze some of the computerized IEP records and compare them with classroom practices, you will find in certain school districts a rather alarming number of inconsistencies. You will find that screening information does not always match assessment procedures; that assessment information is not always consistent with pupil classification and program recommendations; and that classroom practices are not always consistent with IEP program information.

It is clear the computerized IEP does not always function as an implementation of the information age. It is somewhat analogous to a stone-age citizen using an outboard motor as an anchor for a raft. What we have done is move our paper records into the computer. We are treating the computer as an unintelligent file cabinet. The computer is perfectly capable of determining the degree to which the process of screening, assessment, classification, placement, and program implementation is a generally rational process. One would hope that the reason we have failed to use the intelligence of the computer to monitor the rationality of our activities is due mainly to our naivete regarding computers and not our lack of interest in evaluating the validity of our decisions. Having seen computer-managed instruction make a significant difference in the quality of life for thousands of children, I become saddened when I see computers being used as final resting places for valuable information that could be used for program improvement. In many ways the unopened file cabinet is preferable to the computer storing of information that is never used. At least with the unopened file cabinet we were not fooling ourselves that we were doing something significant or professional.

COMPUTER LITERACY

In the previous applications that we have discussed, the computer served as a tool--as a personal assistive device, as an instructional aid, or as an information management device. In computer literacy the computer