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ABSTRACT

Thirty-three papers are presented from a conference on the application of technology for use in the rehabilitation field. Presentations include "Technology--Opening Doors for Disabled People" (Rochlin, Bowe); "Management Information Systems Development for Rehabilitation Facilities: Critical Factors in Development and Implementation" (Robbins, et al.); "Technology for Children with Disabilities in Connecticut" (Rucker, Gillung); "Microcomputer Education for Employment of the Disabled (MEED): Discovering Microcomputer Careers" (Layton, Yourist); "Teaming the Classroom Computer with a Textbook for Teaching Phonics to the Hearing Impaired" (Hart-Davis); "The Student in the Thicket: Providing World of Work Experiences in an On-the-job Training Setting" (Hoppe); "A Study of Educational Computer Applications for Disabled Children Under 36 Months" (Ellingson, Treptow); "Disabled Access to Technological Advances" (Houston, Cress); "Bridging the Technological Gap" (Musante, et al.); "The Use of Computers in Vocational Assessment" (Tango, Reber); "Parents and Teachers Can Use Peripherals: A Training Perspective" (Hutinger); "Training Teachers to Use Microcomputers: A Consultant Approach" (Keefe); "Technology and Training Eligibility: The 'Fuzzy' Logic Approach to Computerized Vocational Choice" (Williamson); "Computer Speech Recognition for Vocational Training: Strategies and Observations" (Grooms); "Use of Computers for Cognitive Rehabilitation" (Wamboldt, et al.); "The Challenge and the Promise of Computer Access in the 21st Century" (Sloane); "Using LOGO and BASIC with Mildly and Moderately Handicapped Children" (Jolly); "Integrating Vocational Rehabilitation Operations through Automation" (Glass, et al.); "The Other Side of the Disk" (Krasnow, Floyd); "Clothing for Independent Living" (Albrecht, Habdas); "Innovative Software for Cognitive Rehabilitation" (Criter); "Developing Effective Rehabilitation Training Curriculums in Light of Current Technological and

Socioeconomic Trends" (Smith); "Choosing Appropriate Input Mode/Device for the Pediatric Client" (Vargas); "Communicate to Educate" (Joseph); "Adapting an Information Desk Job Setting for the Visually-Impaired" (Black); "The Implementation of Computer Technology in a Special Education/Clinical Setting" (Lashway); "AppleWorks for the Special Education Teacher" (Paulson); "Vocational Evaluation Upgrade Program" (Traver); "Vocational Rehabilitation Engineering--What Is It?" (Anderson, Ross); "Personal Computer Assisted Vocational Evaluation (P-Cave)" (Tuck); "Introduction to Microprocessing and Academic Strategies for Developmental-Level College Students" (Griffey); "NU-VUE-CUE: Verbal Eyes Verbalize" (Clark); and "Integrating Assistive Device Machine-Readable Databases with Design, Fabrication, and Testing of Devices and Components for Successful Work Adjustment" (Shafer). Author, title, and topic indexes are provided. (YLB)

TRAINING AND TECHNOLOGY FOR THE DISABLED

CONFERENCE PAPERS

Edited by:
Christopher Smith
University of Wisconsin-Stout

DISCOVERY III

March 10 - 12, 1986
Milwaukee, Wisconsin

Sponsored by:
University of Wisconsin-Stout
Office of Continuing Education and Summer Session
School of Education and Human Services

Materials Development Center
School of Education and Human Services
University of Wisconsin-Stout
Menomonie, Wisconsin 54751

Discovery III:

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EDITOR'S COMMENTS

Discovery III is history, but the conference will continue to impact training programs. The ideas and contacts garnered by conference participants and generated through the publication of these conference papers will subtly change the programs provided by participants and readers. Certainly "Training and Technology for the Disabled" participants have returned to their organizations richer for their contact with 34 exhibitors, 82 presentations, and 449 peers. Through these pages, you too will share the core messages of presentations made at the conference.

Since beginning the "Discovery" series in 1983, the field has seen an avalanche of conferences dealing with the topics of "computers" and "technology." Their themes necessarily revolve around changing technology. Participants in these conferences have no doubts that technological changes profoundly impact the lives of persons with disabling conditions and the personnel that provide training services for them. At least for those clients who receive the new devices it will dramatically change their potentials for job placement and their ability to live dignified and independent lives.

What stood out at "Training and Technology for the Disabled" were the terms used to describe technological products. Terms such as: "refined," "portable," and "compatible" were used. These adjectives illustrate the change that has occurred in the application of technology for use in the rehabilitation field. The dramatic introduction of new products is less likely to be seen at Discovery conferences now, though dramatic new advances are certainly occurring. Instead, more sophisticated versions of existing product concepts are receiving the most development activity and attracting the most attention.

This shift in product development is largely the result of a shift in development view. Entrepeneural developers are tending to view the rehabilitation field as a "peripheral market." This view of the rehabilitation market leads developers to create devices for the field that have first shown promise in other, larger, markets. These are the devices that are receiving the most intensive development. This results in sophistication aimed at capturing the largest market possible. Of course, persons with disabling conditions can reap benefits from their status as a peripheral market. But dangers exist in complacently sitting on the outside of the "big" market.

George Conn, Commissioner of the Rehabilitation Services Administration, Department of Education, in his concluding keynote address warned us of a large "peripheral" danger. As computerized devices proliferate, we are faced with an accessability gap that parallels the physical accessability problems still existing in our architecture.

Recognizing this danger now gives us an opportunity to negate some of the problem before it becomes costly to remedy. Mr. Conn urged the enactment of legislation in the form of a series of regulations. These regulations will have the express purpose of requiring any computerized device or accessory sold to the federal government to be usable, with adaptive aids, by any person with disabilities. The rules would make any newly designed device fully accessible to persons with disabling conditions.

Everyone is talking about technological change; some talk with wonder, some with fear. The underlying trends are the elements that justify both wonder and fear. Discovery III has helped focus our attention on some of the underlying trends: the trend toward greater sophistication for assistive devices, the trend of developers to see the disabled customer as part of a peripheral market, and the need to insure that new computerized products will be fully accessible to persons with special needs.

Discovery III was created with a great deal of effort on the part of conference staff and presenters. The University of

Wisconsin-Stout was proud to work in association with the Division of Handicapped Children and Pupil Services of the Wisconsin Department of Public Instruction, the Division of Vocational Rehabilitation of the Wisconsin Department of Health and Social Services, the Wisconsin Board of Vocational, Technical, and Adult Education, and Goodwill Industries of the Milwaukee Area, Inc. to present "Training and Technology for the Disabled."

Dr. Janet Roehl coordinated the conference through the Office of Continuing Education and Summer Session, John Van Osdale, Director, with consultation and support from the staff of the School of Education and Human Services, and Dr. Paul R. Hoffman, Executive Director of the Rehabilitation Institute. The staff and students of these organizations and associates together produced a valuable meeting of contemporary thinkers on the topic of technological innovation in training settings.

With these conference papers, the Materials Development Center has instituted a new policy of presenting conference documents in original form, as submitted by authors. Thus, this publication will vary slightly in form from paper to paper. We hope that this will clearly convey each author's original thoughts and will, thus, be of benefit to readers.

The ideas, products, services, and opinions expressed in these papers reflect the thinking of their authors. Their inclusion in this publication does not necessarily constitute endorsement by the Office of Continuing Education and Summer Session, the School of Education and Human Services, or the Materials Development Center of the University of Wisconsin-Stout.

Christopher Smith, Editor
April, 1986

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INTRODUCTION

The expertise and body of knowledge that has been developed through rehabilitation engineering and in the field of rehabilitation technology is significant. Due to the lack of awareness of the rehabilitation service delivery process and the concurrent lack of awareness that rehabilitation and education professionals have of technological aids and devices, much of this capability, however, is not being effectively utilized.

Personnel available to provide assistance with specifying and fabricating adaptive equipment, modifying work stations, and designing assistive devices are limited in number. A noticeable gap exists between the expertise of the clinical rehabilitation engineer, the medical team and the direct service providers. The recognition that greater emphasis needs to be placed on the actual delivery of services has been receiving considerable attention by government agencies and the professional community.

The thought for developing a "specialist" that would be trained in both rehabilitation skills as well as many of the technical competencies from the engineering field, is not new. Working with rehabilitation counselors, physical and occupational therapists, special education teachers, rehabilitation engineers, and others, the Rehabilitation Technology Specialist is responsible to come up with practical applications of technology that actually work. As a "specialist", the Rehabilitation Technology Specialist would work primarily in the actual delivery of services. The "specialist" would not replace or eliminate the need for rehabilitation engineers. Instead, it is anticipated that through the availability of rehabilitation professionals that are skilled in both technology and human service, the applications of technology to assist persons with disabilities will be improved and expanded.

The task delivering efficient and effective rehabilitation technology services to the broad range of individual physical and mental disabilities requires expertise and contributions from professionals in many varied fields. It has been well documented that the team approach utilizing expertise from medicine, rehabilitation and engineering has been effective in developing rehabilitation technology and as an important service component. The importance of rehabilitation technology in the rehabilitation process is becoming more and more recognized. Legislation for the reauthorization of the Rehabilitation Act has for the first time specifically recognized rehabilitation technology as a distinct component of the rehabilitation process. The question at hand is not to decide whether or not rehabilitation technology should be an integral component but rather how the rehabilitation field can most effectively utilize the resources and capabilities available.

Increased numbers of clients, the inclusion of persons with disabilities who were not previously served, more and more emphasis on meeting the needs of severely disabled and the specter of reduction in funds all contribute to making the provision of services a complex and difficult task. It has become increasingly clear that full utilization must be made of all resources and approaches available if quality rehabilitation technology service delivery can be provided.

Rehabilitation Technology has been defined by the 13th Institute on Rehabilitation Issues Study Group (February, 1986) as "use of adaptive equipment, and the application of compensatory strategies to increase and improve functional capacities of persons with disabilities." The expertise and body of knowledge that has been developed through rehabilitation engineering and in the field of rehabilitation technology is significant. One very apparent issue that has been identified is the engineering and technically oriented community's lack of familiarity with the service delivery models utilized in the rehabilitation field. A very large portion of the technology applications for disabled persons is occurring on a research and product development level within the network of Rehabilitation Engineering Centers (REC) supported by the National Institute of Handicapped Research (NIHR). These RECs along with the Veterans Administration Hospitals and their respective research programs and a number of university programs in engineering have developed some excellent resources and devices for vocational and independent living needs and other applications. Due to the lack of awareness of the rehabilitation service delivery process and the concurrent lack of awareness that rehabilitation and education professionals have of technological aids and devices, much of this capability however is not being effectively utilized (Technology and Handicapped People, 1982).

Personnel available to provide assistance with specifying and fabricating adaptive equipment, modifying work stations, and designing of assistive devices are limited in number. Clinical rehabilitation engineers are normally available at Rehabilitation Engineering Centers, medical rehabilitation hospitals and occasionally with state agencies such as Vocational Rehabilitation. A limited number of rehabilitation engineers also work on a consultation basis in many states in the United States. These numbers however are not sufficient to provide outreach services to the number of persons with disabilities who need assistance. Occupational therapists and others have done an effective job in many cases in functioning as adaptive equipment specialists. These staff normally are associated with medical hospitals or in school systems. A noticeable gap still exists however between the expertise of the clinical rehabilitation engineer, the medical team and the direct service providers in schools, rehabilitation facilities and state agencies. This becomes increasingly apparent when vocational applications of rehabilitation technology resources are needed.

The recognition that greater emphasis needs to be placed on the actual delivery of services has been receiving considerable attention by Rehabilitation Services Administration, National Institute for Handicapped Research, and the Association for Advancement of Rehabilitation Technology (formerly RESNA). Priority is being placed on the development of effective models for the delivery of rehabilitation technology services and identification of personnel available.

The thought for developing a "specialist" that would be trained in both rehabilitation skills as well as many of the technical competencies from the engineering field is not new. For the past three to four years staff in the rehabilitation program at the University of Wisconsin-Stout have been working on developing a training specialty that would prepare bachelor level staff to work effectively with technology while also having strong rehabilitation skills.

A Rehabilitation Technology Specialist is one consultant to the rehabilitation team that works with disabled persons to identify ways to overcome, or at least minimize, physical limitations. Working with rehabilitation counselors, physical and occupational therapists, special education teachers, rehabilitation engineers, and others, the Rehabilitation Technology Specialist is responsible to come up with practical applications of technology that actually work. This team approach is an important concept with the Rehabilitation Technology Specialist. There is no one "professional" in the rehabilitation process that provides everything for the clients who are served. In actual practice, the rehabilitation process functions most effectively when there are many professionals such as occupational therapists, rehabilitation counselors, special educators, vocational evaluators, rehabilitation engineers and placement staff each contributing their specific expertise.

As a "specialist", the rehabilitation technology specialist would work in conjunction with rehabilitation engineers, occupational therapists and other professionals in the actual delivery of services. Duties and responsibilities would include such things as job modifications, modifying job sites, fabricating adaptive equipment or specifying available aids and devices in rehabilitation hospitals, state vocational rehabilitation agencies and facilities, private rehabilitation, schools and in business and industry. In addition to being able to "specialize" in this type of work, this training model also includes skill preparation in counseling, vocational evaluation, work adjustment or many of the other human service tasks. This flexibility is important in most employment settings.

This "specialist" would not replace or eliminate the need for rehabilitation engineers. Instead it is anticipated that through the availability of rehabilitation professionals that are skilled in both technology and human service, the applications of technology to assist persons with disabilities will be improved and expanded and the market for qualified rehabilitation engineers will be increased as well.

Does sufficient need exist for another "specialist"? Judging from the limited knowledge that most rehabilitation professionals have of rehabilitation technology resources and applications, the limited number of facilities and centers offering rehabilitation technology services, and the limited number of service delivery personnel available, the need very much exists.

More information about Rehabilitation Technology Specialists and training programs for persons interested in becoming specialists can be obtained from the School of Education and Human Services at the University of Wisconsin-Stout, Menomonie, Wisconsin.

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TECHNOLOGY -- OPENING DOORS FOR DISABLED PEOPLE

Jay Rochlin and Frank Bowe

ABSTRACT: As the opening keynote speaker, Mr. Rochlin presents Frank Bowe's comments on the need of the disabled community to influence the creation of technologically oriented products in specific directions. He elaborated on the following needs: accessible equipment, incentives for "orphan" markets, decreasing equipment cost, and training in the use of aids.

Good morning. It is a pleasure for me to be here with you in Milwaukee. I am Jay Rochlin, Acting Executive Director of the President's Committee on Employment of the Handicapped, in Washington. How I came to be here is a long story -- but I will make it brief. Back in March, 1985, Frank Bowe accepted an invitation from Paul Hoffman to be the opening keynote speaker for Discovery '85, which then was scheduled for the following October. In April, Paul advised Frank that the dates had been changed to early March, 1986. And then in August, the date was again changed -- but this time Frank was no longer sure that he could make it. Three weeks ago, he knew that he had an unavoidable conflict. Frank suggested, and Paul agreed, that I would read for you the paper Frank had prepared.

I talked with Frank the other day. He very much wanted to be here with you; he believes this is an important conference, and he wanted to do this for Paul Hoffman, whom he respects. However, he asked me to convey to all of you his apologies and his sincere hope that all you will miss will be his famous Scandinavian accent!

In the novel, "Fletch and the Man Who," by Gregory McDonald, I. M. Fletcher makes the provocative comment: "'Ideology will never equalize the world. Technology is doing so.'" As 'The Man Who' responds: "There are many parts to that observation'".

Let me twist Fletch's words slightly: "Training will never equalize disabled and nondisabled people. Technology is doing so." Americans with disabilities have been described, accurately I think, as the best-trained unemployed people in our society. I do not mean to disparage vocational and other training; far from it. Untrained disabled persons truly are and will be unemployable. But we have learned that it is not enough to equip a disabled jobseeker with vocational and social skills, because nondisabled persons with similar training retain their advantage. For two applicants, disabled and nondisabled, to be equal in the eyes of the employer, we need something more than training. Today, that something more often is technology. With the right aid, the disabled person is equal.

Let me explain that.

In today's job market, blind persons often are handicapped by inability to read typed, printed or displayed information. Yet, we have -- from Xerox, from Dest Corporation, from Oberon, and now from Tecmar -- inexpensive machines that do the reading. These machines scan text and enter it, automatically, into a computer. We also have very inexpensive speech synthesizers -- made by, among others, Votrax, Votan, Texas Instruments, Street Electronics, and DEC (Digital Equipment Corporation) -- that translate the text into an understandable voice at up to 720 words a minute, or four times the rate of conversational speech.

Persons with very severe mobility impairments often cannot even perform minimum-wage jobs at fast-food or laundry establishments. Yet we have today machines that accept their speech as input and let them work from their homes, or even beds, if need be. I personally know two young men who are doing exactly that, from beds in Virginia and Maryland.

Individuals who are severely retarded often cannot remember the sequence in which various tasks are to be done, even if they do each of these tasks conscientiously and well. Today, we can use microprocessor-based aids to take these individuals step-by-step through the entire job. The computer accepts speech as input and can produce speech as output, or even images showing how the job is to be performed, all of this instantly available when needed.

And very soon, within five to ten years, we will have machines that understand conversational speech and display it -- in 'real time'. Deaf people will be able to read on a screen what a caller says on the telephone. Frank says he can't wait to get his first call offering him free singing lessons.

The point of all of this is twofold. First, these aids do what disability prevents: they see for blind people, move for physically disabled persons, remember for retarded individuals, and hear for people who are deaf. In other words, they equalize the situation.

Does an employer really care whether a document is being seen by human eyes or by an electronic eye -- as long as it is read and understood? Does an employer really care whether a programmer enters commands by finger or by voice? I think not. With technology, trained disabled people become equal to trained nondisabled people.

And that's always been the goal: to give people with disabilities a fair chance.

What I've been describing so far is more ideal than real. True, the technologies are here right now. But few employers know about them -- and fewer disabled people are using them. This is where training comes in: for both employer and would-be employee or employee seeking promotion.

The President's Committee sponsors, with support from the National Institute of Handicapped Research and the Rehabilitation Services Administration, and with the help of West Virginia's Rehabilitation Research and Training Center, one part of the answer: JAN. The Job Accommodation Network is a toll-free database that employers can use to get immediate help in finding accommodations for disabled jobseekers and employees. By calling 1-800-JAN-PCEH, an employer can learn of the most recent and cost-effective aids -- and the names of other employers who have used these aids.

Some local programs -- such as The Computer Center for the Visually Impaired at Baruch College in New York City, Arkansas Enterprises for the Blind in Little Rock, National Technical Institute for the Deaf in Rochester, and the Maryland Rehabilitation Center in Baltimore --provide training for disabled persons in use of these new technologies.

But both JAN and these training programs represent only the beginning of what we must do.

Let me suggest some logical next steps.

First, we've got to make equipment more accessible. Before the dawn of the "Information Age", the most critical need was for accessible buildings. We've done a lot in that area. But now, with more than half of all jobs being so-called "information jobs", we have an equally urgent need to make typewriters, copiers, computers and other equipment accessible to and usable by disabled persons. The National Council on the Handicapped has proposed to Congress that it create a new "Title VIII" in PL 93-112, the Rehabilitation Act -- which is even now being reauthorized -- that would require the Federal Government, and in a few years, all Federal contractors and grant recipients -- to purchase only accessible or adaptable equipment. I urge you to contact your Senators and Representatives to support enactment of this Title as part of the new Rehabilitation Act.

Second, we need to provide manufacturers with incentives to make equipment that have only very small potential markets. There is, for example, a television decoder now being built that lets deaf-blind people read on their fingertips everything that deaf people see in captioned programs. This will be a big boost for thousands of deaf-blind persons. But they are not sizeable enough to convince a company to invest several millions of dollars in product manufacture, sales, distribution and service. A second part of the National Council on the Handicapped's proposed Title VIII would provide the needed incentive. Modelled after the Orphan Drugs law, this Orphan Technologies Act would offer manufacturers tax credits for work they do on devices such as this deaf-blind TV decoder.

Third, we must keep prices of special aids going down. Only 20,000 disabled people, by most estimates, now have adapted personal computers, yet we know the need is in the tens of millions. Only low prices will broaden the base of this market. To get prices really down, we need to make these aids helpful to nondisabled as well as disabled persons. The document scanners I described earlier, for example, are falling in cost because companies use them to reduce the need to hire typists and data entry clerks.

Fourth, we must greatly expand training for disabled people in use of the new aids. These are literally the hearing aids and the canes of tomorrow. Just as we train blind people to use guide dogs, so too must we train disabled individuals to use the new technologies.

To do all this, we really need a strong advocacy organization that speaks for all of us. In Changing the Rules, Frank Bowe describes how the American Coalition of Citizens with Disabilities (ACCD) played that role in response to the crisis around section 504. Perhaps we will need another crisis to bring us together again. I hope that we have the maturity, however, to act on our own. Technology, then, isn't the whole answer. Neither is training. They must come together --for each disabled person we serve. I've suggested some ways we might do this, but I am sure you have many more ideas. That is what you will be discussing at Discovery '86 --and I wish you the best of luck!

Reference:

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Management Information Systems Development for Rehabilitation Facilities: Critical Factors in Development and Implementation

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Abstract

The development of a computerized information system for a rehabilitation facility is a detailed process involving many hours of analysis and design. Portions of this process can be carried out by existing facility staff, while other portions require data processing professionals. In addition to the development processes, a facility must select software and hardware that will meet its information needs. Once the system development and hardware and software selection have been completed, the new system can be implemented. Throughout each of these processes it is essential that the facility staff be involved and kept informed of progress. This paper discusses some of the critical factors involved in surveying a facility's information needs and developing documentation specifying those needs. This documentation can then be used in developing a computerized information system for vocational rehabilitation facilities.

As public funds become more scarce, the accountability demands for funding agencies are increased (Simon, 1982), which in turn increases documentation requirements in the form of staff paperwork. Even more significant is the client training issue. In addition to required paperwork, staff members are also responsible for successfully training the facility's clientele. Successful training is very dependent on training results information being readily available to staff. The dilemma faced by rehabilitation facilities is one of either allocating staff time primarily to paperwork or allocating staff time primarily to client training. With this in mind, the need for an easily accessible, manageable, maintainable, and timely information system is self-evident. More and more rehabilitation facilities are turning to computer technology in an attempt to manage information systems.

Computerized information systems are desirable for several reasons. A computerized system allows massive amounts of information to be stored and retrieved with much less effort than a manual system. Information can also be sorted, compiled, and analyzed in a fraction of the time required by a manual system. This allows staff time to be reallocated to more productive areas of operation.

Although computerized systems are the obvious solution to a facility's increasing information management needs, these systems can be nightmares if not properly designed and implemented. The following discussion addresses several critical factors in the development of an automated information system.

Systems Development

Systems development is a two-part process involving an analysis of current information requirements and the design of a new system to better meet those requirements. In analyzing an information system all the information tracked and recorded within the facility, as well as how and by whom the information is collected and manipulated, should be considered. Keep in mind that the real information system is usually a combination of the formally documented system and an informal system. (This informal information system is a product of staff ingenuity in solving perceived deficiencies in the formal system.) In addition, systems designers must evaluate future needs of the facility. The design of a new system involves streamlining the current system and adding to this system to better meet the facility's current and future information requirements.

Systems Development Preparation

The first, and probably most critical factor, in systems development is the preparation phase. Begin this phase by selecting an individual(s) who has a neutral position within the facility. Allow this individual(s) to carry out the systems analysis and design. Keep in mind that a thorough investigation of the how, why, what, and who of the current information system is to be conducted. In order to perform this investigation effectively, an individual should be a non-threatening entity to other staff. This individual should not be surprised to find portions of the current information system that are not functioning and other portions that have been informally modified by staff to meet their needs. These irregularities should be considered as part of the real information system.

Whenever a facility faces potential change, it is necessary to prepare for that change. Each staff member should be involved from the very beginning. Inform the staff of the anticipated development process and, more importantly, involve the staff in the process. Solicit staff suggestions on specific functional modules of the system. Not only should the staff be involved from the beginning, but they should be involved throughout the development process. Soliciting and maintaining staff involvement is an excellent way to prepare for the organizational changes inherent in developing and implementing a new information system.

Current Information System Analysis

The analysis of the current information system can be stated simply as, "What is the existing system?" To determine "What Is" the current system, it is necessary to carefully examine each component of the system. These components include staff, information collection forms, reporting formats and frequencies, information manipulation processes, and information storage requirements. Begin by reviewing the specific information requirements of each staff member. This process can be carried out in a personal interview with each staff member. Review each form used by the staff member, giving attention to the individual pieces of information (data elements) that the staff member receives, uses, or generates. Develop a special form on which to record this information. An excellent procedure for this task is to review each form that the staff member uses. For each data element (piece of information) on these forms, record where the data element comes from, by department and staff member. In addition, record any processing performed by the staff member. Next, note where each data element goes, by department and staff member.

Two other factors to consider at this point are reporting and purging frequencies. Determine reporting periods for each report. For example, how often does the facility submit a "Services Rendered Report" to a funding agency? Purging frequency simply means the length of time that a data element must be maintained on file before it can be discarded. For example, the length of time that client training progress information must be maintained in an active file.

The next step in the analysis is the development of an overall concept of relationships between the system's data elements. The best method for this process is the development of flowcharts. These flowcharts will be diagrammatic depictions of the information system and how it works. Forms are shown in relationship to other forms used, as well as to the staff position using it. Duplication of data and processes can easily be seen by studying these charts.

Once this process is completed, compile all of the data elements into a catalog form. List a particular data element only once. In a computerized information system a data element (also referred to as a datum) usually needs to be stored only once. When that particular data element is required for a report or screen, it can be retrieved and used as needed.

When this process has been performed, the system analysis phase is almost complete. The data element catalog and flowcharts should be reviewed with each staff member to identify any ommitted data elements.

New Information System Design

The second part of the system development process is designing the new information system. At this point, review the system analysis documents (i.e., data elements catalog and flowcharts). Note the areas of duplication in data collection, data entry, and reporting functions. If this duplication is not part of a data integrity check, consider eliminating the function. Remember that a computerized information system generally requires the entry of a data element only once, even though it may be used in several processes.

The data elements catalogue should be organized into functionally related groups. An example of this is the employee daily attendance records. The data directly related to this tracking function should be grouped together. Carry out this process for each anticipated component (i.e., data entry screens/forms, processing functions, and reports). This process can be made easier by studying the flowcharts to see where data enters the system and how it travels through the system. At this point, only the particular data elements included in these components are being addressed. The detailed format of these components will come at a later point.

Other factors to be considered at this point are data entry modes, data processing speed, and the degree to which the system should be user-friendly (easily understood and utilized). Data entry modes refer to the method by which data are entered into the information system. The options here are classified into two general methods. One method is point-of-entry, in which the data are entered at the point where it is collected or generated. An example of this is a client trainer entering training progress data as it occurs. The other method is that of batch entry, where data are entered at a time later than the actual occurence. For example, a client trainer records training progress data on a form for the period of one week. This data is then entered in the computerized system by a data entry clerk or the trainer at the end of the week. In addition, consider the option of having several staff members enter data at the same time. This multiuser capability has been available on mainframe and minicomputers for several years, but only recently on microcomputers.

Another factor to be considered is processing speed. The amount of time allowable between data entry and results reporting should be determined. In areas where immediate (real-time) results are required, the allowable response time should not exceed three to five seconds. In other areas where immediate feedback is not a necessity, the allowable time period might be as long as one month. The issue here is one of determining what functions must be real-time versus batch (delayed) processing.

Usability requirements are another critical factor in system development. The usability of computer software has become a major issue in the software development industry. Recently a leading industry expert indicated that by the year 1986, any software program that requires more than 30 minutes to learn will never be marketable (Bunnell, 1985). A computerized information system that requires a user to learn several pages of cryptic commands is likely to be avoided and underutilized. User-friendliness should be a key factor in developing a widely used interactive system. By including user instructions in the form of on-line help screens, the probability that the system will be fully utilized can be significantly increased. With this method, the user can access immediate operating instructions on the computer screen.

Data/System Requirement Prioritization

To this point the new information system has been designed in a general manner. The next step is to prioritize the system requirements into: (1) functions essential to the operation of the facility; (2) functions that are desirable, but not essential; and (3) functions that are helpful, but somewhat luxurious. Keep in mind the cost constraints that must be met. These constraints will no doubt have a direct effect on the prioritized system requirements.

Evaluating Available Software

The evaluation and selection of software is next. Even though many facilities are tempted to select hardware at this point, it is best to proceed with the selection of software.

As a result of the proceeding phases, there should exist a catalog of prioritized data elements for the new system, a set of flowcharts that diagrammatically depict the new system, and a document that indicates reporting formats and frequencies. Together these documents provide a detailed analysis of the system, which in turn provides an excellent software evaluation tool. Also, the facility should develop a list of how it has decided to address each of the critical factors mentioned previously (e.g., data entry modes, usability requirements, processing speed requirements, cost constraints, etc.).

Begin the software evaluation process by obtaining brochures, demonstration diskettes, copies of reports generated by the system, information on technical support available to users, and operating manuals for the software package. Review these materials with respect to all requirements. Then talk with individuals who are actually using the software. Inquire about the ease of learning the system, problems encountered, dealer response to technical questions, and the overall opinion of the users. In addition, inquire about the needed functions that the software is not providing. This information often will aid in eliminating inappropriate software packages from the selection possibilities.

The next step in the evaluation process is the testing of the software with actual data. Use actual data from the facility. Take note of the processing speed during the data entry and reporting functions. Calculate the amount of disk storage that is required to accommodate the facility's information. Determine if the software will accommodate the length of the facility's data elements. In addition, compare the package's reporting formats with the facility's reporting requirements. If there are format discrepancies, examine the package's report generation capabilities. Determine if its capabilities will supplement the provided reports to meet the facility's reporting needs. If modification is required, obtain firm prices from the software supplier. Once this information has been gathered, a cost-benefit analysis can be performed to facilitate the software selection.

Custom Programming of Software

After the evaluation process is completed, if no software package meets the facility's information management needs, it would be advisable to either alter an existing package or to custom program a software package tailored to the facility's needs. Regardless of the decision, a computer consultant is helpful during this phase of development. If possible, hire a computer consultant with experience in the human services/rehabilitation field. This will reduce the amount of time required to educate the consultant about the facility.

After the consultant has reviewed the system design, ask for written suggestions as to how the development project should be continued. Next develop detailed specifications for the new information system. This step can be carried out by facility staff, but it should be directed by the computer consultant. This includes designing the actual report formats, data entry screens/forms, and step-by-step detailing of the processing involved. Develop a time table within which the programming is to be completed. Once this process has been completed, the actual programming process can begin.

The consultant should help the facility select a programmer/programming firm to continue the development through custom programming. Be prepared to spend some time interviewing and selecting a programmer/programming firm. This selection is a critical link in the project. Evaluate the programmer/programming firm's resources in terms of staff, experience, and financial solvency. Spend time with prospective consultants. Determine what type of projects the firm has completed. Ask for specifics on how the project will be managed. Request a list of end user references and then contact the references to determine how the firm met their needs. Also ask the references how the firm was at meeting schedules. Look for firms that seem to understand and appreciate the magnitude of the project. Ask for a proposal in writing. Then verbally review the proposal with the consultant. Extreme care should be exercised in this selection. A poor selection at this point can result in monies being expended with very few usable results. Select the firm that seems best equipped to complete the programming project within the facility's time schedule.

Evaluating Available Hardware

Once the software has been selected, or custom programming has begun, a facility can evaluate and select computer hardware. It should be stated once again that hardware should be selected after the software has been chosen. Keep in mind that the software directs data processing functions. For this reason, the software determines the facility's processing capabilities and should be selected first. Hardware can then be selected that will allow the software to perform at its optimum capability.

The computer industry boasts a wide variety of hardware options. Most of these options are very capable computers. However, the selection issue is not one of which computer is the most capable, but rather one of which computer is best for a particular situation, and which computer will survive in the volatile computer market. Many industry leaders believe that the Microsoft Disk Operating System (DOS) popularized by the IBM compatible personal computers and computers operating with the UNIX operating system will become the industry standard. If this is true, then computers of this type would represent a good selection.

There are several factors to consider when selecting hardware. One factor is expandability. The selection of a computer with limited expandibility in terms of information storage could be a disaster for a rapidly expanding facility. Another factor is operating costs. Some hardware requires special environments, trained professional operators, and regular maintenance. These operating costs must be considered in addition to the purchase cost of the hardware. A very important factor is maintenance. Before selecting a particular brand of hardware, evaluate the available maintenance/repair service. Even if a facility has the fastest and most advanced hardware available, that hardware is useless if it is inoperable. Be particularly aware of industry standards and available maintenance service.

Implementing the New System

Once the software has been selected or programmed, and the hardware has been chosen, the new information system can be implemented. At this point, the prior efforts to involve the facility staff in the development process will make a significant difference in the implementation process. Continue to involve the staff. Develop an implementation plan and present it to the facility staff. The implementation plan should include provisions for operating the current system parallel to the newly implemented system for several months. This will allow the comparison of results from both systems to test for reliability. It will also provide a backup information system for use when problems occur in the newly implemented system. In addition, a staff training program should be implemented. This program should provide training in the areas of computer literacy and usage of the new system.

During implementation of the new system, a major portion of staff time will be spent collecting and formatting existing data so that it can be entered into the system. This process will be time consuming. However, this time will usually be recovered once the system becomes completely operational. In addition, during the initial months of using the new system, the staff will experience a learning curve effect. As they begin working with the system, the staff will notice a considerable increase in the amount of time required to perform a particular task. The staff are likely to become frustrated with the system at this point. However, as they become familiar with the system, they will notice a decrease in the amount of time required to perform that same task, and their frustration will subside.

Overall, the new system should provide for an increase in productivity. The direct service staff can spend more time with staff-client interactions and less time completing paperwork. The management staff will have current information available on the operation of the facility. In both cases, timely information will allow timely feedback to staff and clients, as well as allowing corrective action to be taken more quickly than before.

Summary

The development of a computerized information system for a rehabilitation facility is a detailed process involving hours of analysis and design. Parts of this process can be carried out by facility staff, while other portions require computer professionals. In addition to the development processes, a facility must select software and hardware that will meet its current and future information needs. After system development and hardware and software selection have been completed, the implementation of the new system follows. Throughout each of these processes it is essential that the facililty staff be involved and kept informed of progress.

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Technology for Children with Disabilities in Connecticut

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This presentation will present various activities in Connecticut that deal with technology and children with disabilities. The two major efforts are the Connecticut Special Education Network for Software Evaluation (ConnSENSE) Project, and the Connecticut Special Education Computer Network (ConnNET) Project. ConnSENSE provides a statewide model for the evaluation of software for children with disabilities. The ConnNET Project is an effort to encourage Connecticut school districts to become involved in telecommunications.

The University of Connecticut has created a Special Education Center to best meet the broad needs of individuals with handicaps. There are specific service delivery units within the center, each serving a particular target population. The Technology for Children with Handicaps Unit provides direct technological assistance to state and local agencies, school administrators, and special education coordinators and teachers. The latest breakthroughs in hardware, software and procedures, are filtered through the unit. Both the ConnSENSE and ConnNET projects are housed here. The Technology for Children with Handicaps Unit also works cooperatively with the Connecticut State Department of Education.

ConnSENSE Project

The Connecticut Special Education Network for Software Evaluation (ConnSENSE) is a Connecticut State Department of Education funded project in its third year of operation. The overall goal of ConnSENSE has been to develop and field test a statewide model that evaluates the effectiveness of courseware for children with disabilities, and disseminate the results within Connecticut and beyond. To insure that this goal is achieved, the project developed a courseware evaluation model and instrument, trained a cadre of over 100 teachers and administrators to evaluate courseware, and has disseminated the reviews in the *ConnSENSE Bulletin*.

In order to develop a courseware evaluation instrument, the ConnSENSE staff first explored the forms already in existence. Those of most help were from FDLRS/TECH, MCE, MECC, Microsift, Microware, Stanton M. Morris, and Scholastic. This survey of the literature resulted in the development of an evaluation form that contained four factors common to all previous forms. These common components were: Documentation, Educational Validity, Technical Qualities, and Presentation/Instructional Quality. For each factor, particular attention was given to the needs of children with disabilities. For example, under Documentation, evaluators assess whether the publisher claims the courseware is designed for children with disabilities, or whether it is modifiable for use with these children.

The unique feature of the *ConnSENSE Courseware Evaluation Form* (Rucker, Archambault, Davis, & Kahn, 1984) is the fact that it looks at the skills necessary to operate the courseware as well as the modifications that are possible to make in the courseware. With this information the teacher can determine whether the courseware is too difficult for the students, and if so whether significant modifications can be made that would make the courseware appropriate for the children.

Under the Skills Necessary section, the evaluators consider the reading level, interest level, text size and the amount of manual dexterity and the extent of eye-hand coordination required. They also observe if sound is necessary, whether the program is voice activated, whether color discrimination is required, and the amount of sequential memory skill necessary.

The Modifications section determines whether modifications are possible to the reading level, graphics, speech, input mode, form of feedback, reinforcement schedule, or the actual content of the program. Evaluators may also indicate if no modifications are possible to the courseware.

The ConnSENSE Project has trained over 100 Connecticut special education teachers and administrators in software evaluation. The training involves guiding the participants through the evaluation of a piece of courseware using the <u>ConnSENSE Courseware Evaluation Form</u>. Everyone uses the same piece of courseware and, through discussion, comes to an understanding of exactly what is intended by each section of the evaluation form.

Courseware received by the ConnSENSE Project is taken to these training workshops and also distributed to the cadre of evaluators. After a piece of courseware has been evaluated by at least three cadre members, the ConnSENSE staff writes a review of the courseware.

The project publishes the courseware reviews three times a year in the <u>ConnSENSE Bulletin</u>, which is mailed to over 2000 special educators nationwide. In addition to the Connecticut reviews, the bulletin includes reviews from other members of the National Consortium on Technology for Children with Handicaps. There are also updates on the latest adaptive devices, announcements of upcoming workshops and conferences, and reports of studies and practices in the use of computers with the handicapped.

ConnSENSE conducts a one-day conference each summer at the University of Connecticut campus in Storrs. The project anticipates that 300 educators will attend ConnSENSE '86 for up-to-date information, hands on experience, and outstanding exhibits.

<u>The National Consortium On Technology for Children with Handicaps</u>

The National Consortium on Technology for Children With Handicaps is comprised of state funded projects from Connecticut, Florida, Kansas, Michigan and Utah. This informal group dates back to the Plan Tech Conference at Gallaudet College in Washington D.C. in July of 1984. The conference, organized by the National Association of State Directors of Special Education (NASDSE) and Education Turnkey Systems, was funded by the Office of Special Education Programs of the U.S. Department of Education. Project directors from Connecticut's ConnSENSE Project (Chauncy Rucker), Florida's FDLRS/TECH Project (Eileen Pracek), Kansas' MICC Project (Judy Wilson) and Utah's SECTOR Project (Bob Reid) presented a panel discussion on their respective projects.

The panel presentation offered the project directors the opportunity to interact for the first time. It was discovered that the projects had many points in common, but each also had unique qualities. The group later received funding from the Northeast Regional Resource Center (NERRC) in Burlington, Vermont, to meet in Kansas City. The intent of the conference was to explore additional ways to organize a systematic method of information sharing.

The Kansas City conference marked the beginning of a working consortium. The four project directors mentioned above were present, along with Bob Hoehle from the Mountain Plains Regional Resource Center in Iowa, Ruth Bragman from the South Atlantic Regional Resource Center in Florida, and Ken Baker from NERRC.

In June of 1985, the consortium met with Jim Randall from Michigan's Project ACCESS. Since Project ACCESS is also a state funded project with a mission similar to that of the other consortium members, Project ACCESS was invited to join The National Consortium on Technology for Children with Handicaps.

<u>Consortium Objectives</u>

The consortium now represents five different states. The following objectives have been adopted by each project:

1. To avoid duplication of effort. Every project does not need to concentrate on courseware evaluation. Each project should be encouraged to pursue diverse activities.

2. To share information on exemplary programs and practices. Each project has examples of outstanding practices concerning computers and children with handicaps. These results should be shared amongst the member projects.

3. To coordinate software purchases and share evaluation results. Consortium member states will be afforded a broader look at educational software, as it is economically impossible for each project to purchase all of the courseware that might have applications for children with handicaps.

4. To influence publishers to improve the quality of software for children with handicaps. Reputable publishers are very interested in what educators think. Several publishers, when developing products for the special education

market, have sought the advice of consortium members.

The National Consortium on Technology for Children with Handicaps is having positive effects on all involved. By disseminating information about computer technology and special populations through training, software reviews and instructional products, teachers and administrators from consortium member states are benefiting from this cooperative effort. Some consortium products are being made available to states not involved in the consortium. More importantly, the quality of courseware for the handicapped is improving. This will have a profound and positive effect on the entire handicapped population.

ConnNET Project

The Connecticut Special Education Computer Network (ConnNET) Project is in its second year of funding from the Connecticut State Department of Education. Its aim is to field test the feasibility of a computer network among schools and school districts within Connecticut. SpecialNet, a national computer network of special educators, serves as the backbone of the project. The major activities have included development of a Connecticut bulletin board on SpecialNet, evaluation of school district equipment needs, training local school district and State Department staff in SpecialNet, and offering technical assistance to project schools.

Implement Connecticut Bulletin Board

The first activity was to implement a Connecticut bulletin board on SpecialNet. Since this should provided an added incentive for Connecticut school districts to join SpecialNet, work relating to this activity began as soon as the project was funded. The Connecticut bulletin board provides instant communications between Connecticut school districts and the State Department of Education, as well as among the districts themselves. The Connecticut bulletin board functions like a State Department of Education electronic newsletter. Information of particular importance to Connecticut special education administrators is "on line" instantly.

SpecialNet recommends several steps for setting up a statewide bulletin board: (a) identify the audience, (b) outline the information base, (c) decide on the type of bulletin board, and (d) arrange for the administration of the board.

Identify Audience. The general audience for the ConnNET Project consists of the State Department of Education, all Connecticut local school districts, regional education service centers (RESCs), the Connecticut Special Education Resource Center (SERC), and colleges and universities across the State. The primary audience for the first phase of the project was local school districts and the State Department of Education. We selected 30 local school districts, and funded their subscriptions to SpecialNet the first year of the project.

Information Base. The Connecticut bulletin board is an all purpose board. That is, the board contains a wide variety of topics rather than concentrating on a single theme. Examples of items entered on the board include: State Department of Education memos, new State policy/procedures, promising practices within the state, notices of meetings/conferences, lists of resources in various locations, examples of successful administrative strategies, position announcements, requests for information, and requests for technical assistance. The ConnNET staff, State Department, and local school district staffs contribute items under these categories.

Type of Bulletin Board. A bulletin board can be "open" so that any SpecialNet user can access it and add items to it, open only to Connecticut users, or closed so that information can only be added by the project staff. The Connecticut bulletin board is open in order to encourage the greatest number of users and contributions.

Administration of Bulletin Board. The project has trained State Department personnel in Hartford in the use of SpecialNet. However, the bulletin board is administered by the ConnNET staff at the University of Connecticut. The project staff works in very close cooperation with the State Department, since much of the bulletin board content emanates from Hartford.

Evaluate Equipment Needs

A telecommunications equipment questionnaire was mailed to all interested school districts. The questionnaire was designed to determine equipment needs which would enable the schools to link to SpecialNet. The questionnaire was returned to ConnNET and analyzed by staff members at NSMI, National Systems Management, Inc. of Washington D.C., which operates the SpecialNet system. Individual recommendations for each school district were made in terms of the most appropriate and cost effective way to join the network. This analysis was completed before the first training session so that the results could be discussed with the participants at that time.

Train School District and State Department Staffs

The project trained staff members from the selected school districts, plus designated State Department of Education personnel. The training sessions were conducted in conjunction with NSMI, which has conducted similar training in several states with success. The ConnNET staff worked closely with NSMI and made all the arrangements for the workshops. There were two training sessions the first year of the project, corresponding roughly to beginning-intermediate, and advanced training. These were spaced appropriately to allow users time to practice their skills between sessions.

ConnNET, in its second year of funding, has added twenty new school districts to the network. The schools have been trained in the use of SpecialNet, and are currently receiving technical assistance from the ConnNET staff.

Future Directions

The Technology Unit of the University of Connecticut Special Education Center has recently completed an agreement with IBM Corporation. IBM has loaned the unit 14 fully equipped computers. They all have printers, modems, and the complete IBM Assistant Series software. In addition, IBM has given the unit the entire collection of IBM educational software. The unit will use the equipment to pursue goals of both the ConnSENSE and ConnNET Projects.

The ConnSENSE cadre of courseware evaluators was the first group to receive training on the IBM computers. ConnSENSE discovered that although the evaluators were quite comfortable with Apple computers, this did not automatically transfer to a different computer. They needed a brief training session on the IBM machines. The main ingredient of this training was introducing the IBM disk operating system (DOS), and gaining familiarity with the keyboard. Evaluating the IBM courseware is proving a bit more difficult, in that fewer of the cadre members have IBM's in their schools. Thus, they have to travel to the University of Connecticut to evaluate the courseware.

The project staff continues to train special educators in courseware evaluation. During the 1985-86 school year the project will train over 100 new cadre members. The difference in the training is simply that now the teachers will be given training on both Apple and IBM computers and evaluate courseware for both machines.

The ConnNET project is also making use of the new IBM machines. As there are now 14 computers with modems available, finding a facility with 14 modular phone jacks represented a major problem. The project is happy to report that the University of Connecticut is providing such a facility in the near future. We will finally have a training facility to demonstrate the excitement of telecommunications.

The future looks bright for children with disabilities in Connecticut. One of the future activities still in the development stage includes a cooperative venture involving the University of Connecticut, the Connecticut State Department of Education, IBM Corporation, and The Easter Seals Society of Connecticut.

The proposal combines the excitement of instruction via modem with the encouragement and support of an itinerant teacher. Twenty students from a two-week session of Camp Hemlocks, a summer camp specifically designed for the physically handicapped individual, sponsored by The Easter Seal Society of Connecticut, would be sent home with IBM computers complete with modems. The project would develop and maintain a home-based computer instruction program for children with exceptional intellectual ability who are physically handicapped. In cooperation with the regular classroom teacher, students would learn word processing, telecommunication skills, and computer programming with the assistance of the itinerant teacher.

Ideally, the computer education the students receive at the camp would be continued over the school year. Hopefully, this personalized and intensive educational program will enhance the child's performance in school, and provide the attitude, confidence and competitive edge necessary to become a productive member of society.

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MEED: DISCOVERING MICROCOMPUTER CAREERS

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ABSTRACT

The MEED project will train and place 30 disabled adults per year in business information management positions. The curriculum is directly linked to an expanding job market, and trains in skills needed for practical business applications.

Major software companies support the MEED program by donating software packages to the students. Many other corporations actively participate through a Business Advisory Council, selecting the students, developing the curriculum, locating appropriate hardware and equipment and placing graduates into internships and ultimately jobs.

Government and academia also collaborate in this unique rehabilitation effort. The State of Florida Division of Labor, and Office of Vocational Rehabilitation, assist with identification and funding of trainees. At the University of Miami the Dept. of Medicine and Ortho-Rehab. provide health care, while personnel from the School of Education and Continuing Studies develop curriculum and manage the training program.

GENERAL DESCRIPTION

The University of Miami's MEED program is a model rehabilitative training program based within its Microcomputer Institute. It is a joint project of the University's School of Medicine, School of Continuing Studies, and School of Education and Allied Professions.

The goal of the program is to train severely disabled persons in practical microcomputer business applications and to place them in satisfying jobs which will offer upward mobility.

PROGRAM COMPONENTS

The two major aspects of the program are training and placement. Training consists of three stages: assessment, instruction, and internship. During assessment applicants' abilities, aptitudes, and interests are evaluated. Applicants are then interviewed by the screening committee of the Business Advisory Council. Those accepted into the program move on to coursework at the University of Miami's MEED program for five eight-week sessions.

Trainees take a variety of microcomputer business application courses including: microcomputer hardware and software, word processing, database management, spreadsheet applications, communications and networking, and information retrieval. Each trainee also takes a number of enrichment courses such as typing, business math, management and supervision, business communication, and systems analysis.

The coursework is followed by eight weeks of internship in a local business where trainees get practical experience in solving real-world problems. A job placement counselor co-supervises trainee activities, and provides follow-up counseling and monitoring after the trainee is permanently employed.

BUSINESS ADVISORY COUNCIL

MEED is a cooperative community venture designed to serve the productivity and efficiency needs of local business. In order to respond meaningfully to the current job market, the activities of a dynamic Business Advisory Council are engaged. The BAC consists of local business leaders who have achieved a high level of expertise in their fields and who are willing to advise the project on a number of vital matters.

Typically, separate committees of the BAC work in specific areas. They provide guidance to project personnel, identify technical needs, specify student selection criteria, participate in development of the curriculum, evaluate students capabilities and training effectiveness, provide internship training sites, and share the responsiblity of placement of MEED graduates. Active involvement of the BAC ensures the excellence of MEED in every way.

TEAMING THE CLASSROOM COMPUTER WITH A TEXTBOOK FOR TEACHING PHONICS TO THE HEARING-IMPAIRED

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Abstract

Software has been developed to support teaching with an existing textbook. The computer provides both phonetic and phonologic practice tied to specific areas in the textbook. The role of the computer is: (1) To ask questions related to the material presented in the textbook, (2) to drill the students in the analysis and recognition of consonants, vowel letters, and spelling patterns, (3) to provide a structure for the student to generate sentences using specific words, (4) to provide a non-threatening and uncritical instruction/test/evaluation procedure with instant feedback, and (5) to keep and accurate and unobtrusive score of student progress. Benefits of this approach appear to be a faster learning pace, better retention of the material, p... support in performing exercises correctly, and increased teacher productivity.

INTRODUCTION

"Phonics" is the application of phonetics to the teaching of reading. Using the phonics approach means to use the sounds made in speech and the pronunciation of words and syllables as part of the teaching of the meaning and use of words. This is the approach of the computer application described below. Pictures are used to represent words in the textbook. A word is analyzed from the point of view of vowels and consonants, and correct spelling. It is then "sounded out" based upon its components. The next step is the utilization of the word in a signed or verbal sentence. Finally, practice is provided in the use and spelling of the word via crossword puzzle games.

Teaching with phonics is important for hearing-impaired students. Hearing students have the advantage of hearing words in everyday speech which, together with reading, augments and increases the understanding of word usage and increases vocabulary. Without this advantage, hearing-impaired students are limited to the visual impression of word symbols. Phonics, as applied through the computer application described below, is multisensory in its approach. Students verbalize the words. They visualize the words through pictures of the words in the textbook, and the printed form on the computer screen. They associate the symbols and the sounds of the words. And they involve their motor skills as they type the letters of the word in response to the computer queries. This variety of learning modes significantly enhances the studenta interest, holds and maintains his/her attention, and increases the motivation to learn.

ISSUES AND APPROACH

The acquisition of speech and language competency is often a slow process for hearing-impaired students. At Kendall Demonstration Elementary School, located on the Gallaudet College campus in Washington, D.C., a number of the 12 to 15 year old students have speech, language and reading skills at or below the second grade level. This low level of achievement is typically accompanied by a lack of motivation to improve these skills. Experience has shown that students with these characteristics require much individual attention from the teacher if any improvements in sight vocabulary, written language or speech are to be made.

To help alleviate this problem, the classroom computer, operating with software developed by the author, was introduced into the Middle School Speech program. With this software, the computer is applied directly in support of teaching with a standard phonics textbook, "DISCOVERING PHONICS WE USE" (Arthur W. Heilman; The Riverside Publishing Company, 1981). The computer provides both phonetic and, in conjunction with the teacher, phonologic practice tied to specific areas in the textbook.

This approach requires the student both to analyze the components of a word and to utilize the word in natural language. The student learns that words are made up of vowels and consonants, how to sound out written words as a way of pronouncing and reading, and then learns how the words are used in everyday language. The student proceeds at his/her own pace, and self-directs which activities are to be undertaken at any given time. The teacher's role is to guide and monitor, and to provide individualized instruction as needed. The role of the computer is the following:

o to provide a learning environment in which the student will become self-motivated to progress.

o to raise questions related to the material presented in the textbook.

o to drill the students in the analysis and recognition of consonants and vowel letters, their combination in words and pronounciation.

o to provide a structure for the student to apply the words in natural sentences.

o to provide a nonthreatening and uncritical instruction/test/evaluation procedure with instant feedback to the student.

o to keep an accurate and unobtrusive score of the students progress and areas needing attention.

PROCEDURE

The textbook upon which the procedure is based is divided into sections which relate both to skill level and skill type. Each major section of the text is introduced by the teacher to the students in a typical classroom setting. The material is discussed in terms of the objectives and the general procedures to be followed in carrying out the text exercises.

The computer is then introduced. Text exercises, which normally would be performed by the student with pencil and paper, are performed instead using the computer. Instructions presented in the text are paraphrased and supplemented by the computer with each exercise. Since the computer-generated instructions are derived from the text and are in context, they are a valuable supplement to the teacher-generated instructions in the medium of signing/finger spelling.

Each student proceeds through the computer-generated materials at his/her own pace. Many opportunities are provided to the student to end a session without interrupting or shutting off the computer, thereby allowing another student to begin a new session quickly. The computer exercises follow and enhance the text -- an important feature because of the disparity in the text's intended much younger age group than the age of the students.

The learning process proceeds in three phases. First, the student is exposed to words via pictures from one of the textbook pages. These words are related by initial consonants, by final consonants, by vowel sounds, etc.. The teacher reinforces the sound/symbol association by articulating the words with emphasis on the component sounds. In the second phase the students are led through various exercises by the computer. These exercises, which correspond to each page in the textbook, cause the student to think about each word in terms of its structure, spelling and meaning. Auditory components of the words are emphasized by the teacher. The computer also provides an opportunity for the student to utilize each word in a sentence. The sentences provide a communication opportunity between the student and his/her peers, as well as the teacher for modifying and expanding grammer and vocabulary. In the third phase, specially designed crossword puzzles are used which are keyed to the words covered in the lesson. The puzzles are presented on the computer screen, with clues provided for each word. They may also be printed on a dot matrix printer. The student responds by entering words horizontally or vertically in the puzzle. The correct puzzle solution is provided at the end of the exercise along with the student's score. The puzzle exercises reinforce proper word spelling, contextual meaning, word association, and recall (although the student may use the textbook for reference

A computer session is conducted by the student using a hierarchical set of informative displays, menus and question/response screens. The design is such as to minimize the need for teacher intervention, and to be as self explanatory as possible.

The computer software is designed to lead the student through several exercises related to each page of the textbook. No prior knowledge of computer operations is required. When the computer is turned on, it immediately displays an initial identification screen, which is shortly followed by another display identifying the text pages covered. The second display is a menu of text page groups, one of which is to be selected by the student for the session.

When the student selects one of the page groups, the computer requests the date and student's name to personalize subsequent activities. Another purpose of requesting information from the student is to initiate the beginning of a dialog between the student and the computer via the displays and keyboard. The asking of simple questions of this type helps overcome the initial intimidation felt by first time users as well as offering a nonthreatening hands-on experience with the computer. The students name is repeated to the student from time to time by the computer to emphasize a "user friendly" and personal environment.

After entering his/her name and date, the student is presented with a brief introduction to the objectives of the exercises to come. This introduction is tailored to the specific material presented in the textbook, and, again, is intended to encourage the development of an interactive relationship between the student and the computer. The teacher reads the screen with the student and explains any words or concepts that the student does not understand.

Next, the computer displays the main menu of options which may be performed. This menu may require some initial explanation by the teacher before the student can fully understand the options presented. The first option, "DIRECTIONS", provides a display of instructions for the uninitiated student. The second option, "WORK IN MY BOOK", is selected by a student who is ready to proceed with the exercises pertaining to a specific page in the textbook. The third option, "SEE MY SCORE", displays the student's score from the exercises. The forth option, "QUIT", ends the session. The fifth option, "ORDER OF ITEMS", allows the teacher or student to cause the computer to select questions during the exercises in a repetitive sequence (the default choice if Option 5 is not selected) or randomly. The sixth option 6, "ANSWER KEYS", provides the correct spelling of all of the vocabulary used in each exercise. This option provides opportunities for auditory training, e.g., "find the word", speech reading, sight word vocabulary, sign language practice, and speech drills.

The menu display reappears after the directions screen. If the student were then to choose option 2, "WORK IN MY BOOK", a display of specific page options to choose would then appear. This display allows the student to select the exact page in the textbook in which to work.

After selecting the textbook page, the student is then presented with the choice of how many of the words are to be included in this particular exercise. The computer then responds with a question/response screen. The student examines this screen and decides how to spell the word. The spelling of the word is entered on the keyboard, and the computer verifies the entry. If the spelling is incorrect ("DUT" instead of "NUT", for example), the computer responds with the correct spelling before continuing. If the spelling is correct, the computer responds with "GOOD". The computer then asks for the letter representing the beginning sound. In this simple example the beginning sound is represented by a single letter ("N"), but in later, higher level exercises the sound may require more than one letter.

If the student's answer is correct, the computer responds with "YES!" and asks the student to enter a sentence containing the word. The sentence response area has four lines of space for keyboard entry. This space may be used for writing sentences, presenting speech drills by the teacher, spelling practice by the student, or any other text entry activity. "Are you finished?", is the computer's final question. If the response is 'N', the display cursor is returned to the sentence input area and the student is given the opportunity to change, add to, or correct the previous response. The student may select "QUIT" after entering the sentence.

The above discussion applies to a very basic level exercise-- beginning consonants in the above example. As the student progresses, the exercises grow in sophistication. The next level contains exercises with vowel sounds. In this instance the computer asks for the number of vowel letters in the word represented by the picture in the textbook. The correct response given, the computer then requests the number of vowel sounds in the word, and, for the first vowel, whether it is long or short. As in the first example, the student is then asked to use the word in a sentence.

At this point the student may end the exercise and return to the main menu, or continue with another exercise. If the student elects to end the exercise, he/she may then choose to review the spelling exercises. The computer then displays an Answer Key. This answer key indicates the correct spelling for each of the pictures found on the chosen page in the textbook.

The student may also review his/her score. Everything the student types on the computer is stored on a separate Data Disk. The student and teacher may review this information together and print it out for record keeping purposes. Errors can be analyzed for individual remedial work.

Additional language enhancement is provided by means of computer-generated crossword puzzle exercises. These exercises continue with the words and relationships covered in the previous question/response exercises. A puzzle is organized to challenge the student to recall words from the earlier exercises, using clues provided with the puzzle. A blank puzzle is presented on the computer screen with the clues at the bottom, as shown below. The student fills in the puzzle on the screen using the keyboard, and then the computer validates this input.

RESULTS

The results of applying the computer in this way have been very rewarding. Benefits of this approach include increased student interest in the task at hand, a faster learning pace and better retention of the material by the students, peer support in performing exercises correctly, and positive social interaction. Other benefits include a marked improvement in teacher productivity and, as a byproduct, the exposure of the students to computers and keyboard interaction.

THE STUDENT IN THE THICKET: PROVIDING WORLD OF WORK EXPERIENCES IN AN ON-THE-JOB TRAINING SETTING

Roberta Hoppe
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Abstract

The unique features of the Multi-Occupational Aide vocational training program include:

* a placement rate of 90-95% over the last 15 years.
* low cost per student (39 cents per student hour).
* received the 1985 Exemplary Educational Services Award by the Wisconsin Vocational Association for its outstanding contribution to training special needs students.
* provides on-the-job training and competency-based classroom sessions in the areas of laundry, kitchen, maintenance, program activity, restorative exercise, housekeeping, consumerism, personal development, human relations and adult basic education.
* local employers annually contribute equipment, services, staff and facilities that equate to approximately $114,000 and the program experiences a constant flow of visitors.

DESCRIPTION OF THE PROGRAM

The Multi-Occupational Cluster (MOA) Student

They are handicapped and disadvantaged, mentally retarded (educable and trainable), mentally ill, vision or hearing impaired, possess learning disabilities, emotionally disabled, newly displaced homemakers, incarcerated, alcoholic or drug abusers, orthopedically impaired and non-literate; they are drawn to FVTI because of its unique and one-of-a-kind MOA program.

These people are the typical MOA student. Since each student has a severe problem of some sort, many traditional educational institutions do not have the facilities or staff to address their vocational, educational, and personal development needs. The MOA program at FVTI was designed especially for the academic special needs student.

The Multi-Occupational Cluster (MOA) Program

The Multi-Occupational Cluster program was designed in a cooperative spirit among FVTI, local business employers, area agencies like the Winnebago County Unified Board, Job Service, Department of Vocational Rehabilitation, Goodwill Industries, Work Adjustment Services, Inc., and nursing care facilities staff members. The linkages and working relationships between these "program partners" has been exemplary.

The program is designed to provide on-the-job training and classroom sessions in the areas of laundry, kitchen, maintenance, program activity, restorative exercise therapy and housekeeping to students with special needs.

The program is open-ended, meaning students can enter and exit the program at different times during the year. The schedule includes four days a week of OJT and one day of consumer education/world of work classroom activities. The OJT experiences include allotted time in all the aforementioned areas, with students working side-by-side off campus with regular employees at retirement and nursing care facilities; on campus with regular employees and full-time students in the food programs and under school supervision. Staff of both FVTI and the care facilities are jointly involved in the training process on a day-to-day basis. Students learn the basics in each area and also can determine their interests and abilities. Classroom activities encompass topics of leisure time activities, budgeting, meal planning, insurance needs, banking services, grooming, application blanks, interviews, and job-related experiences.

Each student is certified upon completion of the program in each area he/she has been successful in and assistance is provided with job leads, arranging interviews and providing references. After the student begins working, the program instructor maintains periodic contacts with the employer and employee in order to answer any questions that may arise.

The unique and outstanding features of this program include:

..a placement rate of 90-95% over the last 15 years.

..an emphasis on high touch vs. high tech.

..training occurs on "real" job sites with students exposed to a variety of different jobs.

..private and public agencies work together in a network to place special students into employment.

..it is a human resource development program which serves special occupational needs.

..students are able to access a variety of learning experiences to achieve maximum potential of capabilities (not self-contained unit but based on community and institution resources).

..low cost per student (39 cents per student hour due to sharing of private business sector facilities and equipment).

..a holistic student training approach is emphasized with related courses being provided in the areas of consumerism, personal development, human relations and adult basic education.

..a recruitment and training process that stresses involvement of businesses, student and parents, non-profit agencies, FVTI instructors and training site personnel.

PROGRAM'S OBJECTIVES AND STATED PURPOSE

Albert Einstein noted, "Our age is characterized by the perfection of means...and the confusion of goals..." In some cases programs can claim "success" simply by completing tasks on time. A great deal of thought was given to insisting that the MOA program provides a framework for judging whether the project achieved a desired impact or produced worth-while results. With the assistance of the MOA Advisory Committee, three measurable objectives were established prior to the implementation of the program so that information could be collected later to judge whether the objectives were achieved.

Objective One (Performance Objective)

At the end of the MOA program, ninety percent of the special needs students that entered and completed the program will have received a job within sixty days of graduation commensurate with their abilities in the following areas of training: laundry, kitchen, housekeeping, restorative therapy, maintenance, bakery, short order, garde manger, food preparation and service.

Objective Two (Behavioral Objective)

During the on-the-job training and classroom activities, students will demonstrate that they have learned socialization skills, practice good grooming, accept constructive criticism, gain self-confidence and follow work ethics as measured by a minimum gain of four raw score points on a staff-developed DACUM pre-and-post test. In addition to this classroom measurement, follow-up employer and student satisfaction surveys will be made by the staff.

Objective Three (Product Objective)

Each year the program staff shall provide the MOA Advisory Committee with a verbal report and an annual written evaluation that details the number of project modules that have been developed (instructional materials and aids that may be used by others in the delivery of this program) which shalbe judged effective by the amount of use by other agencies.

EVIDENCE OF ACHIEVEMENT OF OBJECTIVES

Program staff invested several hours of time developing and writing clear and appropriate program objectives because they believed "the correct statement of an objective is the first step in its attainment." Evidence of the successful achievement of the previously stated three program objectives is witnessed by the following results:

1. Placement of the students, who have completed training, into gainful, competitive employment has been nearly 100%. Over a 15-year period this program has achieved an overall placement rate of 90-95%. (765 students have been served in 15 years with 701 students placed.)
2. Graduates are accepted by industry and students are satisfied with their training. Letters verifying industry acceptance and student satisfaction are on file. Confidential DACUM test results indicate that students have achieved a minimum gain of four raw score points.
3. The program has been judged to be transferable to other educational institutions based on the obtainment of low student cost of 39 cents per student hour and a high placement rate.

The program has experienced a constant flow of visitors who are interested in starting a similar program in their own areas. Program staff have also been invited to make presentations to a variety of interested audiences which have included the Wisconsin Vocational Association and the Mid-America Conference.

The complete competency-based, individualized format and multi-option curriculum has been further developed into written lesson plans that are "saleable."

DESCRIPTION OF INSTRUCTION AND INSTRUCTIONAL MATERIALS THAT ENHANCE EMPLOYABILITY

The MOA program is designed to achieve its stated "education for employment" objectives. All components of the program---in-take, assessment and employability planning, orientation and counseling, classroom instruction, on-the-job training, job placement, and follow-along support---aim toward the stated objectives.

Instruction and instructional materials enhance employability through the following:

..off-campus students integrate with full-time employees of training site so that they receive real experiences and not simulated experiences.

..staff of both FVTI and the care facilities (retirement and nursing care facilities) are jointly involved in the training process on a day-to-day basis.

..completely competency-based, individualized format and multi-option curriculum that correspond directly to the needs of nursing

homes, hospitals, cleaning services, motels, laundries, janitorial services and restaurants/food service facilities.
..competency-based education for link from high school to adult (curriculum models for non-reader student and the Wisconsin Competency Based Occupational Curriculum Data System WISCOM).
..competency cards provide a task model of interrelationships among the three cluster components: MOA-Mini/MOA-Foods/MOA-Kitchen, Laundry,Housekeeping,Maintenance,Program Activity,Restorative Exercise.
..competency cards demonstrate breadth of training and are utilized as an evaluation tool.
..continuous process of evaluation.
..teachers develop own teaching modules that evidence transferability and are saleable.
..mini classes---2 weeks, 60-hour overview for job exploration in laundry, housekeeping, and kitchen.
..MOA Foods---6-week blocks of hands-on activity sampling.
..MOA Laundry/Kitchen/Housekeeping/Maintenance/ Program Activity/Restorative Exercise---6-week blocks of hands-on activity sampling.
..students in mini class can job out, be referred to MOA Foods or MOA Regular (any or all of the six areas).
..students in MOA Foods can job out or be referred to MOA Regular for additional content area training.
..students in MOA Regular can job out, take one or more content training areas, or be referred to MOA Foods for more intensive foods training.
..students can be referred back to agency if not appropriate for work training.
..students can also be mainstreamed into other FVTI classes if appropriate.
..each content cluster is independent or can be a basis for building on additional content clusters. The student achieves their maximum potential.

INSTRUCTIONAL EQUIPMENT AND FACILITIES

The Multi-Occupational Aid Cluster consists of three components: MOA-Mini, MOA-Regular (both off-campus), and MOA-Foods (on-campus). As a result of the partnership that FVTI has formed with the business community, students are able to learn skills on a variety of equipment and within a real work environment.

Off-Campus MOA Mini/Regular Components

Site: Area retirement home/nursing home that is comprised of independent living apartments and cottages on the premises and health care rooms.

Lab Areas: Entire building inside and outside grounds/walks/parking areas.

Private Sector Donations: All equipment and supplies, instructor office space/phone/receptionist duties, employee lounge/vending machines available for student use.

On-Campus Food Program

Lab Areas: Institutional kitchen space in school that is used by entire food service staff and traditional students. MOA instructors coincide with regular instruction in the traditional Food Prep. Assistant, Restaurant and Hotel Cookery, and Quantity Food Production Assistant programs.

Institutional Foods Equipment: All equipment utilized in the foods classes for traditional students.

"HANDS-ON" EXPERIENCES

The MOA Cluster is designed to provide on-the-job training and classroom sessions in the areas of laundry, kitchen, maintenance, program activity, restorative and housekeeping to students with special needs.

The program is open-ended, meaning students can enter and exit the program at different times during the year. The schedule includes four days a week of OJT and one day of classroom activity. Each student is certified upon completion of the program.

MOA students work with regular nursing home employees on-site under supervision of FVTI instructors at the training facility at Evergreen Manor in Oshkosh for the MOA-Regular components of the program.

The laundry is large and includes a mangle which the students learn to use along with all the other machines. In the housekeeping area, there are apartments and cottages so that the students get opportunities to make beds, clean, handle directions, etc. In the kitchen they work on the tray line, serve, make salads, are responsible for tallying menu requisition orders, and work in the dishwashing area.

Program Activity gives them opportunity to assist with scrap books, take residents to places in the building, help arrange coffee klatches, and play games. The Restorative Exercise area provides exercise therapy for the residents. The students help and work with equipment, but do not compete with the nurse's aide on duty. In maintenance they are involved in outside planting, cleaning boiler areas, fixing screens, hinges and pipes, and painting. Each course is in a six week block and students get to choose which areas they wish to enter. Students are certified only for the areas they complete the competencies for.

PLANNING PROCESS AND INDUSTRY COOPERATION

Planning Process

The Wisconsin Vocational Technical System program development structure demands the establishment of a private sector-guided program advisory committee to assist in the program planning process. FVTI's MOA Advisory Committee presently includes representatives of FVTI personnel, referral agency members, community agencies, service agencies for handicapped/developmentally disabled populations, students, parents, and employers. Each group interrelates with the whole as guidelines and expectations evolve.

Industry Cooperation

Major financial support is received in the form of in-kind donations from the retirement and nursing care facilities. The contributions include services, facilities and staff time. Other aspects of cooperation include:

..networking with community agencies and area high schools: Goodwill, Work Adjustment Services, Unified Board, Division of Vocational Rehabilitation, and Mental Health Clinic. These agencies/schools assess, evaluate, assist with placement and follow-up activities.

..business community personnel provide feedback regarding employment trends, work skills needed, upgrading/refinement/expansion activities required, integration of special needs students to competitive employment.

..training site personnel provide continuous information on work habits and expectations.

EVALUATIVE FEEDBACK

Several mechanisms have been designed to provide feedback and evaluation of the MOA program. These include:

..annual student evaluation of instruction and non-instructional areas such as scheduling and planning.

..employer surveys, letters, and on-site visits.

..6-month and 5-year graduate placement follow-up studies.

..a graduate task analysis survey.

..6-week evaluations of the students to determine if they advance to another training area or repeat the segment.

..ongoing advisory committee evaluation of program goals, objectives, and curriculum.

..curriculum evaluation by instructors from other in-state vocational schools.

..annual standard district audit of program cost effectiveness and graduate placement.

..five-year standard district audit of industry acceptance of program curriculum/graduates.

One of the outstanding features of this program has been the careful consideration of the various feedback information by staff members. Evidence of feedback from students, employers, and others include case studies of students, supporting letters from students, employers, visitors and agencies that document outstanding success and student success, and letters from groups who are emulating the program.

PLACEMENT PROCESSES AND RATE

Placement Process

Fox Valley Technical Institute has a Student Placement Office which works in direct cooperation with Wisconsin Job Service; Job Service has placed a full-time employee on campus.

Students referred by agency members are also assigned to the said agency placement personnel. Faculty-employer contacts also provide placement opportunities.

Each student completes an application file card. They are also encouraged to submit credential materials such as resumes, faculty or employer evaluation/recommendations, and a transcript of credits.

Placement Rate

The MOA program had its first graduate fifteen years ago. Since that time graduates have been quite successful as the statistics show. Seven hundred sixty-five (765) persons have graduated from the program at the present time.

Students have been placed at a variety of sites within the private and public sectors. These have included: private homes, restaurants/supper clubs, fast food chains, motel/hotels, hospitals, janitorial services, bakeries, laundries/dry cleaners, maintenance firms, nursing homes/retirement homes, and schools/universities.

Employer Satisfaction

As an awareness of the Multi-Occupational Aide program grows throughout the Fox Valley District, the quantity as well as the quality of placement figures are improving. It is becoming common for employers to call and request MOA graduates. Employer endorsement and agency placement personnel endorsement letters are on file.

PROGRAM COSTS

Equipment and Staff Costs

No new equipment or supplies are needed for on-campus MOA food programs because these costs are reflected in the budgets of other on-going existing food programs(i.e., restaurant and hotel cookery, quantity food production, food preparation assistant). District costs are largely associated with the salaries of the MOA staff. The total program costs per student hour of instruction is thirty-nine cents. (Total program district costs $90,444 divided by 34,821 total student hours equals .385 cents). The program is tuition free (fees are charged to the federal project).

Industry Contributions

Major financial support is received in the form of in-kind donations from the retirement and nursing care facilities.

PROGRAM PUBLICITY AND RECOGNITION

State Award

Fox Valley Technical Institute's Multi-Occupational Aide program has been selected to receive the 1984-85 Exemplary Educational Services Award as Wisconsin's Outstanding Vocational program by the Wisconsin Vocational Association for its outstanding contribution to training special needs students.

Recognition of Program Quality

Numerous endorsement letters have been received from area employers, community agencies, public schools, and the students. These letters are on file; an excerpt from an unsolicited letter received from the Oshkosh Area School District reads: "...The Multi-Occupational Aide cluster has been super for a number of our special needs students in general and specific training for service industry occupations. This program helps enable special needs clients to adapt to, contribute to, and be a benefit to the working society in which we live."

A Study of Educational Computer Applications for Disabled Children Under 36 Months

Edward Ellingson, Rehabilitation Engineer
Beth Treptow, Special Education Teacher

Abstract

Computer programs and special hardware were developed and tested with 10 disabled and 7 non-disabled children to learn how they would respond. After some modification to the programs, 6 children with varying degrees of disabilities were tested with both the computer programs and conventional adapted toys. The results show that the computer programs were at least as effective in maintaining attention as the adapted toys. Cost estimates show that the selling price would be realistic for rehabilitation facilities.

INTRODUCTION

This project was begun on the basis of a perceived need for an educational toy model that is appropriate and functional for use by numerous children at various stages of cognitive development and with limited and varied physical capabilities. It was hypothesized that a computer could be employed as a toy (having graphic display, sound output, etc.) and as a control center for activating a variety of toy variations adapted for use by children of a wide age range and with limitations caused by a variety of disabilities. The goal of this project was to study the feasibility of utilizing computers as an educational aid (a "toy") for disabled children.

BACKGROUND

A toy can be described as any device that provides amusement and captures the interest of the user. More important, toys often function as a learning aid to enable children to experiment with their environment and develop conceptual knowledge through creative expression and play . All children have the same needs and desires to learn, to explore, and to have fun. Children with physical disabilitites, however, are less able to experiment with their environment through conventional play activiites and toys because of inherent movement limitations.

Commercially produced educational toys are developed on the premis that the functional manipulation skills of the child parallels that of the child's level of cognition. Unfortunately, a physically disabled child will often exhibit a low level of functional manifulation skills as compared to cognitive abilities. Therefore, it becomes necessary to change the manner in which the toy is used or activated in order for the child to benefit from its use as an education aid or source of enjoyment.

Numerous commercially-produced toys can be adapted or modified to meet the needs of indivial handicapped children. However, the versatility of one toy adaptation to be used by several handicapped children is highly unlikely due to the multiplicity of needs exhibited by various types of disabling conditions. In addition, the utility of a toy engaged for educational purposes is considerably limited because of the normal maturation process. For these reasons, adaptation of singular toys is frequently costly compared to benefits derived. A computer utilized to perform similar functions could be very versatile, but questions regarding cost-effectiveness must be addressed.

Curative is a large, comprehensive, outpatient facility treating about 650 children per year. A large percentage of these children are under three years of age, and these children are of particular interest for developing educational aids. The treatment population is large enough to justify the initial expense of the type of system considered in this project.

PROJECT DESCRIPTION

The general approach was to:

1. Develop the "toy" itself, including any special hardware
2. Test the concept on several children to learn as much about the applicability of the technique as possible
3. Modify the "toys" based on this experience
4. Conduct a test to compare disabled children's response to computer "toys" and conventional adapted toys
5. Study the economic feasibility of developing a complete computer-based educational system for disabled children and marketing it to schools and rehab. facilities.

Each of these program elements is addressed below.

Development of the "Toy" Elements Hardware . A total of 10 different switch units were fabricated for this project, plus 4 duplicates. These were :

1. large plate switch (SPST, NO, momentary)
2. large plate switch w/ texture (SPST, NO, momentary)
3. rocker switch (SPDT)
4. finger pinch switch (SPST, NO, momentary)
5. squeeze bulb switch (SPST, NO, momentary)
6. plate switch (SPDT)
7. reed switch, magnet activated (SPST, NO)
8. mercury level switch (SPST)
9. sip and puff switch (DPDT, NO, center off)
10. photocell switch (cover to activate, SPST)

In addition to the above, 2 joysticks were purchased (one of these was modified to require less force to activate) and one light pen. An interconnector box was also made to connect up to 10 switches to the 2 joystick ports of a Commodore 64 computer. This provided the means for a child to access the computer using only switches. The Commodore 64 computer was used in this project along with the associated 1702 Color Monitor, 1541 Disk Drive, and 1526 Printer.

Software. A total of 14 computer programs (games) were developed with variations on speed, graphic display, and auditory components. These are "cause and effect" learning games that are activated by closing switches, and combinations of these into "activity box" games. Some commercial software was purchased to better determine what was available, and one of these, "Match-Up" by Hayden Software was modified to work with our external switch interconnection device.

Preliminary Testing
Ten children with varying disabilities plus seven non-handicapped children were exposed to and observed using the developed software and hardware with the following conclusions:

1. Disabled children can and do attend to the video screen, however, it appears that the child must be functioning at or near the 18 mo. level in cognitive skill to maintain their interest.
2. All children tested showed some attentiveness to sound effects (youngest was 12 mo. old.)
3. Each child tested had toy preferences, ie. fast or slow-moving displays, colors, and sound effects.
4. Computer-based toys offer options which connot be obtained with conventional toys. These options include selection of colors, sound effects (including synthesized voice output), automated record keeping for each trial and for each child, and adjustable speed of displays. The variable speed at which toys can be played appears to be extremely important. Some children repond very positively to quickly moving, fast-paced toys while others may be overwhelmed at that pace. For the latter group, toy speed can be reduced to their comfort and learning level. In both cases, toy speed can be increased or decreased to meet specific learning objectives.

   The automated record-keeping also appears to be very important to rehabilitation professionals. They have a need to document progress and the computer offers a relatively easy way to record data, store information, generate reports, and other related activities.
5. A large number of programs would be required to effectively serve disabled children in the age range desired because of the different effects of various disabilities and individual preferences.
6. Preliminary investigation of commercially avilable microcomputer "matching games" and "puzzles" appear to be too advanced for the population addressed by this project. The children at this age are just beginning to develop concepts of size, shape, color, and number.
7. During the course of this project it was found that several commercial vendors are now directing their effors to developing programs for pre-school children, often recommended for ages as low as three years. These programs are usually well developed with good sound and graphics, however, they are not intended for the under three population and/or for those with physical disablities. The potential exists for the development of new programs for the younger population as well as modifying commercially available programs for use by disabled children.

Final Testing

Subject Selection. Six children were selected from a group of 16 disabled children according to the following crieria:

1. Moderate to severe fine motor involvement.
2. Cognitive/Language development at a minimum level of 18 months.

Skill levels were assessed according to the Early Intervention Developmental Profile (EIDP) and clinical observation prior to the selection of the test sample. Actual ages ranged from 26 to 40 months.

Training Session. One training session was performed for each child with three purposes:

1. Familiarize children with the equipment.
2. Position children appropriately at the equipment.
3. Select appropriate switches for the equipment.

During the training session one adaptive toy and one computer program were selected as an introduction to the project, these differing from the toy and program used in final testing. This training session preceeded the testing by 3 to 7 days.

All training and testing sessions were performed in a consistent environment, the children being brought to a specific room reserved for this purpose.

Testing Sessions. Testing consisted of two 20 minute (maximum) sessions, the sessions separated by 3 to 7 days. During the testing sessions the tester presented the adapted toy and the computer program. In the first session half of the testing sample played with the adapted toy first and then the computer program, while the order was reversed for the other half. In the second session the order of presentation was reversed. Only one adapted toy (the Musical TV) was used and only one toy program (the Clown Face). There was no minimum time of presentation, but a maximum of 10 minutes was set for both the adapted toy and the program. A presentation was ended prior to the 10 minutes when the presenter judged that attention was decreasing significantly. One other staff member was present to observe the child's reactions and complete an anecdotal record.

Test Results. For all of the tests overall time was recorded as well as the time that the toy was "on". This was accomplished by using the clock built into the Commodore 64 computer (for total time of presentation) and timed delay loops in the program (for time "on"). During Test 1 there was a problem with the adapted toy timing technique during the test of two children; for this reason Test 1 will be ignored. The results were as follows:

	AVERAGE	RANGE
Battery Toy		
Session time (sec)	236	140-357
% Time "on"	46	14-57
Computer Toy		
Session time (sec)	454	313-620
% Time "on"	70	51-92

A paired sample T-test was performed on this data. The differences in % Time "on" were not significant (ie., the data have a .654 probability of being from the same population, 95% confidence level). The differences in Session Time are more significant, having a .006 probability of being from the same population, 95% confidence level.

ECONOMIC ANALYSIS

The purpose of an economic analysis is to develop an understanding of what the expected costs and sales would be if this "toy" concept was taken to the marketplace. This is difficult to do with precision since the "product" is not completely defined. A more complete package (ie., many subprograms, special options, extensive record-keeping, etc.) should sell more units, but the cost of developing it would also be higher and a higher cost would tend to reduce the sales. The intent here was only to make a first approximation of expected cost and sales.

The result of this study was an estimated selling price of $300 and sales to 450 institutions estimated.

CONCLUSIONS

1. Children respond at least equally well to the two toy types. The data indicate that the computer toys might hold their interest a little longer.

2. The cost of a computer-based educational learning device or "toy" system is realistic for a rehabilitation facility.

3. Many variations of the "toy" programs would be required to serve the disabled population considering the wide range of age and disability that it would be desired to serve.

RECOMMENDATIONS FOR FURTHER WORK

1. Develop a formal protocol for assessing children's learning potential based on responses and reactions to computer-based learning aids.

2. Conduct tests of 30 disabled and 30 non-disabled children to compare the effectiveness of computer vs. non-computer learning aids using the protocol developed above.

3. Analyze the test results to determine the value of the learning aids in achieving educational objectives.

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Abstract

DATA is developing a method for assisting persons who are severely disabled to reach their vocational potential by utilizing computers or other technological aids and a coordinated system of community services. The participants are aged 15-47 and have cerebral palsy or other severe physical disabilities. Vocational choices of participants include clerical, law, accounting, urban planning, social work and programming. Technology is used to create solutions to the physical barriers involved with writing, communicating or accessing information. Vocational training is mainstreamed into regular academic settings. Support services are provided by Access to Independence, a Business Advisory Council, Wisconsin Division of Vocational Rehabilitation, Trace Research and Development Center and Computers to Help People, Inc.

DATA is an innovative approach to assist persons with severe physical disabilities to gain access to employment opportunities using computer technology. DATA is funded by the Rehabilitation Services Administration for three years ending next fall to learn whether this approach is feasible.

Because of the emphasis on the use of existing resources, it is designed so that our experiences may be used in other communities.

Component Agencies

Access to Independence or Access is the independent living center in Madison, Wisconsin providing services to people with physical disabilities. Access coordinates project activities and works closely with each participant to tailor project activities to that person's needs.

Wisconsin Division of Vocational Rehabilitation or DVR coordinates their other services with those of DATA for each client.

Trace Research and Development Center or Trace is a rehab engineering research center in the areas of communication aids and computer access. Trace evaluates the communication and computer access needs of the clients and makes equipment recommendations and/or custom designs equipment for them.

Computers to Help People, Inc. or CHPI is a non-profit computer software and training center founded and managed by people with disabilities. CHPI provides training in equipment use and peer support They also organized a network for use by project components.

The Business Advisory Council or BAC is a group of local business persons brought together to provide consultation and the business perspective to the project.

Innovations in Project Design

First--the vocational training is being mainstreamed into regular existing academic training programs. Madison has four universities and colleges which offer a wide range of fields of study and levels of training.

Second--we are using computers as tools to access whatever fields the participants might choose. Examples include using a computer for communication, for word processing in any field that requires writing, or for statistical analysis in such fields as planning or social work.

Third--a range of support services is being provided by the different agencies. The specific services varies with the individual needs of each person.

Application Process

Upon referral of an applicant an initial meeting for information and screening was scheduled. The selection criteria emphasize service for clients who are severely disabled; motivated to seek employment; and able to benefit by computer technology. The steering committee, made up of representatives of the four component agencies, met to determine eligibility. If that person met eligibility criteria, a more intensive evaluation began.

Fifteen participants are currently in the project. Two others were accepted and later it was determined that technology would not be of benefit for them in their job goals.

Service Process

Once a person was accepted into the project, a comprehensive action plan was developed.

The clients are attending whichever academic training program is most appropriate for reaching their vocational goals. DATA is available to provide support services and advocacy as needed.

Appropriate computer technology is provided for each client as recommended by Trace. This equipment is being purchased by DATA or DVR with custom modifications by Trace. Training in the use of this equipment is being provided by CHPI, Trace, Access, and several software packages.

Access is providing assistance to help persons improve their independent living skills.

Another segment of the project are the vocational skills workshops. Many persons with life-long severe disabilities have little or no experience with getting and keeping a job, and may have difficulty with some interpersonal skills. Each client is required to attend workshops in job-seeking and keeping skills, and interpersonal skills.

For those who have completed their academic training, and are now seeking employment, trial work experiences are being arranged by DVR and Access. This provides a chance to round out skills acquired in academic training and project activities in actual work experience. Certain financial, equipment, or other problems may show up only upon employment. This is an attempt to resolve these before the person has a full-time job.

After successful completion of the trial work experience(s), a permanent job is being sought. The participant works with DVR and other resources that client has developed by this time to aid in this process.

After the client begins the job, DATA is available for consultation on the transition to permanent employment. All service agencies assist with these follow-up services.

Client Information

Table 1 lists age, gender, disability, and education characteristics of the 15 DATA clients. Seven clients are currently enrolled in higher education, and three anticipate receiving their degrees before the end of the project. Average age of participants is 29 years.

Table 1: Client Demographics
(at beginning of 3rd Year)

Age	Sex	Disability	Education Level
16	M	Muscular Dystrophy	In High School
47	F	Spinal Cord Injury	Associate Degree
22	F	Arthrogryposis	In College
36	M	Cerebral Palsy	Master's Degree
32	F	Cerebral Palsy	Some College Training
30	F	Cerebral Palsy	Some College Training
18	M	Spinal Musc. Atrophy	High School Diploma
19	M	Cerebral Palsy	Some College Training
27	M	Cerebral Palsy	B.A.
29	F	Multiple Sclerosis	B.A.
31	M	Cerebral Palsy	BA, in Law School
24	F	Cerebral Palsy	High School Diploma
34	F	Multiple Sclerosis	Master's Degree
33	M	Spinal Cord Injury	M.A.
37	M	Spinal Cord Injury	In Graduate School

Only two clients are seeking employment in computer programming: other vocational goals include clerical positions (3 clients), administration (2), entry level social services, i.e. child care, peer support (2), professional social services, e.g. social work, recreational therapy, counseling (3), urban planning (2), and law (1).

The types of technology applied varied according to client vocational goals and requirements. Systems were provided to fulfil four different functions:

- communication or writing, with a portable computer device, software (such as the Trine System), and peripheral input/output devices
- access to standard computer functions, with peripherals and rehabilitation software for standard IBM or Apple computers
- remote access to computer systems, through a telephone modem arrangement
- environmental control, including home temperature, and telephone adaptations

Table 2: Types of Adaptive Equipment By Number of Clients

Note: (Numbers of clients in this table exceed total participants because most clients received more than one type of equipment.)

HARDWARE	
Standard Computer	2
Portable Lap Computer	4
Printer/Monitor	5
Modem	2
SOFTWARE	
Technical/Program Design Software (e.g., Dec-Talk-Trine, One-finger program)	2
Wordprocessing/Professional Software (e.g., Word Perfect, Super Calc, statistical packages)	5
Educational/Training Software (spelling checks, SAT training	4
Adaptive Typing Tutors	5
PERIPHERALS	
Keyboard Emulators	1
Other Access/Input Equipment (e.g., headpointer, mouthstick, typing splints, special armrest)	3
Speech Synthesizer	1
Computer Accessories (keyboards, moisture guard, tables)	4
OTHER	
Phone Systems (hands-free phones, amplifiers)	3
Environmental Control Systems	1
Sensory Aids (hearing aids, screen magnifiers)	3

Other services provided by the DATA project included school/career planning, equipment use training, software practice, introduction to computer functions, test-taking planning, financial or peer support counseling, independent living or other job-related training.

Client Status at Third Year of Project

The goal of the DATA project was to increase the employability or job readiness of clients through the application of computer technology and related services. By the second half of the third year of the project, 10 clients were fully equipped with appropriate technology and required training. One client was acquiring a system, and technology to further vocational goals for the remaining four clients was still being developed.

Three of the 15 DATA clients will continue to apply technology to address educational goals throughout the remainder of the project. Five clients are in active permanent job search, four are completing trial or part-time work, and three are permanently employed in competitive work situations.

Issues and Recommendations

Since DATA was designed as a demonstration as well as service project, it is important to discuss what we learned, and what factors have contributed to relative success in achieving project goals to date.

1. The coordination of services between the four member agencies has been extremely valuable. For instance, it is necessary to describe requisite skills for a client's vocational goals before appropriate technology can be applied.
2. Integration of services enabled flexibility in project timeline. For instance, some clients had completed trial work experience before entering the project and began permanent job search immediately after training; others completed trial work before application of technology to clarify relationship of skills and vocational goals. This flexibility is difficult in a rigidly sequential timeline for services.
3. The types of technology applied for clients was not necessarily expensive or elaborate. Some systems were composed of rehabilitation software, telephone or peripheral adaptations totalling less than $200.
4. Financial disincentives were recognized at the beginning of the project as a factor which would affect potential for permanent employment. Some clients chose to extend trial work into permanent part-time employment for financial reasons. Further projects focusing exclusively on overcoming disincentives are needed.
5. Work habits/behavior were a greater problem than anticipated, since an extensive behavior checklist was part of the screening process. Transportation difficulties, missed interviews, failure to return applications or test materials, or reluctance to persist in job search, were among the factors which distinguished many clients who were unsuccessful from those who achieved permanent employment.
6. Computers were applicable to skills in a wide range of jobs. Technology addressing communication, writing or computer access can be applicable in virtually every job situation, and will become essential issues for any person seeking employment as computer technology is further integrated into the workplace at large.

The presentation was followed by a videotape of 3 DATA clients describing the application of technology to meet their vocational goals.

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BRIDGING THE TECHNOLOGICAL GAP

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The policy of deinstitutionalization of the mentally ill coupled with the rapid growth of technology in the workplace has decreased the effectiveness of psychiatric rehabilitation. The Bridging the Technological Gap Project uses microcomputers with custom designed software to remediate specific cognitive deficits and increase the employability of the mentally ill.

In spite of the many seeming advantages accrued to individuals involved in work, the mental health system has not been successful in meeting the goal of finding meaningful employment for persons with psychiatric disorders(Black, 1977). Despite the changes, rehabilitation agencies have undergone over the past 20 years in terms of their nature and function, their programs still have not successfully translated into a new model for these populations (Lamb , 1971). The Institute of Handicapped Research aptly described the situation in a study when they reported that, "although mentally disabled clients make up the largest number of cases eligible for vocational rehabilitation services, they have the least probability of success before and after rehabilitation" (1979). Facility-based rehabilitation programs have reported similar difficulties in working with this severely disabled group (Griffiths, 1974). One study concluded that rehabilitation had no detectable effect on schizophrenics (Griffiths, 1974).

The vocational rehabilitation system as we know it fails to address certain "core deficits" that interfere with the psychiatrically disabled person's functioning. These core deficits include an inability to sustain attention, distractability, impulsivity and behavioral rigidity.

The failure of both traditional and newer vocational rehabilitation programs to deal with these core deficits continues at a time when employers and, to a lesser degree, higher level rehabilitaion programs, are starting to demand personal strengths in flexibility, independent judgement, and the readiness to continue to learn during the course of employment(Labor Market Information Network, 1982). As one moves along vocational rehabilitation and employment continuums, a higher premium is placed on these kinds of skills.

As a partial response to these needs of the mentally illserved in vocational rehabilitation facilities, Altro developed the "Bridging the Technological Gap"(BTG) project, funded by the Rehabilitation Services Administration of the U.S. Department of Education. This project attempts to reduce these cognitive "core deficits" found in the mentally ill using computer technology and customized software as the vehicle by which to achieve this goal. This program signifies a dramatic change in the approach to rehabilitating the mentally ill with these core deficits, in the sense that the program is attempting to build attentional and flexibility skills rather than create situations that avoid the need for them.

ALTRO: History and Services

Altro Health and Rehabilitation Services was founded in 1913 and is viewed as a pioneer in the development of many concepts of care and rehabilitation for persons suffering from long-term illness. Originally concerned with the treatment and rehabilitation of persons with tuberculosis, services were expanded in 1948 to include patients with cardiovascular disease. In 1953, the agency initiated a program for post-hospitalized psychiatric patients and has now been providing psychiatric rehabilitation services for more than 30 years.

Today Altro can best be described as a comprehensive multidisciplinary rehabilitation agency. The Altro model synergistically integrates a traditional vocational rehabilitation facility in that the agency provides a full range of day/vocational training activities, residential care and outpatient clinic services. Last year, Altro served 1500 chronically mentally ill persons in the greater New York Metropolitan area. Fifty-five percent of these carried a diagnosis of schizophrenia and more than three quarters had been hospitalized for psychiatric reasons, most received public assistance.

Altro offers workshop-based training in automated office skills, food services, printing, direct mail, garment, machine shop and assembly/packaging. In addition, individuals who are not able to benefit from this type of vocational training can participate in a group oriented prevocational program. A work activity center offers "sheltered employment" for Altro's extended clients. In addition, Altro operates three twenty-hed community residences and administers a community support program for chronic patients residing in two private proprietary homes for adults.

Participants for the BTG project were drawn from the pool of transitional clients who are in one of the workshop-based training programs. These clients are expected to move from this sheltered setting to community-based competitive or volunteer employment within 18 months.

THE CORE DEFICITS

Initially, three core deficits were selected for remediation based on an extensive literature search and ongoing surveys of Altro's workshop managers. The first deficit, attention, has two components. Sustained attention is the ability to stick with one task until completion. Distractability, another component of attention is evidence in the presence of both auditory and visual distractors. In the most recent manager survey conducted in February, six of nine workshop managers felt that attentional deficits interfered with vocational functioning at least occasionally.

The second deficit that was selected for remediation was impulsivity, the lack of control of specific behaviors or urges. Workshop managers tended to define this in relationship to attention and flexibility. For example, an impulsive reaction to poor concentration on work tasks is to leave program without informing staff members. Contrary to our initial prediction, this particular core deficit did not appear to interfere in the functioning of our participants. The opposite of impulsivity or lack of initiative is frequently observed and is considered one of the "negative" symptoms of schizophrenia. It is possible that impulsivity is exhibited by more symptomatic clients and that the modules designed to address this core area are more appropriate at earlier stages of rehabilitation.

The third core deficit, behavioral rigidity can be defined as the inability to change from one task to the next or to generalize learning from one environment to the next. There is little to be found in the literature about behavioral flexibility. At Altro's workcenter, managers described it as a "reluctance to change", "lack of initiative" and an "inability to handle two or more tasks at a time".

Additional interferences to vocational functioning that were identified by workshop managers included: poor self-esteem, attendance, and stress. While these issues were not addressed specifically by the BTG project, there did appear to be some improvement noted in these areas by program participants.

ADMINISTERING THE SOFTWARE

Sixteen software modules (Cogito) that resemble computer games were designed for remediation of the core deficits. Participants practiced the modules one half-hour a day, five days per week for a period of four to six months. Thus far, there have been two rounds of administration. Data has been collected from the first administration and the results will be discussed in the following section of this paper.

The BTG team reached four general conclusions following the first round that have impact on future administrations: (1) The software in and of itself does not produce magical results. It is merely a tool that lends support to a structured, remedial approach to treatment. In order to facilitate generalization of skills to the work and home environment, this technique must be well grounded programmatically and should include individual or group discussion, supplementary activities and homework assignments. A facilitator manual is being developed that includes behavioral objectives, individual and group protocol, specific use of software modules and supplementary activities. (2) The intervention is most likely to have a positive impact when it is individualized. The only exception to this procedure was with clients who had lowered self-esteem. These clients were allowed to practice modules that were easy for them so that frustration was minimized and positive self-image fostered. (3) Use of game format with scoring may facilitate positive self-image. Almost everyone improved their scores on the games after continued practice. (4) Anecdotally, it appeared that use of software modules in group settings enhanced socialization. Participants were gathered together for a common purpose and they were "special" in that this project was different from other kinds of programming at Altro.

BTG PROJECT DESIGN

Initial Development

The BTG project design called for one year of software development/selection followed by two years of experimentation. The project is currently in its third year of operation. During the first year of the BTG project, staff operationalized the cognitive deficits. An extensive needs assessment existing commercial and educational software was then conducted. It was concluded that at the time (1984) that there were no existing programs geared specifically for the psychiatrically disabled and that the needs of the clients would best be addressed by developing computer "games" specifically targeted to remediate attention/concentration, behavioral flexibility, and impulse control. Altro then contracted for the development of the sixteen computer "games" focusing on the cognitive areas as discussed. In the second and third year, participants were recruited and placed into four different research cells. The first two cells composed of transitional clients from the Direct Mail, Printing, Garment or Assembly programs. One cell participated in remediation using the software modules. The second cell participated in groups that addressed the core areas through group discussion and activities. Participants in the third and fourth cell were recruited from the Automated Office Skills training program. One of these cells participated in remediation using the software modules. The other participated in group activities and discussions addressing the three core areas. Pre and post assessment was conducted with all cells. This included evaluaton of ego functions, self-esteem, distractability and clinical aptitude. Program attendance for the Automated Office Skills cells was also examined.

RESULTS

Pilot testing was completed in August of 1985. Pre and Post test data was collected on 28 of 29 of the original participants. As of this date, not all data has been collected from the second round of testing. However, clerical aptitude testing and attendance has been examined from the Automated Office Skills program. Examination of these results and analysis of software, scores lead to the following conclusions: (1) Participants who initially were easily distracted and were in the cell that practiced the software modules showed greater improvement in attention on the competing messages test (an assessment of distractibility) than participants who were in the control cell. (2) This positive finding could not be linked to a specific software module. This suggests that there is something inherent in the use of the computer for remediation that facilitates improvement in attention. Further exploration of use of computer to engage clients as well as an immediate feedback mechanism is warranted. (3) Attendance in program for participants from Automated Office Skills was higher for those in the cell receiving software remediation than those in the control cell.

SUMMARY

TheBTG project has resulted in several positive findings as well as a refinement in the protocol administering a project of this kind. Altro is still in the final phase of this research project with data still to be analyzed. Initial results are promising with implications for the use of technology linked to a remedial approach for the treatment of this clientele.

Plans for the enhancement of this project include the development of more vocationally relevent software. Initially, this project was designed to address the needs of vocationally transitional clients. It may also be useful for prevocational and extended clients. Our next phase of research will, in fact, include these populations.

This developing technology is a valuable tool that can only enhance the rehabilitation of the chronically mentally ill.

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The Use of Computers in Vocational Assessment

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The advent of large memory, multi-user small office computer systems makes test correction, adjustment training prescription, and program evaluation feasible for the low budgets frequently encountered in adjustment and vocational settings. This session discusses an ongoing development and implementaion activity for the use of computers in Work Evaluation and Work Adjustment Settings.

INTRODUCTION

The use of computer managed occupational skill training is growing. Perhaps the most often asked questions are: How is a computer useful in teaching skills such as are found in Vocational Education Centers? What can Vocational School administrators gain from investing staff and money in computer based instructional management? What I am going to say today partially answers these questions by describing the use of the Tandy 6000 multi-user system within the Seminole Community College Area Vocational School's Centralized Occupational Resource Lab.

The reason for using computers is to cut costs and increase efficiency. At SCC, a computer managed system which integrates traditional instructional program facets, such as, admissions testing, work evaluation, certain aspects of work adjustment training, remedial academic skill training, entry level work skill training, and program evaluation has been designed in order to answer the question "are we doing the right thing to facilitate the student's transition from school to work?". This system is formatted in such a way that it can be accessed by students, teachers, and administrators.

Developing Student Skills via Computers

This use of a computer is built upon a concept just recently being explored in the field of computer technology. The concept is that of the tree-structured database. Like the outline of a book, the book consisting of chapters which in turn consist of topics containing paragraphs which contain sentences which consist of words and punctuation consisting of symbols, so the database is structured. None of the higher level items, the book, chapters, topics, subtopics, paragraphs sentences or words can exist without the low-level characters and symbols, and yet all the high-level items are the proper organizations of these symbols.

Using a UNIX tree structure, each entry level competence which the Vocational School teaches becomes a "leaf" in the "tree of skills". The goals of admissions testing, work evaluation, certain aspects of work adjustment training, remedial academic skill training, entry level work skill training, and program evaluation are achieved by studying the shape of the "tree" which each student develops in learning skills. The various reports that the system is designed to develop are ordered according to the interdependence of elements created through experiences in trying to recruit and teach students.

How it Works

Engelmann (1975) has described the essential "leaves" of a teaching methodology in which skill attainment is presented so that learning outcomes have a positive or negative, yes or no, go or no go interpretation. The Journal of Precision Teaching illustrates the continued use and development of a number of sophisticated precepts of good teaching to insure the learning of a concept or operation by any person. SCC presents each student with learning objectives which are itemized and complete so that the student learns objectives in the order of complexity.

The most common or most frequently performed worker tasks and functions in entry-level occupations related to SCC's Vocational programs have been assigned a specific location within each student's record within the computer. The number of single character locations in the computer is directly related to which field of study the student selects (e.g. electronics, culinary arts).

Students initially function independently of teachers. They are given a series of work samples which are "synonomous" with entry - level skills within the occupation of their choice.

As a student progresses toward his or her own level of competence, a track record is developed in the computer regarding the frequency of their right and wrong functioning. Each record of each student's functioning is recoded in the form of (1,0). This record functions as a baseline for beginning specialized instruction in that field. If the student checks out on all the entry skills this is taken a evidence that he or she is ready to start formal Vocational Laboratory experiences.

The quality of the Vocational School is evaluated on its ability to validly put "1" (can-do-task-rating) in as many task locations as possible in each student's learning record. The more "1's" there are, the more competence a student has to offer employers. At SCC, various hexadecimal numbers are used to represent specific learning outcomes. For example, the competency known as the ability to "identify, select and demonstrate the proper use of tools" can be divided into ten more elemental competencies, "identify hand tools," "select correct tool according to job", "demonstrate safe and proper use and care of hand tools," "identify power tools," "select correct power tool according to job," "demonstrate safe and proper use and care of power tools," "identify special tools," "select the correct special tool according to the job," "demonstrate safe and proper use and care of special tools," and "demonstrate safe and proper use and care of special tools requiring OSHA certification." If each of these competencies were assigned one bit that is either a "1" for its success or a "0" for its failure, all ten can be represented by simple coding into a two-byte number which may be stored on disk. Since each byte consists of eight bits and is represented by two hexa-decimal numbers, the complete success of these competencies may be coded as 0000,0011,1111,1111 in binary and represented by "03FF" in hexadecimal. This number can then be used to compare with the student's achievements using simple subtraction of what they have done from what they are required to do. If the student has accomplished all but the competency "demonstrate safe and proper use and care of special tools requiring OSHA certification," his achievement score would be a "01FF" in hexadecimal. "03FF" minus "01FF" becomes "0200" which is the code for that last competency.

This coding saves memory within the storage media of the computer, which is always a major concern for the efficient usage of computer resources and its inherent speed, but more importantly this coding provides a quick and easy way to show what a student yet needs in his or her curriculum. Although staff and administration are not intimately aware of this structure, they are constantly altering and drawing upon this data in their interaction with the computer system. Thus, to them, their particular application is like using an appliance to get their job done.

Implications

The reasons for using a multi-user computer system to establish a curriculum for students, to track student progress, and to account for the effectiveness of teaching techniques are as follows:

1. Students need frequent and easily accessible "feedback" as to how they are doing. Having all of their school work available to them in minute detail is

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helpful in letting them see what is happening in their attempts to learn.

2. Having a system of programs which is accessible to the input of the various teachers in the lab and to students allows each staff and student to contribute in building a picture of how students are learning. For example, evaluation staff enter baseline statistics, evaluation report writers utilize evaluation data to write learning prescriptions, teachers enter "success and failure" performance ratings, the computer itself records time and attendance data, and administrators pull together various program facets to better understand how the group is functioning in comparison to objectives.

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PARENTS AND TEACHERS CAN USE PERIPHERALS: A TRAINING PERSPECTIVE

Patricia L. Hutinger

Abstract

The development of a wide range of peripheral devices enables the specialized individualized adaptations necessary to permit computer usage by young and/or handicapped children for education, entertainment, and, for severely handicapped, socialization. But the specialized and individualized nature of adaptations to fit the needs of a given child means that education instruction and training materials are not readily available. Training competencies, developed and tested over a three year period by the M.U.S.E. and MUSE Trainer Projec staff, allow individuals to choose the areas st relevant to their specific situations and to attain competencies in areas of practical use tc them. They can be used with parents and staff alike.

When Macomb Projects' staff train parents, teachers and support staff to use computers with disabled individuals from birth through adulthood, the major emphasis is on first helping those we train acquire tool uses for themselves. We believe that if the adults who work with the disabled find that computers are useful to themselves, these same adults are more likely to ensure that the disabled in their care will have access to computers and the adaptive peripherals that may be necessary for specific applications. Through our efforts in rural West Central Illinois since 1982, we know that parents willingly became involved in computer activities and seek training.

Training adults is based on a set of general principles related to the M.U.S.E. (Microcomputer Use in Special Education) competencies. Simply stated, the principles we feel adults need to know before they use computers and peripherals with child, youth, or adults follow:

1. You can put computers to work for you.

2. Computers are understandable and controllable.

3. Computers will NOT replace teachers.

4. Computer usage has a special language all its own, so learn "techie talk" and read computer magazines.

5. No one knows all there is to know about computers, but someone always knows something you don't know. Learn to "team" with others so you can do more and learn more.

6. Computers can do much more than emulate workbook pages. Make use of a wide range of tool, tutor, and tutee functions.

7. Asking questions is an honorable and necessary activity.

8. When you learn to use a computer you are learning a new skill and go through similar stages in learning that children do when they first learn new things.

9. Lots of children like computers and some who don't like much of anything about school WILL use computers and like them.

Training to use peripherals can be organized according to the nature of the training (1. individual tutorial or consultation, 2. group inservice, and 3. formal university coursework); the content and accompanying competencies; the characteristics of the trainees; and the time period needed.

Trainers must recognize that there are many reasons why people want training, reasons that range from very general to highly specific. While some "just want to know more about computers," others want to be able to use specific applications with specific individuals. We believe that when trainees need to solve relevant problems, the need to acquire a skill is more salient. Sometimes trainees have no idea of the kinds of available peripherals and their functions. In this case, videotapes of children or adults using various computer applications are useful.

For example, recently a teacher who had used simple computer applications with preschool handicapped children for the past two years decided she wanted to do an instructional unit on computers without outside help. She asked for specific training on printer set-up and use because she wanted to print children's LOGO patterns. She also needed to learn to use a graphics dump for the printer she was using. She wanted to learn to use the Turtle Tot, which involved another set of skills. In addition, she wanted to know how to use the Echo II and a Power Pad so she could use the software she had in mind. In this instance, the teacher requested the training, which actually took the form of an individual tutorial. The training met her needs, was immediately applied to a real life problem, and was tied to some of the skills she already possessed.

The materials used in training an individual are similar to those used with larger groups. We recommend using hardware, peripherals, and software similar to the equipment the individual intends to use, particularly when the trainee is in the beginning stages of using a computer. While generalizing skills to a variety of computers is a worthwhile goal, it is not yet a realistic goal for beginners. It only comes after ample time to experiment with equipment and a degree of confidence.

We have developed a series of training materials to use in peripheral training. These include videotapes of a variety of children and youth using many different peripherals, a general list of computer competencies (Hutinger, et al, 1985), a specific list of subskills related to peripheral use (Hutinger, 1985), a "peripheral worksheet" used to record information about specific applications as well as a set of written resources, and ideas for peripheral use and curriculum integration (Hutinger, et al, 1986). Peripheral competencies include those needed for printers, Votrax, Echo II, Echo +, Adaptive Firmware Card, Mockingboard, input/output box, Topo (a robot), Turtle Tot, joystick, Touch Tablet, mouse, various switches, and modem (with specific software). When trainees begin, they can check their own skill level on the general list of competencies, then move to specific competencies they need to acquire.

Teaching parents, teachers, and others to use peripherals also includes helping them consider several factors prior to making decisions about which peripherals to use with specific individuals. These include both technical and educational considerations involved in selecting appropriate applications. Determine the present behavior of the child, youth, or adult. What can he/she do? Identify potential peripherals and task requirements, then match the two. Decisions must also be based on cost, effectiveness, availability and the degree of technical adaptations that must be made in order to accomplish the desired outcome.

Whether training is accomplished in an informal basis or in a university course, we help trainees overcome their fear of computers. We make the peripherals and their use understandable and "do-able" by offering plenty of actual time on the computer with a specific peripheral, an adequate supply of equipment, and a large software library.

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James M. Keefe

Abstract

In order to help teachers acquire computer skills, a trainer may use the same skills he or she possesses in developing individual treatment programs for children and apply them to consulting. Possible steps for such use are:

1. Diagnose the current problem by knowing how much competence presently exists.

2. Gain an understanding of the level of confidence possessed by the teacher.

3. Match the competencies the teacher presently has with those required by possible hardware and software applications. Use only applications which are understandable at the teacher's present level.

4. Provide relevant applications which allow the teacher to solve real and current problems.

5. After applications are being used to solve current problems, try to introduce new curriculum goals which can be met with the computer applications the consultant knows.

Let me tell you first about my recent conversation. Janet is a teacher who spends part of her week traveling to rural school districts working with children using computers and encouraging the classroom teachers to use those computers during the rest of the week. She is concerned about the lack of follow-through shown by the teachers with whom she works. She is certain that the activities she develops and takes to these schools are beneficial to the children she sees, but she feels just as certain that the teachers do not follow through with the activities when she is not present. She also feels that the teachers are not willing to interact with the computers as much as they should, and so remain unsophisticated about how they work and unwilling to try things on their own. What Janet wants, of course, is to be able to provide interesting new activities that the teachers can use for themselves, to offer encouragement for the teachers to do more things on their own with the computers, and generally to make the computers more a part of the everyday classroom routine.

Janet has several problems to contend with. It is difficult to put these problems in a specific order of importance, as sometimes one is dominant and must be solved first, while in other circumstances, another order appears. The problems relating to (1) teacher competence (with the machines, with the software, with the teaching approach which will take advantage of the machine), with (2) teacher attitude (toward the machine, toward the lessons which can be taught with the machine), and with (3) teacher commitment to using the machine, either for existing or new teaching purposes. How is she to make the best use of her time, so that these teachers will come to appreciate the computerized lessons and will come to feel confident in using this new technology? This is a difficult task - and it may be the pivotal task in bringing technology to the schools.

In a class I teach at Western Illinois University (WIU) in the summer, titled "Technology and the Handicapped," I am probably most concerned with the issue of attitude. This course, which is mostly about how to make things - switches, digital logic devices, toy modifications, etc. - requires that the students learn to work with tools that are often quite unfamiliar. We build circuits of resistors, capacitors, and logic chips, using such things as breadboards, soldering irons and test probes, most of which are not in the experience of teachers of the handicapped. In order to make things possible for the students, I emphasize hands-on work, both to enhance the understanding of how these devices can be helpful in the teaching process and to build confidence in the learners. The first few days of class are anxiety-filled, sometimes even leading to tears.

(I think it is a good experience for any of us who teach to try to learn something completely new just to keep us in touch with the feelings encountered by our students when we put them in the same position.)

Confidence is built when the construction projects begin to work - and to date everybody has successfully built every project. The result is a high-energy class where ideas for possible uses of the technology seem to blossom from every mind. It is an exciting experience.

Moving past that first bloom, a teacher trainer must have some sort of system to use. I believe that there is a way to bring any teacher to a new appreciation of the usefulness of computer technology. It can be done by using the same kind of approach any good teacher uses in working with children who have learning problems. In studying the diagnosis and remediation of learning disabilities, I have found that there is a useful system of identification of needs and treatments, and this system applies here. The first thing that must be done is to take a baseline of the individual's present level of competence. With LD children, we do this through testing and analyzing their daily work. In Janet's case, a formal evaluation of the knowledge level of the teachers she works with can be done using one of the pre-tests available from the M.U.S.E. (Microcomputer Use in Special Education) Project. She can also use a checklist of competencies and fill it out by watching what the teacher does during daily class work. With this, she will know what to expect the teacher to be able to do independently, and where the teacher will need specific instruction. Janet can quickly find out if the teacher can independently get the computer up and running, if she can load and run a specific program, if she can attach and use a peripheral, and so forth.

The next level of baselining will take some more time, but again, can be done. Janet is going to have to assess the level of confidence the teacher has for using the computer alone. It is true of all of us, from frightened first graders to university professors, that we do not do what we do not believe we can do. A major effort must be made to understand the level of confidence the teacher has for using technology, for without confidence, nothing independent is going to happen. Janet may be able to make this baseline appraisal by keeping a journal with comments specifically devoted to this issue. She may "set up" some situations to see if the teacher in question is able to deal with particular kinds of problems. Or she can use teachers' reports of their own feeling in questionnaires developed by Project M.U.S.E.

The next task is to make a hierarchical list of the skills necessary to use the computer in the manner Janet wants. This list may be for a specific application, such as using Logo with a group of kindergarten children, or it may be for a kind of teaching activitiy, such as using the computer to teach a specific skill or concept. Some lists are available in ACTT (Activating Children Through Technology) and M.U.S.E. materials.

Next comes the issue of relevance. Janet needs to understand the teacher's goals, and be able to enhance the accomplishment of those goals through her computer applications. I think a real issue here is the fact that all teachers feel that there are great time limitations on all of their work. There is not enough time to accomplish all of the goals that exist in any curriculum. Teachers are frustrated by this. One way to get computers into more classrooms is to find ways to use them to enhance current goals. In this instance, we are finding ways to use the computer as a tool to meet current needs. Perhaps the best way to begin this phase of the application is to have a discussion with the teacher centered on the curriculum, so that the consultant can know what present goals exist. With this information, an analysis of current hardware and software can be done to see what tools for learning can be provided by the computer.

At another level, it may be possible to bring potential new teaching goals up for consideration. For example, Janet has told me of the benefit she has seen in using the computer to assist in cooperation and socialization in children. As we know, young children have difficulty with sharing and working cooperatively. Janet has seen many instances where two or three children, sharing keyboard responsibilities, or taking turns at the keyboard, have gained new skill for working as a team. One child may be in the position of "screen watcher," analyzing the movement of the turtle in a Logo program, while another actually makes the keyboard entries. By asking leading questions of the children, or by defining a problem for them, Janet has been able to show that they learn to work as a team. When she convinces the teacher that this kind of learning is valuable and applies to other instances, she has a very good entry for an ongoing lesson which the teacher could carry out daily, perhaps reporting to Janet from her own journal when Janet makes her weekly visit. In this case, Janet would be showing how a previously untaught skill can be integrated with the current curriculum, demonstrating that the computer has applications beyond present lessons.

The important thing here is not what Janet does with these problems, but that she can take a set of skills she already possesses - those for developing individual treatment programs for children - and apply them to her classroom computer consulting work.

TECHNOLOGY AND TRAINING ELIGIBILITY: THE "FUZZY" LOGIC APPROACH TO COMPUTERIZED VOCATIONAL CHOICE

Ann Williamson

Abstract

This presentation describes the methods Career Evaluation Systems, Inc., uses to provide, through "fuzzy" logic, a more accurate computerized screening of specific occupational training ability for impaired persons than is available through other methods. Because of work adjustment technology's capability of increasing vocational choices, it is necessary for the computer science predicting training potential to deal more with probabilities and less with the absolute yes-no of the traditional logic. Akin to the newly-developing "artificial intelligence" logic for computers, "fuzzy" logic provides this more humanistic approach. This, plus special adjustments applied to the DOT's ability requirements, are the bases for the new approach to vocational training eligibility.

Just a few years ago, we only dreamed of expanded job choices for our "disabled" through the use of computer technology. Today this is a fast-growing reality. Now we're racing to catch up in our vocational assessments so they will accurately predict performance in persons with impairments to match the existing techologies.

This is a tough task for us. We're so anxious to use the new devices (because they offer such great help) that we may not be considering the overall impact. In the normal workforce, it's being discovered that not everyone is successful using a computer as a work tool. We must consider that this could also be the case with some impaired people. We must rely on new, specific assessments--before beginning technology training programs--to discover the full potential of our clients.

Assessing for technological training eligibility should force us to re-analyze our procedues in evaluation, for new techniques will be needed to establish successful training programs. (1) Assessments from instruments formerly considered to be "screening tools" should be used to provide the most appropriate assessment conclusions. (2) It will be more important for the evaluator to know isolated specific functioning capabilities of the person rather than simply overall job placement functioning. And (3) the type of computer logic used for drawing vocational conclusions about the disabled client must deal with the new "artificial intelligence" concept. This paper will explore each of these three statements.

The Change to Screening Style Assessments

When we are assessing for job placement, we are concerned with more aspects of the client than screening tools can provide. But in assessing for training programs, screening tools are more appropriate than the usual work sample analyses. Too much time is involved in work sample assessment that will only be re-evaluated during the training period, and it is not yet certain which work samples are appropriate to the new technologies.

Screening tools, which in a few minutes each give reliable indications of specific functions of the person, are the appropriate assessment tools prior to training. In a period of a few hours, the evaluator knows the mental and physical functioning levels of the client which are the necessary bases for training program planning.

New Job Requirements in New Techologies

There are not yet reliable guidelines for job requirements when new work devices are used. For many years to come, we can count on the DOT to lag behind reality in stating new job requirements, because the explosion of technologies cannot be efficiently corraled by a bureaucracy.

It will be up to the evalutors to build his/her own databank of job requirements through experience--plus to share that experience with others. Without an imposed standard, it will be imperative to be in touch with the experience of other standard-makers.

To build this experience, it will be more important than in the past to discover and use isolated functioning levels, rather than simply record general or overall functioning levels of the client. The more precise the measurements of physical and mental factors, the more reliable the conclusions will be when the factors are combined to generate a profile of requirements. This was first documented by the Air Force in World War II and later by E.A. Fleishman and his associates in the study of human factor analysis. (Fleishman, et al, 1958)

Career Evaluation Systems is based on human factor analysis Our testing methods provide the evaluator with the specific functioning information crucial for developing experience for new job requirements. Not only is the local evaluator able to build his/her own observational research, however, but local data will be compared with other user's research through the national headquarter's computer operation. (Career Evaluation Systems methods are not software-issued based, but computer-scored by telecommunication from a central evaluation database.) In addition, Career Evaluation Systems has already begun and is using a databank of altered job requirements for physically-impaired clients, based on use information from the field.

The New Style of Computer Analysis

Dependence on the computer to gather test results and predict job performance conclusions about a client is becoming universal--but it can be misleading. Traditional computer logic was developed to deal with finite values--basically numbers. It cannot deal in probabilities, which is the basis of human thought. The answers from traditional logic are <u>on/off</u>, <u>yes/no</u>; there is no means to access a <u>maybe</u> answer, which is essential in dealing with conclusions about human performance.

Some evaluators are already experiencing unsatisfactory conclusions from computer decision-making. They sometimes are circumventing the traditional computer logic conclusion process by re-entering "what if" data after seeing computer results--for example, "what if the person had done just a little bit better on this or that test--could I get more satisfactory results?" Sometimes they alter job requirements, or simply do not use the computer. But there is a better computer conclusion process available than hypothetically and inefficiently overriding objective data. It is embodied in the "fuzzy logic" method.

When the concept of fuzzy logic is used for computer analysis, objective data is considered on a probability basis, which is the way we reach conclusions without computer aid: "given all this data about the client, what do I think would be the client's best performance conclusions?" In other words, all available data is considered simultaneously and the pluses and minuses are weighed in a consistent manner, rather than considering datum one-by-one in an isolated manner. And the vocational choices made for the client are arranged in terms of best probability first, with next best following.

To illustrate further, traditional computer logic looks at one datum at a time and concludes either that the requirement <u>was</u> met or <u>was not</u> met. It continues this process until all the data have been read, but at any time when a condition is "no," it aborts the process. To bring this into evaluation terms: if the person's test results met all but just one requirement for a job position, that job position would be denied. Traditional logic is not capable of reasoning with knowledge that some or many of the other requirements may have been met extremely well, which in human reasoning--or fuzzy logic reasoning--would result in <u>maybe</u>, rather than in <u>denial</u>.

If we don't allow probability to govern job performance conclusions about a client, we are denying our clients perhaps some of their better choices for vocation. This is especially critical when we're assessing for training eligibility, because we are trying to find the best possible choices before assigning the singular training path.

Fuzzy logic computer systems are now available and providing a more reliable approach to assessment. It is the obligation of the evaluator to investigate and understand the differences in the various computer methods available before using the end product printout. Career Evaluation Systems discloses in its technical paper how fuzzy logic functions in its computer analysis process.

Conclusion

Training people with impairments to enter the workforce with the use of new technologies introduces new considerations for evaluation: the use of the most recent technology in assessment testing and computerized performance conclusions. It also calls for new analyses in job requirement factors, and the universal sharing of those characteristics from actual field experience because of the acceleration of new developments. And finally, it is now critical when choosing assessment methods to have a full understanding of the science upon which each is based, as well as the potential uses for the various methods.

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ABSTRACT

This paper discusses some of the strategies used and observations made in a year-long vocational training project for severely developmentally disabled individuals. All of the participants had severe hand dysfunction and computer speech recognition was used to provide them with marketable job skills.

In October of 1985, the Iowa State University Computation Center finished a year-long study which was designed to determine the efficacy of a speech-input computer as a vocational training tool. Those chosen to participate in the training were all developmentally disabled and had severe hand dysfunction. This report gives some of the techniques used and comments on their effectiveness.

Three basic fundamental skill areas were covered:

1. using the computer to produce neatly written and printed documents,
2. developing, manipulating, and maintaining a computer data base, and
3. performing numerical computations in an easy-to-use tabular manner.

These three areas are those usually considered essential to making someone computer literate. They were chosen because they were deemed fundamental to employability. They could result directly in a computer-related job. They also provided alternative techniques useful in other jobs and educational goals. Details on staffing, linkages, and funding sources were covered in an earlier report (Grooms, 1985) and will not be repeated here. Research and instructional staff with a wide variety of backgrounds were used. These included special education, engineering, computer science and speech pathology.

Basic Speech-Recognition Concepts

Hardware

The underlying speech recognition hardware used was manufactured by Texas Instruments Incorporated (Texas Instruments, 1985) and uses a technique known as linear predictive coding (LPC). This technique models the human vocal tract as a time-varying filter. It is worth noting that the recognition hardware chip is not a specialized LPC device, although such chips are often used in speech recognition systems. Rather, it is a general-purpose digital signal processing (DSP) chip. This means that the algorithm used for speech recognition is changable by software, without any hardware change. Indeed, the same hardware can be used for both speech recognition and synthesis, as well as a variety of other applications. As speech recognition algorithms improve, the hardware will not become quickly obsolete. Readers who thirst for further engineering details are referred to any text book on DSP and to the manufacturer's users guide (Texas Instruments, 1983).

Vocabulary Definition

This speech recognition system, like most, responds in the following manner. When the user speaks the computer will respond with an action if it recognizes that utterance. The action is user-defined and can be a simple keystroke equivalent or a complex series of actions. A vocabulary is a collection of such utterance-action pairs. This is diagrammed below:

Utterance_1	Action_1
Utterance_2	Action_2
∘	∘
∘	∘
∘	∘
Utterance_N	Action_N

$N \leq 50$

The system used is speaker dependent. Each person must train the computer to recognize his or her voice for a given vocabulary. Vocabularies for each user are stored on the computer's hard disk drive.

Vocabulary Use

When the computer is being used, several vocabularies are loaded from the hard disk into the computer's random access memory (RAM). The speech recognition hardware only acts with one vocabulary at a time. This is called the active vocabulary. When using the active vocabulary, one speaks a phrase and the computer attempts a statistical best-fit to the utterances in its table. If a poor fit occurs, the computer does nothing. If a good fit occurs, the indicated action takes place. One or more of the utterances in the active vocabulary may cause a different vocabulary in RAM to become the active one. Vocabulary definitions and switching patterns were important investigation areas of this project. We shall discuss them more as we go on.

Training Sessions

Session Format

Each participant in this training project was given three two-hour sessions each week. There was a five to twenty minute break between the two hours of a session. This worked well. By the end of the first hour, most of the participants were ready for a rest. By the end of the second hour, most of the participants were fatigued and ready to stop for the day.

Every training session involved only one participant and one or more instructor. As the course progressed, participants were left to work alone for progressively longer periods of time. This worked well in some cases.

Log Books

Log books were kept for each participant, and an entry was made for every training session. Log entries for a session contained the following information: a standard heading giving the session number for that participant, the month, date of the month, the day of the week, and the participant's name was on the first line. The names of instructors were given on the second line. The third line contained the session starting time. Succeeding lines contained narrative on what occurred during the session. Both objective and subjective data were recorded. Break beginning and ending times were recorded. A narrative for the second hour was kept. The session stop-time was recorded. The last entry for each session was an evaluation of the session's usefulness, both from the viewpoint of the participant as well as that of the instructors. Also, expectations of what was to occur in the next training session were recorded in this final section.

The log books were very helpful in evaluating the participant's progress. They were equally helpful in evaluating the training project itself.

More Computer Concepts

When a participant begins a training session, the following sequence of events takes place: The computer shows the prompt, "Please speak your name." When the participant does this, a vocabulary of application program choices is loaded into RAM. This vocabulary is specific to the participant who has just spoken. The prompt appears, "Please speak the name of the program you wish to use.

Your choices are: EasyWriter (TM)
Multiplan (TM)
File (TM)."

This menu of program choices varies from person to person. When one of the programs is selected, and its name spoken, the vocabulary set for that program is loaded into RAM from the hard disk. The program itself is not started for reasons given in Grooms, (1985). The first active vocabulary has been predetermined by the project director and is usually the upper case alphabet.

Because computers don't, as yet, have as good aural acuity as humans, phonetic spelling of alphabetic characters is used. For this project, we took a pragmatic approach. That is, we attempted to find participant utterances which worked well. We did not have staff or time to try to find optimal utterances.

As a starting point for each participant, we used the International Civil Aviation Organization (ICAO) standard phonetic alphabet, with one change. The ICAO alphabet is constructed so that each word is distinct from all others, with a wide range of national accents tolerated. It is used by commercial airlines from most countries, NATO forces, and NASA among others. The ICAO alphabet, modified, is shown in table 1.

Table 1. ICAO Alphabet, modified

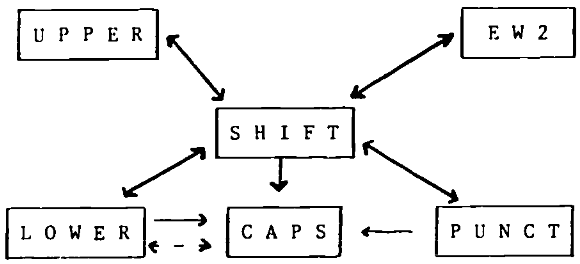
alpha	a	november	n
bravo	b	oscar	o
charlie	c	papa	p
delta	d	quebec	q
easy	e	romeo	r
foxtrot	f	sierra	s
golf	g	tango	t
hotel	h	uniform	u
india	i	victor	v
juliet	j	whiskey	w
kilo	k	xray	x
limo	l	yankee	y
mike	m	zulu	z

The one modification to the ICAO standard was the substitution of "easy" for "echo." The computer liked "easy" better than "echo." Of course, other phonetic alphabets can be used. For example, see Serota, (1983).

Vocabularies were developed for upper and lower case letters. Each of these also contained punctuation symbols. A "CAPS" vocabulary was devised which typed a capital letter and then automatically switched the active vocabulary to the lower case vocabulary. Vocabularies for each application program were developed. These contained key words and commands for those programs. A punctuation vocabulary was developed.

For word processing, the structure of the English language was exploited. For example, the lower case vocabulary contained the utterance "period." When this was spoken, the computer produced a period, two spaces and a switch to the CAPS vocabulary. The assumption here is that one is ending a sentence and wishes to start another. If only a period is required, it is in the punctuation vocabulary. Other "tricks" which made use of the most likely switching patterns for particular applications were used. It is necessary for each vocabulary to contain at least one switch utterance to another. In a mathematical sense, the vocabulary sets and their switches must constitute a strongly-connected directed graph.

Two basic switching patterns were investigated. In the first of these, each vocabulary could switch to each other vocabulary. In the second, each vocabulary contained only one switch utterance that was to a vocabulary which itself contained only switches to all vocabularies. The advantage of the first method is instant access to every vocabulary from every other vocabulary. The price of this is that each vocabulary must contain many switch utterances, each taking space that could be used for productive utterances. The advantage of the second method is that more productive utterances could be put in a vocabulary. The cost is that two utterances must be spoken to switch vocabularies. This is somewhat slower than the first method. Each method has an advantage and a price. We frequently made use of a hybrid as shown in figure 1.



UPPER is an upper case vocabulary.

LOWER is a lower case vocabulary.

PUNCT is a punctuation vocabulary.

EW2 is a word processing vocabulary.

CAPS is an automatically switching upper case vocabulary.

SHIFT is a vocabulary of switch words.

<u>Figure</u> 1. Word processing switching graph

The presence of an arrow from one vocabulary to another means the vocabulary at the arrow's tail can switch to that at the arrow's head. A dashed arrow means that at least one utterance at the arrow's tail can produce an action and then automatically switch to the vocabulary at the arrow's head.

<u>Concluding Remarks</u>

Typing tests given at the end of the course showed that the participants' input speeds were all below five words per minute. A word in these tests was defined as five letters and a space. Speech input was faster than manual input for all but two of the participants. Typing by hand was only slightly faster than speech for these two. Typing tests were given using an IBM Selectric III (TM).

Word processing input speed can be increased significantly if a dictionary of frequently used words is included in the vocabulary set. This is especially useful if a particular jargon or lexicon is being used. For example, if one is writing on corn borers, such words as "corn," "borers," "insecticide," "farming," etc. might logically be put in the dictionary. The project director and two participants have experimented with this technique. It is effective. Verbal data entry for word processing is slow, but it is functional.

For data base management and spreadsheet work, speech input may be faster than manual input. Multiple keystrokes, such as "alt-F10" become something more meaningful, such as "retrieve form."

In summary, speech recognition technology for personal computers should be considered as being at the adolescent stage. It's somewhat slow, but it's functional.

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Use of Computers for Cognitive Rehabilitation

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Abstract

This presentation will focus on the use of microcomputers for cognitive rehabilitation of neurologically involved patients such as those with stroke or head injury. One of the primary treatment goals for these patients is to stimulate their thinking skills. The computer provides a practical and useful tool in this respect as it offers consistent, systematic presentation of tasks as well as an efficient method for data collection. At Schwab Rehabilitation Center, psychology, occupational therapy, and speech therapy are using the computer in their treatment for deficits such as attention and concentration, memory, and problem solving. Presentors will describe specific applications for treatment andwill also review a case study to illustrate how the rehabilitation team can effectively utilize computer technology with neurologically involved patients.

Cognitive retraining and cognitive stimulation are words that describe treatment for someone who has had a neurological injury, such as a stroke, head injury, aneurysm rupture etc, which produces some degree of brain damage. Brain damage, as you probably know, reduces somebody's functional skills. For example, their ability to drive, fill out a form, operate a drill press, or remember the instructions their boss gave them in the morning that they need to follow through on in the afternoon. The theory behind cognitive retraining and cognitive stimulation is based on the assumption that a damaged brain can re-organize itself through practice. That is, that damaged brain structures may be able to re-organize themselves to form functional units and/or that non-damaged brain structures will learn to "take over" function of the damaged brain structures. Although the theories are more complex than this, I think this represents an adequate summary. The other theoretical orientation is the difference between cognitive retraining and cognitive stimulation. Cognitive <u>stimulation</u> is providing tasks to patients during the phase of "spontaenous recovery." It is well known that after a brain injury, the brain heals itself to some extent automatically. It is felt that providing tasks which the patient can be successful at, and which challenges abilities somewhat, do not overtax his damaged cognitive abilities, help the patient recover functions better. Thus, we assume that a patient who receives this structured cognitive stimulation will recover better and to a higher degree than a patient who does not receive the structured cognitive stimulation. Cognitive <u>retraining</u> on the other hand, is more a matter of the person attaining insight into their problems and learning to compensate for them. A good example is someone who begins to understand that their memory is unreliable for long phone messages and uses a piece of paper to write them down. Cognitive retraining is used to help people adjust to their brain injuries, by helping them increase their functional abilities after the brain has already healed itself as much as it can from a physiological point of view.

There are two basic approaches to cognitive retraining and stimulation. The first approach, suggests that we work directly on the skill itself. For example if one is having difficulty dressing because of some cognitive deficits, then it makes sense to have them practice dressing. An in fact, there is some utility in this approach. A second approach to cognitive retraining and stimulation, is that you work on the splinter skills, or those smaller skills which go together to make up the larger skill. For example: In dressing, one needs to be able to orient his body in space, visually scan the garments, use fine motor coordination to button, and understand the main concept of putting the article of clothing on the appropriate part of the body. Obviously, computers can be used to help in both approaches, but are geared more towards the second approach, working on the splinter skills. Computers are fast becoming a viable adjunct, to what therapists have been doing for many years without computers. Let's ask the question then, "WHY SHOULD WE USE COMPUTERS?" Well, the answer is simple. Computers allow us to present component parts to a larger visual skill. They allow many repetitions or trials without being judgmental, and with the ability to present the stimulus or the information in a precise and measured way. Computers allow us the ability to provide stimulation and information in a graded hierarchy that starts off with fewer cognitive demands and then works it's way up as the brain either compensates or recovers. Computers provide a certain degree of versatility. They can do a variety of different tasks, that involve both language and non-language related skills. Computers can also vary visual stimulation in time and space. This is something that cannot be done with paper and pencil tasks, and so this represents a major contribution of a computer in the area of cognitive retraining/ stimulation.

And finally, the computer allows us a very objective and efficient way of collecting data. This is a most important factor, as we want to make sure that what we are doing is really having some effect. In other words, does the patient really improve in an objective way, rather than just subjectively saying "yes, he seems to have improved."

IN SUMMARY, in recent years, the computer has become a viable tool for cognitive therapists in a rehabilitation setting when working with patients with neurological diseases which have resulted in either permanent or temporary brain damage, We feel, and there is some data to support the assumption, that working with patients in this way, allows them to improve beyond the point that they would automatically and without this structured cognitive stimulation.

Historically, one of the first types of software we used for patient treatment was written for educational purposes with programs on perception, math and language skills. Lynch has documented the use of video games in therapy, however most of these are too high level for neurologicallyinvolved patients, requiring fast reaction time and good dexterity, and do not allow enough flexibility. More rehabilitation centers are learning about public domain software as an inexpensive resource. Many programs are available that cover relevant academic skills and activities for higher level reasoning and problem solving. We have found some commercially available games to be suitable for our higher level patients. The patients so enjoy this type of task that it is used as a reward that they can pursue in their leisure time while also providing valuable practice in problem solving.

Only in the last few years has there been software available that is written specifically for cognitive rehabilitation. Neuropsychologists like Bracy and Gianutsos led the way, with some speech pathologists and occupational therapists following suit. Now there are as least a dozen different packages available that offer programs covering a multitude of cognitive and perceptual areas. These clinicians/ programmers have realized the capability of the computer to be able to focus in on simple, structured tasks, and to also build from one skill to the next. Program developers seem to gradually be getting better at making full use of the computer's abilities (eg. graphics, varying time and space, speech synthesis) while still meeting our treatment goals.

In occupational therapy, we use the computer in a variety of ways for cognitive and perceptual rehabilitation. Like all otner areas of treatment in O.T. we try to always make a direct relationship between the treatment task and what we expect to see functionally. The most basic computer programs we use address deficits in attention and concentration. Obviously if a patient is unable to maintain his attention while putting on a shirt--which can be a highly complex task--then we need to structure the treatment activity at the level where he can succeed.

The most basic programs we have found are Bracy's Foundations Skills package. In the first program (Simple Visual Reaction), the patient responds to a one inch yellow square by depressing the joystick pushbutton. After twenty trials, the average reaction time is given. Another basic program by Gianutsos, called REACT, presents stimuli by rapidly counting numbers at given locations on the computer screen. The patient is told to depress the space bar as soon as he sees the numbers; at that point the count is stopped and his reaction time is given. Another program by Bracy looks at visual scanning. In addition to requiring attention, the patient must track a horizontal line drawn by the computer and respond each time the computer "draws" the line white instead of black. The patient also learns to turn his eyes at the end of the line to look for the beginning of the next line. Many of our CVA patients have the perceptual problem of neglect where they do not attend to stimuli in one half of the visual field. This program appears to be a good training task especially for this problem. It is not uncommon for the patient to need many cues initially, but then as with any other treatment activity, these are gradually reduced. An advantage of this program is that the speed can be controlled allowing us to further grade the activity to the patient's level.

Discrimination is the next level of cognitive skills. Functionally the patient may need to distinguish two shirts by their color.

To find the correct bottle that contains the shampoo in their drawer they need to attend to detail. Starting at a very basic level again, Bracy designed this program, Visual Reaction Differential Response I (VRDRI), which reuires the patient to move the joystick right or left according to the side of the screen where the stimulus was presented. Attention to both visual fields is required, but now the patient must also make a choice with his response. In VRDRII, three large squares are presented that vary in color and the patient indicates when two of them match in color. In Bracy's Line Orientation, the patient matches the angle of a line that is highlighted amongst several rays. In Gianutsos's programs, MATCH, the patient must decide if the shapes are the same or different. Chamoff, an occupational therapist, has written several programs that work on visual discrimination, figure ground, spatial relationships, and scanning. The patient responds in a possibly more concrete manner by using a light pen and directly choosing the answer. Blank templates are also included so additional screens may be created by the therapist.

The next level is organization which includes seriation, sequencing, association, and categorization. One Bracy program looks at sequencing of size. The patient uses the joystick to move from one vertical bar to another to place the bars in order according to their size. One package we use frequently for this area is the Hartley software.

Memory is an area that all clinicians must address since obviously it affects most daily tasks. Most of the cognitive rehabilitation packages include tasks for visual, verbal and auditory memory. It is important to remember that many of the higher level programs inherently require memory skills--to remember directions, a sequence, or rules.

Also used are programs that require integration of many skills. Programs by Sbordonne set up a situation wehre the patient must solve a problem while remembering different conditions and rules. Sometimes we use programs that look at independent living skills. Most of these were originally designed for education. One program by ComputAbility is called Money. The patient reads a paragraph of text and then answers questions. It provides immediate feedback, a definite advantage of the computer, however it relies solely on written material so good reading skills are required.

Still other programs prove to be useful for visual motor skills because of the fine motor movements required to complete the programs. A simplified pinball game, Bracy's Paddleball, allows the use to vary both the speed and the length of the paddle. Eye hand coordination can be practiced as well as developing palmar prehension and rotary movement of individual finger muscles. Patients with apraxia (especially distally) can use joystick moves in rapid succession to complete a maze. To improve bilateral integration, the user controls one game paddle in each hand for Cube-in-a-Box.

Except for patients using some of the higher level programs, in occupational therapy most patients require supervision and often cueing to complete the programs. Rather than having the computer replace the therapist, the therapist still interacts with the patient by providing or supplementing instructions and feedback, and interpreting results. By not having to record performance statistics, the therapist is free to observe the patient's behaviors and analyze deficits.

A study is presently underway at Schwab to investigate the effectiveness of computer assisted therapy for right CVA patients with neglect. Two subjects will be discussed briefly to illustrate their courses of therapy. John G., a 59 year old male with an eight grade education, sustained a right CVA with lesions in the parietal lobe and basal ganglia. In addition to the unilateral neglect, he also had a 30 degree left visual field cut. Severe neglect was found on all paper and pencils tests as well as moderate neglect during the self-care tasks of eating and dressing. He also had problems with attention, memory, and impulsivity, and showed poor insight into these deficits. Rehabilitation for cognitive deficits began by focusing on the attention problem with Bracy's SVR program. Once he was able to complete this program without cues, VRDRI was introduced. Much cueing was needed initially, but gradually he did show improvement and learned to compensate for the visual field loss. At discharge, he still showed some neglect, but it had decreased from moderate to mild on self-care tasks and it had improved significantly on all paper/pencil tasks.

Evelyn W., a 49 year old female with a ninth grade education, sustained an infarct to the right internal capsule. Moderate neglect was found in paper/pencil tasks and during self-care activities. Poor attention and impulsivity were also noted. Initial programs included SVR, VRDRI, and Visual Scanning. Since impulsivity remained a major problem, two programs that require the patient to control the speed of their response were also used with some success. At discharge neglect was no longer found to be a significant problem during self-care and was only a mild problem on paper/pencil tasks.

Traditionally, speech pathologists have facilitated speech and language recovery with the neurologically impaired patient who exhibits a communication disorder. Less traditional, but with increasing frequency, cognitive reorganization has been establishing its place within the domain of the speech pathologist. Characteristic of the head-injured patient, language impairments are secondary to cognitive deficits. Cognitive reorganization may focus on improving attention and concentration, discrimination, organization -- to include categorization, closure, and sequencing, recall, and high level though processes such as convergent and divergent thinking, deductive and inductive reasoning and multi-process reasoning.

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What I have prepared to present to you is a single head-injured patient's computer-assisted therapeutic data using the Cognitive Rehabilitation Software Series. This series was developed to address the variety of organizational deficits which typically result from traumatic brain injury.

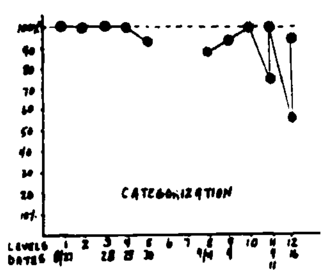
The ability to organize is fundamental in the acquisition of new information, in recall, and in other high level processes, such as problem-solving and reasoning. Effective organization requires the ability to identify compare, and prioritize related characteristics of stimuli. Organization allows the patient to break down incoming stiumation into useable components of information.

The categorization of the Cognitive Rehabilitation Series by Hartley, provides a hierarchy of categorization activities focusing on evaluation of appropriate and inappropriate category members. Simple stated - fits and misfits.

The beginning level consists of simple concrete category inclusion - a right or wrong answer. Example: "Which one is not a boy's name?"

1. Rick
2. Jim
3. Sally

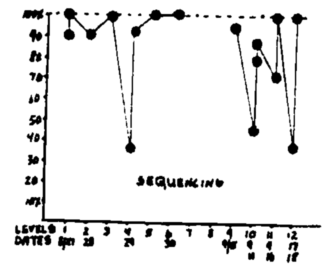
The advanced level requires determination of the abstract relationship between items that would be put in the same category and selection of an additional item that could have some abstract quality. Incorrect answers are followed by hints to give the nature of the relationship. Referring to the graph, labeled, Categorization, the patient demonstrated difficulty with abstract category inclusion (levels 11 and 12). Figure I.



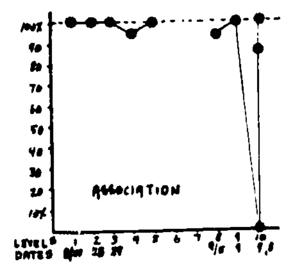
The Sequencing program of the series provides tasks ranging from simple numerical sequencing to verbal sequencing by degrees of meaning, thereby, enhancing the patient's ability to recognize and create logical sequences. Sequencing numbers or letters of the alphabet are at the beginning of the program. The advanced level consists of sequencing descriptive words by their degrees of meaning. Example: "Put in order, least to most or most to least."

1. to drown
2. to drench
3. to sprinkle
4. to water

Referring to the graph, labeled, Sequencing, the patient's performance fell to 33% at level 4 which required sequencing words in alphabetical order up to the fourth letter. While unscrambling words to make a sentence (4-6 words) was manageable (Level 9), the patient initially had difficulty sequencing the steps in a commond daily activity (Level 10), ordering items by their attributes (Level 11), and ordering words by their degrees of meaning (Level 12). Figure II.



The Association program provides a range of association items from simple association to analogous reasoning. The program facilitates the patient's ability to connect information together in a meaningful way, thereby, permitting the patient to tie new information into stored information. This will result in great efficiency in understanding new information. The simple association program presents a single word and requests a word be chosen (given 2 choices) which is related. At the advanced level is analogies. Given a pair of words, the word pain having the same relationship must be found. Looking at the graph labeled, Association, the patient experienced significant difficulty with complex analogies, but was able to grasp the concept quickly with repeated trials. Figure III.



In conclusion, the therapeutic data presented demonstrates the effectiveness of computer-assisted therapy to facilitate a high degree of success, even with initially difficult problems. The assets of computer-assisted therapy for this patient's treatment program were a graded hierarchy of stimuli, accurate, objective and immediate feedback, self competition which increased her motivation and self esteem and her enthusiasm in using the computer. The development of computer software and hardware combinations designed to aid in the process of cognitive reorganization has only recently begun. The elements are being developed to create more complete and comprehensive rehabilitation therapies. As new software packages become available, the capabilities will become increasingly sophisticated, and patients will receive previously unavailable treatment.

THE CHALLENGE AND THE PROMISE OF COMPUTER ACCESS IN THE 21ST CENTURY

Dr. Eydie Sloane

The dawn of a new century is less than 14 years from now. Many of us will see that century; many more of us will live and work in it. And hundreds of thousands of students currently enrolled in our schools will live, work, and recreate most of their lives in the 21st century.

Their daily living tools will comprise an array of complex technologies that will, of course, include computers. But in addition to computers, their lives will be enriched by computers that you and I have yet to see. Those computers will be programmed to use artificial intelligence. And robots, unlike any you and I have any familiarity with, will be in use. These robots will be programmed with artificial intelligence. Telecommunication systems will evolve into networked systems that will be configured to respond in a multi-sensory way. And they will be able to simulate real-life situations through interactive video compact disc. Information will be instantaneous and unlimited. And that is only the beginning.

Those of us who work with special populations have long been users of innovative applications. Years ago, it seems like eons now, we were among the first to see the advantages of cassette recorders, talking books, calculators, learning stations, instructional television, and a myriad number of other innovative teaching and therapeutic devices. Some of these devices are no longer considered innovative. They are a normal part of our daily teaching and working environment. But technology, while it is beginning to show up in more and more classrooms and in therapy, is still not a normal part of our teaching environment. As with other teaching tools, we know that the computer's innovative applications can become integrated and necessary tools in our teaching and in our therapeutic sessions. The computer offers an interactive mode of instruction and learning. Students and clients, and yes, even we eductors, are fascinated by this conglomeration of plastic and metal and silicon and wires and cables. All the little gadgets and devices and thingamajigs and pieces we're not sure how to identify have had an enormous impact on how we go about the business of education and preparing handicapped individuals for life in today's world. What we have to do now, is prepare handicapped individuals for life in tomorrow's world.

In the beginning of the computer era, there were a lot of people who wondered what all the fuss was about. After all, has anyone ever found a computer that can make a really dry martini? As many wonderful things that the computer does, it still, to this day, cannot wash the dog. It cannot get rid of ring around the collar. It can't find your keys. And it continually fails to understand why one should not drink the water in Mexico. Ah, but it does some wonderful things. It provides hours of repetitive drill and practice for the client who needs it. It can give immediate feedback when a student is learning a new concept. It can offer a variety of positive reinforcement for a skill. It can simulate real-life situations. It can test, grade, teach, drill, manage records, and provide hours of leisure time entertainment. It can also manipulate data, simplify the writing and editing of documents, print anything, and in short, do anything you're used to doing with pen and paper, typewriter or calculator. And, it's considerbly faster.

I wrote my doctoral disseration on a computer. I make up tests on the computer. I write letters and speeches on it. I track financial investments on it. I use it to send and receive electronic mail. I design computer workshops with it. I draw pictures and charts and graphs on it. I also use it for mailing lists. It sets my margins, justifies them, corrects my spelling, and reminds me of deadlines. It even sings to me on occasion, I have difficulty remembering what I ever did without it.

I've seen children read for the first time using a computer. I've seen them work math problems way beyond what was though possible for them because pen and paper tests could not diagnose them accurately. I've seen youngsters perform at skills no one taught them before there was a computer in their lives. And I've seen the computer open the world to physically handicapped and blind individuals through voice recognition, voice synthesis and telecommunications.

Today's computers, as we know them in habilitation and rehabilitation, are doing marvelous things for handicapped individuals. Prior to their use, handicapped individuals did not have the access to communicate and function in real-life situations that are now open to them. But the ability of the exceptional person to function in the world of the 21st century will depend, to a great extent, upon their ability to use the technologies of that society as functional daily living tools. The intervention models currently employed with exceptional children and youth were developed to prepare them to enter the society of the industrial age. Those models are no longer appropriate. The world of the 21st century will be the post-industrial society. Properly developed and utilized, future technologies hold the potential to be normalization agents for the exceptional person in school, the home and the community at large. The promise of these technologies will be that computers will be able to aid special populations to overcome physical barriers; they will facilitate communication, and most wonderful of all, they will be able to compensate for biological deficiencies through muscle implants, and subsequently, serve as daily living prosthetic devices.

The technologies of the 21st century will see the common use of robotics, artificial inteligence, interactive communication, and computer simulation. The potential applications of these technologies will impact heavily on education, communication, employment, the field of medicine, and leisure-time activities.

We've all seen guide dogs. We know that they provide blind individuals with guidance, companionship and a meaure of safety. There are hearing dogs as well. Dogs that alert a hearing impaired individual to telephone rings, someone at the door, a baby crying. And dogs pull wheelchairs as well. I've visited hospitals and clinics where monkeys have been trained to feed physically handicapped individuals. They can fetch items and retrieve objects that fall on the floor. And today, there are now technological advances that currently facilitate the daily functioning of many [illegible] individuals. Industrial robotic a[illegible]ing converted for use in the home an[illegible]ace. Robotic arms that fetch, carry [illegible] remove food from the refrigerator a[illegible] microwave ovens, turn dials, feed[illegible], draw, and type. Robots that [illegible] like the ones we saw in Star Wars are [illegible]sted now to work with arthritic clients, [illegible]chair bound clients, to carry and to fetch and to do household chores. Robots will be able to replicate all human senses and interactively communicate with mere humans through voice. And they will come equipped with fiber optics to enhance their fine motor skills.

While robotic use with special populations will include many benefits, there will be barriers as well. The primary technical barrier will not be the development of the senses in robots which replicate that of humans, because these developments are already occuring in research laboratories. The primary barrier to full utilization lies in the state of development of the "mechanical mind" - the microprocessor. Until we develop a functional version of artificial intelligence, and integrate this into our robots, we will not realize the full potential of this technology for special populations. When I speak of artificial intelligence, I am specifically referring to the ability of computer systems to: 1/learn and use languages; 2/interactively communicate with the user in a linguistic system; and 3/solve problems by means of learning from generally given instructions and to learn from past experiences.

The use of robotic trainers, or robotic therapists will permit enhanced physical rehabilitation of the physically handicapped and the adult rehabiliation client. These robots, for example, will be programmed to be expert systems that will monitor a client's responses and modify the client's actions appropriately. I am not suggesting that these robots will replace therapists, but that they will act as intelligent extensions of the therapist.

Other benefits of robotics will include interactive communication interfaces, which will permit all disabled populations to speak with and therefore, command robots. They will be able to do this by means of communicating through their personal or natural inner language systems.

Environmental control in the home and workplace, will be made possible through a system such as the Net Console, which will be possible through the use of intelligent, personally interactive and directed electronic slaves. This will permit even the profoundly physically handicapped to achieve much greater, if not total, independent daily living.

Mobility, both in the home and the community at large, will also be possible through the use of interactive robotic transportation devices. And finally, interactive robotic prosthesis using galvanized skin response or biofeedback controllers will permit the physically disabled to regain control of their bodies.

The challenge can be either an evolution or a revolution. It's our choice. Administrators are being asked to plan programs to prepare special education students to live, work, and recreate in this new society termed the "Information Society." However, administrative planning in both education and business and industry has traditionally focused on historical analysis planning. In such an approach, administrators inspect past trends in order to predict future needs. Unfortunately, this aproach does not permit the administrator to weigh the variables which will impact upon the future. Historical analysis focuses attention upon the problems of the past, rather than upon the solutions of the future.

The development of a plan for the implementation of microcomputer technology for today's special education populations requires an alternative forecasting technique. Technology is growing exponentially. There are three major variables which will affect the life of exceptional individuals in the world of the "Information Society" - advanced technologies, the changing work force, and medical developments.

All futurists project that the 21st century will be a world in which the exceptional individual will have to cope with many changing factors: 1/The information base doubles every 12 months. 2/The majority of the work force will be employed in service, rather than manufacturing jobs. 3/Computer systems will reason, draw conclusions, make judgements, and understand both the written and spoken word. 4/Robots will perform most household chores. 5/Increasingly sophisticated audio and visual technologies may make reading skills decreasingly important.

These technologies will be the daily living tools of the 21st century in the same manner that telephones and automobiles are in the 1980s.

Medical developments, currently in the research stage, will have dramatic impact upon the lives of special populations in the 21st century. The British Royal Society of Medicine predicts that by that date the following will be realized: Anxiety and tension control will be achieved. The Prosthetic heart will be perfected. Mental illness will be successfully treatable. The Artificial womb will be commonly used. A permanent stimulator of intelligence will be found. Aggression control will be achieved. Memory processes will be able to be increased or shortened.

Should these developments be actualized, the very definition of "special populations and special education" may be dramatically altered.

In the area of home services, consider these advances in technology that are already under development, both in the United States and in Japan: Expert parenting systems that monitor children's activities, warn of possible problems, and advise appropriate responses. Story generators and animation packages for creating personalized forms of entertainment and communications. Expert systems for diagnosing problems in the home and providing advice for do-it-yourself repairs. Intelligent control of appliances in response to oral directions. These systems would be prosthetically modifiable for the handicapped, the disaabled, and the aged.
In addition, we will see: Advice on nutrition and interactive medical preventive health care networks. Advice on tax computation, financial planning, budgeting, and legal questions. Expert interactive home work stations. Better systems to aid in identifying, overcoming, or compensating for specific learning or physical disabilities. Expert home librarian systems capable of helping develop strategies for information search and retrieval of data.

A major element of the "Information Age" is the fact that the control and use of data is economic power. Exceptional individuals will have to employ the dynamics of electronic communication in order to compete in this society. They will have to: Use a computer to access data, make decisions, receive information in a usable manner, word process, and solve problems using simulation techniques. Understand how to use information systems to obtain needed information and how to avoid information overload caused by the increasing availability of large amounts of that information. Understand how to deal with society, and its institutions through the use of non-human controlled communication technologies. Understand the similarities and differences between human intelligence and the artificial intelligence of computers.

In addition, if the predictions of futurists come to light, exceptional individuals will also have to cope with these factors: A smaller proportion of the work force will be needed in goods producing industries. A larger proportion of the work force will be needed in service industries. Retraining will be required of all workers in the future. The workers of the future will have to be flexible, continuous, life-long learners.

Are we preparing exceptional individuals for these changes? Are we developing a realistic plan for the future or are we adopting a simplistic vision of a technological utopia? Are we creating a master plan? Are we considering the alternatives of what may happen if we fail to plan? Are we simply going to remain fascinated with these new technologies and allow innovation to just happen?

I believe that most individuals assume that the future is going to be a simple extrapolation of current trends. We want our soothsayers to have an exact vision of the future and not confuse us with a variety of possibilities. But the future is not constant and predictable. There are elements that will determine it. These elements are continuity, change, and choice. Continuity - the future is always influenced by the past and the present. Change - the future is always influenced by unexpected events, those developments that break the continuity of history. Choice - the future is always influenced by the choices that people make when confronted with a new development.

Since our handicapped students will live most of there lives in the 21st century, we have to prepare them for these changes. We must redefine functional skill proficiences to include technological daily living competences. We must help them become functionally and technologically independent. I propose that we develop and implement a new core instructional program that permeats all curriculum areas and is taught at all instructional levels. Technological competenies should include instruction in: The use of computers to overcome physical or sensory obstacles to communication. The use of the computer as a problem solving tool. The prosthetic use of computers, robots and artifical intelligence to compensate for biological deficiences. The recreationaal uses of technology. And the use of technology in ocupational and vocational education.

The ability to use information received from a computer helps handicaped individuals to focus on content rather than on process. It helps them control the rate of presentation. It aids in interpersonal active interactions.

More and more employment opportunities are opening up to the handicapped because they can use word processing, because they can use a VersaBraille, or an electronic Braille Printer, or because they can communicate via telecommunications or eye-tracking devices. Today, we see an increased use of prosthetic devices in the workplace. Common devices in offices are the use of touch sensitive switches, keyguards, and voice activated systems.

Years before I used computers, I used to think that a dedicated word processor was a secretary who stayed after 5 p.m. I have since learned that the practical aplications of technology weren't just for computer programmers or for that matter, clerical staff that keeps my office operating smoothly. I used to think that a degree in computer science and a knowledge of FORTRAN and COBOL were necessary. I have learned differently. I have learned that the practical application of computers is equated by what one hopes to accomplish in the classroom, in rehabilitation, and in the workplace.

When I think of the applications of these devices, I remember Jamie, an autistic child, who learned to talk and to interact with me via the computer. I remember Uncle Aaron, a stroke patient who vegetated for 14 long years until I introduced him to the computer. That computer was the impetus for Uncle Aaron learning how to talk, to word process, to draw pictures with his grandchildren. I remember Joseph - a child thought to be severely retarded, but with the use of a computer, we discovered that the child was performing considerably above his perceived intelligence level. So far above, that after a year on the computer, he was mainstreamed to a program with his chronological peer group. From severely retarded to normalization. And Jimmy, who was so dysarthric, it was assumed he would never be able to communicate. But with a computer, he gets along just fine. And then, there's Rafael, who wants to be an artist. But Rafael has no arms. So, we taught him how to use a mouth probe, and when he gets tired, he transfers a graphics light pen to his toes, and continues drawing. And Dr. Haj, on my staff, blind since infancy - a Ph.D. who told me that he first achieved physical independence when he got his guide-dog, and intellectual independence when he got his computer.

At the IBM plant in San Jose, I saw a computer programmer, dressed in pin stripes, paralyzed from the neck down, laying in a hospital bed, at work on the computer. He was using a robotic probe to enter data into the keyboard. He was actively pursuing his professional occupation. At Hallmark Industries, I watched an artist, with no arms, illustrating Hallmark cards with a light pen between her toes. She was actively pursuing her professional occuaption. Through robotics, through artificial intelligence, through voice recognition systems, through telecommunications, I have seen the prosthetic uses of technology provide necessary access for handicapped individuals. And there will be more. In the not too distant future, miniature protein-based chips will be implanted into muscle tissue so that individuals can walk, and paralyzed arms will regain gross motor skill.

Today, at the University of Miami, there is a project training physically handicapped individuals to use computers for professional employment. Microcomputer Education for Employment of the Disabled trains adults, 18 years of age and older, in information management. Graduates of the program will enter the job market with competitive salaries. Graduates of this program will be prepared to live and work in the 21st century, the "Information Age."

A century ago, fewer than 10% of the American labor force were involved in information work. Today, more than 50% of us are engaged in information related employment. We are moving from a society perceived as a resource-constrained one to one that is information rich. The project at the University of Miami is preparing handicapped individuals to meet new competitive employment requirements because this percentage will increase as we move more deeply into the Information Age.

William Schramm, a communications expert and futurist, points out dramatically the exponential growth of information and the information industries. He says the time span from spoken language to writing was 50 million years; from writing to printing - 50 thousand years; from printing to the development of sight-sound media, which includes photography, the telephone, sound recording, radio, and television - 500 years; from the first of the sight-sound media to the modern computer - less than 50 years.

At Carnegie-Mellon, a new generation of personal computer work stations will emerge 5 to 10 times as powerful as today's machines, with 10 to 20 times as much useful memory and with the advanced graphics capabilities now found only on the most expensive systems, all for the cost of a full-featured personal computer today. This computer is expected to be ready in 1988, only 21 months from today.

In the 1990s, we should see a universal operating system so that all computers will be able to talk to each other and to some degree, share software. Just recently, the major computer manufacturers of this country met to form a consortium to accomplish this very goal. We will also see a computer clock speed of 12 -18 megahertz which is 2-3 times faster than the current IBM PC/AT. The chip will zip along at 4-6 millions of instructions per second. All of this will lead to the inevitable computerization of American society.

Within 20 years, robots will possess human equivalence. That means they will possess the same awareness of their own existence that human beings have. Think about that for a moment. They will have as much intelligence or more than we have. They will have our kind of common sense (this at least, shouldn't give us any worries). And they will also be capable of human emotions. The age of the robot has already begun. I wonder how many of us are emotionally ready for human-like robots? How many of us can foresee the full consequences of another intelligent species sharing our planet? I would guess no one at all. Perhaps, we should begin talking about robots in terms other than costs and productivity.

As the handicapped, the disabled and the aged overcome barriers in society, they inevitably achieve greater environmental control of their lives. They are able to live and work at home with little or no assistance. Their new-found independence, however, may create a new barrier for them. If society cannot see exceptional populations and emotionally react to them, they may very quickly forget about them and their special needs.

Then, the greater their dependency on machines for daily environmental control and mobility, the more susceptible they become to their loss due to machine or power failure. Although this situation is true for everyone using machines, exceptional individuals may be more dependent on robots as prosthetic devices and, therefore, less able to marshall alternative resources.

We are seeing increased evidence of this phenomenon today, particularly with physically and health handicapped adults and with a certain number of our aged citizens. For example, broken wheelchairs and other mobility devices, communication boards, and specially modified automobiles can pose almost insurmountable problems to this population. A non-functional telephone or the loss of power today can cause life threatening situations for them. The more complex the technology, the more likely it will break down. As we move into the technology of the 21st century, these breakdowns begin to resemble human breakdowns. A system failure of life sustaining and daily functioning robots, for example, will be devasting. An intelligent and expert machine cannot help you if it does not work. A singular and utopian vision about the future use of robots with the handicapped is unrealistic and would be extremely self defeating.

I propose that we be neither optimists nor pessimists, but rather realists. Let us direct our attention to the array of alternative implications of robotics and other advancing technologies. In this way, we can use the tools of microtechnology to achieve access for special populations - access that will permit them to live and work productively and socially in the 21st century. This, alone, would remove the word "handicap" from disabilities and improve the lives of exceptional persons in the world of the future - the world that is just 14 years from now.

We're at the dawn of a new century - a century that will be rich in information, complex technologies, and great promise. It will also be filled with challenges we have yet to face. Never before have we had an opportunity to meet those challenges in such a promising way.

Using LOGO and BASIC with Mildly and Moderately Handicapped Children

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Abstract

This paper presents methods used to teach BASIC and LOGO to children who are learning disabled, emotionally disturbed, retarded, autistic and physically handicapped. These programs were chosen because they are easy to learn, yet are powerful tools.

Introduction

Although one finds little evidence to support programming as a learning tool, it has been suggested by many that learning to program does hold some benefits for mildly and moderately handicapped individuals (Horner & Maddux, 1985; Halpern, 1984). One might develop problem solving skills by sharpening one's ability to break tasks down into concise, logical and sequential steps. One might search for "cures" for "bugs" in programs and thus sharpen one's logical thinking skills (Kearsly & Hunter, 1983).

What is LOGO and BASIC?

The programming language LOGO has received the most attention as a problem solving tool. LOGO was developed by Seymour Papert of the Massachusetts Institute of Technology. Based on Piagetian philosophy Papert believes that children do their best learning in the culture. However, in his opinion the American culture does not provide the stimulation to foster exploration of ideas. His solution to this problem is to place children in the fast growing computer culture and teach them to program a computer. Papert believes that computer programming promotes experimentation without the fear of being wrong. From this idea Papert created the programming language, LOGO (Kellam-Scott, 1983).

Almost anyone can begin programming LOGO in a very short time (minutes!). Learners are first introduced to an imaginary turtle which in most versions of LOGO is a triangular shape that appears on the screen of the computer terminal and serves as a graphic cursor. "Turtle geometry" (drawings in LOGO graphics) allows students to draw unlimited types of geometric designs. One of the most interesting features of LOGO is that it provides a learner-driven activity which draws upon the child's previous learning. As the LOGO turtle moves around the screen, children utilize spatial concepts they have learned from moving in their own environment. Children engaged in LOGO problem solving activities can be found moving around the room and "walking" particular geometric designs and pictures. Children work on various spatial concepts and integrate tactile, kinesthetic, motor, visual and sometimes auditory information into the control of the turtle. LOGO has been used by children of all ages and by children who are learning disabled, emotionally disturbed, retarded, autistic and physically handicapped (Goldenberg, 1979). LOGO is easy enough for anyone to use, but powerful enough for any project.

Basic(Basic All-purpose Symbolic Instruction Code) was designed as a modification of FORTRAN for beginners. BASIC was invented in 1963 by John Kemeny and Thomas Kirtz to teach students how to use a computer. In the early days of BASIC, computers were very large and very expensive. With the advent of the microcomputer, BASIC has become the most popular and convenient language of most microcomputers.

By far the most important advance in BASIC was its interactive approach. Users get immediate feedback from typing a line into the computer. Besides interaction BASIC removed some of the more difficult aspects of FORTRAN. Easy problems are very easy to solve in BASIC but hard problems are next to impossible. With the popularity of personal computers, BASIC has been forced into an extended role not because it is easy to use but because it is easy for the computer. BASIC interpreters can be used with 8K byte machines.

Children can learn BASIC with just a few commands. BASIC is structured so that one part of a program branches to another.

Branching can lead to very sophisticated and complicated programs. BASIC was designed to teach computer programming per se.

Teaching LOGO

When teaching mildly and moderately nadicapped students LOGO, I found it imperative to use a variety of presentation modes to introduce a specific concept. Physical activities involving the use of motion, directionality, distance and estimation were used to give students a concrete demonstration of LOGO concepts. Students role-played turtle in the classroom. Obstacle courses were set up in the room and students guided "human turtles" through these obstacles. The turning degrees of left and right were also stimulated by physical activities. Younger students who had difficulty remembering left and right used a red glove for right and a green glove for left. More importantly discussions on the different shapes that the turtle was drawing both before and after the actual activity was extremely valuable to the learning experience. Concrete objects whenever possible were used to teach concepts. Overlays (used over the monitor), posters, flashlights drawing the shapes on the floor, flashcards, color coding the keys, and plenty of displays whether in poster form or on the board to be used with those students with short term memory difficulties. Students were sent home with a short worksheet that reinforced concepts learned in LOGO that day.

We found a number of instructional strategies to be helpful in working with mildly and moderately handicapped students. They included: 1) Allowing students the opportunity to make estimations (e.g. before we type in the line length let's estimate or guess just how long FD 50 is). 2) Provide review daily on concepts learned in previous lessons and concepts learned that day (e.g. how can we combine what we learned yesterday to what we have learned today). 3) Pair computer related technical terms to words students use daily and understand (e.g. Edit mode=teaching mode, Immediate mode="right away mode"). 4) Teacher should demonstrate the procedure first and then discuss concept with student (e.g. the concept of "wrapping" can be demonstrated on the screen first then can be demonstrated using a string that is "wrapped around" the computer monitor). 5) Provide problem solving situations through debugging (e.g. Use a procedure that has a bug and work through the problem together as a group). 6) Insist that students keep a "diary of ideas." Students should first write down their ideas for solving LOGO problems. This encourages students to visualize and organize their idea before attempting to key in their thoughts in a trial and error manner.

Teaching BASIC

When teaching BASIC I found it very helpful to use a method similar to LOGO as mentioned above. Even simple BASIC programs can become very long and complicated. It is important to introduce one small concept at a time ant then to provide a short program that illustrates the concept. Below is a short program that utiles PRINT, VTAB/HTAB, SPEED and FOR-NEXT.

```
5   HOME
10  REM  ROCKET WHICH WILL MOVE O
     FF THE SCREEN
20  VTAB 15
30  HTAB 20: PRINT "^"
40  HTAB 19: PRINT "/ \"
50  HTAB 18: PRINT "/   \"
60  HTAB 17: PRINT "/     \"
70  HTAB 17: PRINT "|     |"
80  HTAB 17: PRINT "|  U  |"
90  HTAB 17: PRINT "|  S  |"
100 HTAB 17: PRINT "|  A  |"
110 HTAB 16: PRINT "/       \"
120 HTAB 15: PRINT "|         |"
125 HTAB 15: PRINT "|  COMET  |"
130 HTAB 15: PRINT "___________"
132 SPEED= 100
135 FOR X = 1 TO 30
140 PRINT "     "
145 NEXT
147 SPEED= 255
```

The program is short and illustrates four concepts. Students can manipulate PRINT, VTAB/HTAB, SPEED, and FOR-NEXT to see what would happen if these concepts were changed.

As programs get longer one might use a grid to aid students who possess handwriting or visual perception difficulties. Sequential order can be taught and reinforced by using activities such as: 1) make a peanut butter sandwich, list each step sequentially and then flow chart your activity. Many students have difficulty logically arranging items in a sequence.

When progressing to low and high resolution graphics one needs to provide each computer with a low resolution and high resolution graphics chart both in transparency form to put over the monitor and in paper form for students to plan graphics pictures. When initially teaching the PLOT command one might put stars or stickers on the monitor and have students light up the square under the corresponding star or sticker under a particular PLOT position. Providing a concrete demonstration or by using an overlay as an aid is most helpful for these students.

Much can be accomplished in teaching LOGO and BASIC without alot of fancy equipment and expensive books. I found that necessity is the mother of invention. The most creative ideas are born out of a lack of materials and the desire to teach effectively.

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INTEGRATING VOCATIONAL REHABILITATION OPERATIONS THROUGH AUTOMATION

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ABSTRACT

This paper addresses the issues involved in automating the total operations of vocational agencies.

Specific issues such as personal versus multi-user systems, integration of software products and technical support are covered.

Computer-based solutions ta[illegible] for vocational rehabilitation are presented in the form of special-purpose database management systems.

Easter Seal Systems' Production-Oriented Payroll (Pops), and Vocational Rehabilitation Client Management systems are reviewed.

Vocational Agencies are beginning to automate their total operations. Most have begun with personal computers according to the Miller 1981 and Vanderheiden 1985 studies.

A personal computer is primarily used for a single task function such as word processing or payroll. Speed of these computers is slow and only one task can be done at any one time. Personal computers are, however, cheap and readily available in local storefronts. A personal computer is a good tool to get your feet wet, and since it can be recycled into your workshop for client use and training on data entry or word processing, it is a good investment.

Most agencies are afraid of making big financial mistakes. A personal computer buys time and experience while the agency does their homework before purchasing larger systems.

Average size vocational agencies outgrow their personal computer within 3 months of its purchase and must therefore keep internal recycling in mind.

Upgrades of hard disk storage to a personal computer will add great costs to initial prices as will attempts to network them (tie 2 or 3 together). Once you are talking 3 PC's, you are better off considering a super micro - multiuser, multitasking system. Multiuser refers to a computer than can have more than one user. Multitasking refers to the computer's ability to handle several tasks at one time. One staff person can be word processing, another doing payroll, while other staff handle accounting and client tracking.

Vocational agencies considering automating full operations must step back and do a full agency needs assessment (automation audit). An automation audit determines your agency's short and long-term automation needs (3 years is long-term in computerization).

In automating your Vocational Rehabilitation agency, you will have to consider using off-the-shelf as well as custom software.

Software is the most important part of automating an agency. You can always find hardware (computers) but if the programs you want won't run on the computer you purchased, you're out of luck.

Almost all computers have office automation software, word processors, spread sheets, and data bases, but very few will adequately run custom vocational software (e.g., client evaluation, tracking, pay and production systems).

Office automation tools, especially word processing, will be the most used tool at your agency.

Making sure basic office automation tools integrate with each other is important. For example, you may want to develop a board report with narrative financial analysis and graphic display of data with an integrated office automation tool. All these can be put in a single report.

Making sure basic office automation tools integrate with the custom software you purchase will assure the power and flexibility you will need in using custom systems effectively. No custom designed software system will fit your operations totally. You have two choices — change your operations to to fit the system or customize the system to fit your operations.

Custom software tools that integrate with off-the-shelf office automation tools will prove very valuable.

Word processing will be the most used tool at your agency. If your system's word processor integrates with your custom software, you're fortunate.

Having basic office automation tools integrate with custom software is also important. When doing budgets, for example, it is really nice to be able to work on an electronic spreadsheet and pass data between General Ledger or to use the word processor in your vocational client tracking system.

Very few custom software systems integrate with off-the-shelf products. Easter Seal Systems, however, has word processors linked to their custom software systems. Our custom software systems are built on the same databases and do about as good a job of integration as any product on the market today.

Aside from looking for software built on databases, because they can be easily maintained, databases offer easier customization to products for your unique needs.

A report generator function is another important tool to look for in your custom software purchase since they allow you to customize your reports to meet your unique agency needs without incurring high customization charges from your consultant.

The major issue in a custom software purchase is how good is the technical support. Be sure you have it. It must be readily available and affordable for you to effectively use vocational software.

Many entrepreneurs have developed Vocational Software systems and sold their systems to other like agencies in most cases to cover their development costs. They are usually not aware of the technical issues. Without technical support, the systems are of little value. Also, these people may not be in business next year. Choose companies with proven track records. Easter Seal Systems builds in the cost of first year technical support in the initial software price to assure successful installation. We also provide toll-free WATS lines to customers and direct modem support when they are stuck.

Immediate help is critical when you are stuck, not a call returned a week later. Easter Seal is the oldest and largest agency directly serving people with disabilities nationwide. We will be around and we know your business.

Two other issues in choosing custom software are customer satisfaction and system documentation. Ask for reference lists of satisfied customers and check those references.

Finally, look at the user friendliness of the system and documentation for the system. Easily understood user guides, technical and tutorial manuals are very revealing in assessing the overall quality of a software product.

Once you have done your homework in learning about what custom software you want, then it's time to look for the hardware.

We find many vocational agencies buying computers because of name brand of (IBM) for price (COMPAC) or because their local store told them the computer they are selling will work for them, fully aware there is no custom software for it. To make sure the vocational custom software you want will run on the computer you need, try to buy your software and hardware from the same place.

The advantage of this becomes apparent once something goes wrong. The hardware vendor blames the software vendor and the software developer claims it's a hardware problem and you sit there confused.

In summary, automating your agency is a difficult task. The field is confusing, the products limited, and the support weak.

Nobody has it all together and if you think quality Vocational Rehabilitation service delivery is getting tougher, wait until you add the challenge of automating. Although at times it's hard to believe, automating your agency can make you more efficient and effective!

Two of our Vocational custom software systems -- Vocational Rehabilitation and POPS, our Production-Oriented Payroll Systems, are tools that you can effectively utilize in buckling down for the Vocational Rehabilitation Management demands we all will be encountering as we move past the 80's and into the future of Vocational Rehabilitation Service Delivery.

- VOCATIONAL REHABILITATION MANAGEMENT SYSTEMS -

MANAGEMENT CHALLENGE:

In some ways, vocational rehabilitation constitutes one of the most difficult challenges in management. As we deal with problems inherent in our highly regulated environment, the margin for management error is diminishing along with the generosity of public funding.

AUTOMATION SOLUTION:

Regulatory and accrediting agencies are requiring that we collect more data, and that it be collected in more refined ways so that it can be properly utilized. The for-profit sector has long realized that this information management requires well-conceived productivity tools.

SPECIAL-PURPOSE DATABASE:

Easter Seal Systems' Vocational Rehabilitation Management System answers key issues that need to be addressed as we move past the 80's. Through special-purpose databases we provide tools that address and solve problems specific to the management challenge of voc rehab.

DEMOGRAPHICS AND OBJECTIVITY:

We provide for the tracking of larger numbers of clients in more detail, measuring human factors objectively. As we know, there is increased need to track demographics within the unique structure of our vocational delivery systems.

ACCREDITING AGENCIES:

Our system includes, but is not limited to, provisions for meeting the requirements for information, reporting, and documentation as described by the CARF standards manual.

FUNDING AGENCIES:

The carefully designed vocational data base addresses the data requirements of state vocational rehabilitation and other funding agencies. As a "byproduct" of your data collection mechanism you should receive service documentation for these agencies. This saves much busy work by your professional staff and relieves your clerical staff of repetitive, error-prone work.

OPEN AND COMPLETE STRUCTURE:

In order to provide meaningful management reports, the data collection mechanism has an open structure that will address all of your vocational programs, ranging from Activity Centers through Work Center and Job Placement Programs. In order to be complete, a vocational rehab system must also track service delivery from referral through discharge, placement, and follow-up.

MARKETING:

The database utilizes demographics to provide the documentation required by funding agencies for new programs and new service delivery directions.

PROGRAM EVALUATION:

This vocational rehab database system addresses program evaluation. Why should you manually collect, analyze, interpret and report on your program objectives when this can easily be handled by a complete computerized system?

INTEGRATION:

Integration with a production-oriented payroll system gives you a complete rehab package that addresses your management needs for both the program and production aspects of your agency.

- WORK CENTER PAYROLLS -

Payroll packages maintain basic compensation and witholding information for each employee. More advanced systems prepare checks, quarterly wage reports, W-2 forms, and track and report payroll tax witholding obligations. An off-the-shelf payroll system is not, however, designed to provide for the unique sub-minimum wage requirements of a work center, activity center or job placement program. In addition to the regular features of a standard payroll package, a well-defined production-oriented payroll system will have the capability of integrating with a program-oriented vocational rehabilitation database management system.

As we are all aware, certain laws allow the payment of sub-minimum wages to certain employees under strictly controlled conditions. In order to maintain certification by the Department of Labor, it is essential that a center have the essential tools necessary to calculate, produce, and document payroll information that meets these regulations. How reassuring it would be if your work center payroll protected you and your agency from inadvertent violations of these federal regulations! The system should also have the flexibility to be easily re-defined to meet local needs and to keep it current with changing laws, regulations, and management philosophy.

A payroll system may be the single most important piece of application software that an agency will buy. In fact, specialized databases are often the "platform" upon which systems are build, and are fast becoming standard equipment of computer systems intended for the rehabilitation environment.

The range and number of database products have grown substantially and will continue to grow. Those who have to select, or approve the selection of a database should, therefore, be familiar with the fundamental concepts and components of a rehabilitation payroll system.

Acquiring the database can be difficult if you attempt to develop your own system. Using an off-the-shelf general purpose database, you must understand and speak the "language", and then must rely on co-workers and/or salespeople to describe the key attributes and key features of the particular products.

You should know what significant trends in the rehab field you should consider. At present, the most important trends include specialized databases that have been designed by rehab professionals - for rehab professionals.

These reduce, or eliminate, your costs of application specification and development. Remember that starting from "scratch", you can expect to invest $ 50,000 to $ 100,000 in these development costs, and with no assurance that you will end up with a product that really meets your needs.

The most advanced of the rehabilitation-specific databases include a multi-user, multi-tasking approach to rehab management. This provides a cost-efficient method of preparing your work center payroll.

The problem with selecting a payroll database is that no single product best suits the needs of every agency. Therefore, when you select a product, you must take time to evaluate your database requirements and to determine the relative strengths and weaknesses of available products.

The next hurdle, therefore, is to evaluate which features are most important to you - given affordable hardware, operating systems, and our rehabilitation applications environment. Typically, work centers look for common benefits from a production-oriented payroll system. Easter Seal Systems' "Pops", was designed to include the following essential elements:

DATA SECURITY:

Your payroll system needs more than just data - it also must have information that limits the use, access, and modification of the data. These kinds of limitations are called integrity constraints. A good database should allow limitations to be placed on who can do what to the database.

PERFORMANCE FEATURES AND ISSUES:

The system must be able to retrieve a record or group of records that meet the specifications you have set forth. Once retrieved, you must have the ability to sort the records as needed, and to automatically produce a pre-defined report based on the information contained in the records you have chosen.

CONFIDENTIALITY:

Payroll records must not be open to access by unauthorized personnel. The program must assure limited access, provide record-locking and password protection at all needed levels.

ACCREDITATION:

The system should provide appropriate documentation for the concerns of the facility's accrediting agency. It should simplify the task of meeting accrediting standards by eliminating much of the manual paper work necessary for compliance.

DEPARTMENT OF LABOR:

The system should provide an efficient means for generating and maintaining information required by the DOL, specifically enforcing compliance with known DOL regulations to protect the facility from the potential liability of non-compliance.

A well-defined system will provide documentation of good production administration in accordance with DOL regulations. It should also document the time spent in service programs and the fairness of cost allocations.

The system must provide for compensation and tracking under regular program, evaluation and training, work activity, and individual certificates issued by the Department of Labor as set forth in the Fair Labor Standards Act.

SERVICE AND SUPPORT:

The single most-valuable asset in an agency's automated system is the service and support from rehab/computer professionals. When you join forces with a rehab systems house such as Easter Seal Systems, you are working with the best in the business!

THE OTHER SIDE OF THE DISK

Ms. Gail Krasnow, Coordinator, (presenter & primary author)
Technology Augmented Learning Center
Dr. Janet M. Floyd, Supervisor
Services for Sensory Impaired

Physical barriers can be easily corrected with ramps, braille signs and labels, interpreters for the deaf, and other such aids. Attitude, on the other hand, is not as curable. In 1947, when the University of Illinois first started their rehabilitation program, attitude problems were a major concern. Because of the poor prevailing attitude across the country towards the disabled, the University adopted the philosophy that any disabled student had the same aspirations, interests, talents, and skills as any nondisabled student, and the difference came in the way things were done or the means of mobility.

From this philosophy grew, what is now known as the Rehabilitation-Education Center at the University of Illinois. At the Center, disabled students have a network of support from counseling services, athletic activities, readers and interpreters for the blind and deaf to computer access with necessary adaptation. It is this network which gives the disabled student the chance to develop skills and reach goals in any and all endeavors of life.

The newly developed computer lab allows access to mainframe and microcomputers. Physical adaptations to keyboards and software adaptations help disabled students learn to program and work on their own, giving them independence and self-satisfaction. The staff in the lab believes that the future holds much potential for research projects which will help the disabled student to use the computer in a career or as an avocation. Some of these projects include various size keyboards and suitable workstations.

To many people ramps, braille signs, and interpreters for the deaf, are all that are needed by a physically disabled individual for survival. This was the prevailing attitude in 1947, and disabled individuals were not generally accepted into Universities or colleges in this country. At the University of Illinois, Tim Nugent realized this was a problem needing immediate attention and began the first rehabilitation education program in a higher education setting. The purpose was two-fold. First, to change poor attitudes which we are still fighting today; and Secondly, to allow young severely physically disabled individuals, with aspirations, talents, and dreams common to all young students, the benefits and experiences of university life.

It was difficult at first, with extremely limited financial support and during the first 17 years, the program was housed in a World War II tarpaper barracks, proving that elaborate facilities were not necessary. The first disabled students attending the University of Illinois did not have the luxuries afforded today, such as curb cuts and wheelchair buses. But they survived. Everyday was a new challenge; how to get everyone to class on time and what to do for physical activity. (Which resulted in establishing wheelchair basketball.) The first tournament was hosted at the University of Illinois with cheerleaders and all. The push for buses which could transport disabled as well as able-bodied people was also starting. Since then, many disabled students have graduated from this University as lawyers, doctors, sportscasters, and professors. The disabled student population has increased from the original 40 students to over 200, including all disabilities, such as spinal chord injury, visual impairment and hearing impairment. An extensive system of supportive services has been developed and is housed in the Rehabilitation-Education Center.

The Rehabilitation-Education Center has been subdivided into seven different support services, physical therapy, medical services, occupational therapy, counseling, services for sensory impaired, recreation and athletics, and transportation.

Physical therapy includes special exercise, instruction in self-care, special functional skills and reeducation on an individually supervised basis. Students can also receive up to four semester hours of physical education credit.

Medical services include medical supervision, physical and medical evaluation, medical consultation and counseling, limited medical treatment. The supervisor of medical services is supported by a full-time registered nurse and board-certified specialists in many medical disciplines.

Occupational therapy includes prosthetics and offers training in vocational skills related to the educational objective of the student, the design and fabrication of adaptive devices to assist the student with the activities of daily living and supportive functional training, and certain elements of routine occupational therapy.

Counseling is geared toward the specific needs of the disabled student with particular emphasis on vocational-education counseling. Also, comprehensive, personal, academic, paramedical, and preadmission counseling are available.

Services for sensory impaired provides education facilitation to severely visually and hearing impaired students. For the visually impaired, instruction in areas such as campus orientation and mobility, braille writing, listening skills, tape transcription, the use of direct readers, tactile aids, evaluation and training with computer equipment and resources, and counseling and rehabilitation for individuals and/or the families are provided. Interpreters for the deaf and special note-taking assistance are available for the hearing impaired.

Through recreation and athletics, disabled students are offered opportunities to get involved in many recreational and sports activities. Basketball, football, tennis, archery, baseball, swimming, and track and field are just a few examples. Many of these activities are offered at the intramural and varsity levels. Those participating in intercollegiate sports at the varsity level are eligible to receive the Varsity I award from the University of Illinois Athletic Association.

Transportation includes four specially engineered buses, used for campus transportation, run on regular schedules and routes making it possible for individuals with physical disabilities, including those in wheelchairs, to come and go independently to classes and other various campus activities. Also, a prosthetic shop is available for students. Shop personnel work closely with and follow the prescriptions of the medical, physical therapy, and occupational therapy supervisors. Personnel also fabricate adaptive devices and maintain a supply of wheelchair and other parts needed for immediate repairs.

These support services are available to all disabled students attending the University. If a university student becomes temporarily disabled, with a sprained ankle for instance, he may then ride buses, use physical therapy, or any other necessary support services. Members of the community are also permitted to use the facilities at the Center. For example, a stroke victim needing physical therapy, an older deaf couple needing interpreting services, or a blind child needing training in orientation and mobility. The Supervisor of Services for Sensory Impaired works with the local school districts, helping teachers teach visually impaired children more effectively. She also oversees the orientation and mobility training.

Sharing our Center with the community serves to move us one step closer to permanently changing the general public's poor attitude towards the disabled. It provides the chance to educate by opening our doors to anyone wanting a tour or other information. A good example of our PR work is the narrated tape you just viewed. It was shown on NBC nationally during half-time of a collegiate basketball game. The more the public knows the easier it will be for students to be accepted their professional careers.

One of the main goals of the Center is to help the students make a smooth transition into careers and functional everyday life. Our services are for support not for dependence. This is difficult for some, as going to college is their first experience away from home. Teaching students to become independent and responsible for their own actions can be a difficult task, each student is so different. One important step in achieving this goal is all university dormitories are being accessible for disabled; and most have modified bathrooms and furniture, but most all have able-bodied roommates. A few students have elected to become a part of our Greek system, joining fraternities or sororities. A living center has been built for severely physically disabled who have the intellectual capabilities and the motivation to pursue a college education, but are unable to live without assistance.

The job world is changing, skills that were important to acquire ten years ago are now obsolete. Much of the necessary knowledge and skills will be learned in classes, however, if a student needs some assistance or an adaptive device it is not always readily available. One area in which this is prevalent is computer science. Computers are being used more and more each day in all fields. Therefore, it is important to have the training and experience in order to be familiar and feel comfortable when using a computer. Many of us do not possess these skills yet, but those just graduating must have them. At the Center we are aware of this fact and have established a working computer lab.

The computer lab has been in operation for a little more than a year and a half. Two graduate student assistants and I staff the lab. I began as a halftime graduate assistant and since receiving a masters in computer science have become full-time computer lab coordinator. I have a bachelor's degree in education and this, coupled with my master, has proven to be an advantageous mixture. With my background, I have the ability to perform a wide variety of tasks. One such task is to patiently and successfully teach the students with limited or no computer knowledge how to use a computer for their needs. Another skill is to help a programming student solve more technical problems which may arise. I have found that having both degrees has helped me work with the people and equipment without hesitation. I am also often called upon to give tours of the lab. The graduate assistants have some computer knowledge and experience. The lab, which has grown too big for its current confines and now undergoing expansion, is equipped with a variety of computer hardware and software. There are two terminals which access any mainframe computer on campus and are generally used for computer programming. The library's computer system is also accessible. We have four micro computers of various makes and models, 2 IBM PC's, an Apple MacIntosh and an Apple IIe. Some of these are equipped with voice synthesizers, large print capabilities, and mouses. One IBM PC is equipped with the VERT voice synthesizer. To use the VERT an extra unit, which can sit on top of the disk drive, must be installed and a software program loaded. This allows the student to change speed, volume, and tone of the voice and move around on the screen, forward or backward, line by line, word by word, or letter by letter. It is compatible with most IBM software.

The other PC is equipped with large print capacity loaded from a disk. With this capability the student can vary the size of the letters from 1/2 inch to 2 inches. It has automatic scrolling, which means the words will move across the screen at a speed chosen by the user. Most of the functions are done using a mouse. This is also compatible with most IBM PC software.

The Apple MacIntosh also has large print capabilities. The student can write a paper and edit it in large print, and change it to standard size print to hand in. It has a drawing program which is mainly controlled by the mouse, allowing some students, who cannot hold a pencil to finally draw.

The Apple IIe is equipped with an ECHO plus voice synthesizer. This voice synthesizer has a smaller hardware unit and, like the VERT, the user must load a program to begin. It can be used with Apple software which has been specifically designed to work with this voice synthesizer.

We always try to keep abreast with new changes in technology and much of our equipment is state-of-the-art. Aside from the usual micros and such, we have four paperless braille writers or VersaBrailles. The original version, the P2C, stores information on 60 minute cassette tapes and has a braille display for both the sighted teacher and the blind user. It allows the user to move around in a file by word, sentence, paragraph, or chapter. The newer version, the VBII stores information on disks. It, also, has a large internal memory allowing the user to store information for a period of time without having to save it to a disk. In addition to the P2C's editing capabilities, the VBII can delete or insert letters, words, sentences, or paragraphs. The printing of boldfaced and underlined characters is also permitted. It is equipped with a braille display for the user and a print display for the sighted teacher. Both VersaBrailles are compact and portable allowing students to carry them to class, to take notes with, write papers on, or do general homework. The student can call up their file, reread it on the braille display or get a braille hardcopy.

Our braille printer, called Ohtsuki,the first of its kind, is a leading product in new technology. Its main features are the ability to print in grade 1 or grade 2 braille, print and braille at the same time, just braille, or just print. This makes it possible for a blind student to work independently. For example, we have a blind PhD student, Becky, writing her dissertation on the computer using the voice synthesizer. She then gets a braille/print copy to take to her advisor for review. Both she and the advisor can read the copy simultaneously, alleviating potential for discrepancy. By using this method Becky is able to write the paper quickly and independently.

Our major goal in the computer lab is fostering independence with computers, whether it means using a word processor, accessing a network for information, or computer programming. Therefore, it is important to find out the computer needs of the students, while helping them plan ahead for their future. If they are in a computer related field, we try to provide as much experience using mainframe and microcomputer equipment as possible. Otherwise we teach various word processing packages to those whose needs are not so technically oriented. We work with each student individually, as their disabilities and computer needs are different, making simple and inexpensive adaptations when possible. This may mean working with the occupational therapist to devise the proper mouthstick or type of keyboard adaptation, or help the student use a switch or joystick.

Some of these adaptations are commercially available, while others have been developed in our lab. One example is program that was written for a student in computer science, Tim. Tim had severe cerebral palsy, was in his last semester, and had never touched a keyboard! Realizing that not many employers are willing to hire two people for one job, one to think and one to type, we created a program to allow him access to the keyboard by using the number pad on the right side of the keyboard. The program emulates the keyboard enabling the student to use any of the keys or functions. He would type in a two to four digit code for each character or key. For example, to type a capital A, the student would type 30, 31 for a B, 32 for a C, etc. By the end of his eight-month training period he was able to do computer programming on his own. He is but one of our many success stories.

CLOTHING FOR INDEPENDENT LIVING

DONNA ALBRECHT
SANDI HABDAS

ABSTRACT

Dr. Albrecht will describe functional fashions for disabled people that make dressing and undressing easier, that are more comfortable, and do not restrict movement. A list of current resources for obtaining a special clothing will be available.

Disabling Condition:

Limited to small motor movements (finger stiffness)

Due to: Arthritis (rheumatoid, osteoarthritis, etc.), gout, Parkinson's disease, multiple sclerosis, cerebral palsy, etc.

These are suggestions for adolescent and adult independent dressers (as opposed to those who need help dressing). Garments can be properly selected or they can be easily adapted.

A. Primary Problem Area: Inability to fasten closures such as buttons and zippers.

*General Clothing Suggestions —

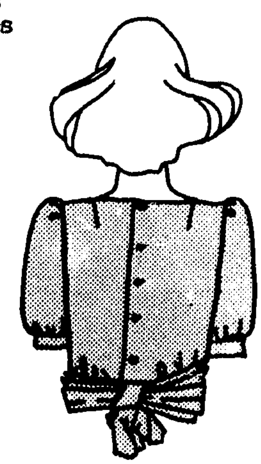
1. Openings: front opening garments, V-necks, styles with wide openings (such as boat neck, elasticized neck or waist, etc.)

2. Closures: large buttons with shanks, button hooks, Velcro replacing buttons, elastic thread on buttoned cuffs, magnetic fasteners, zipper pulls, kempner fastener, easy to reach fasteners.

3. Fabrics: No special considerations.

B. Suggested Garments/Features to Avoid: (for limited small motor dexterity)

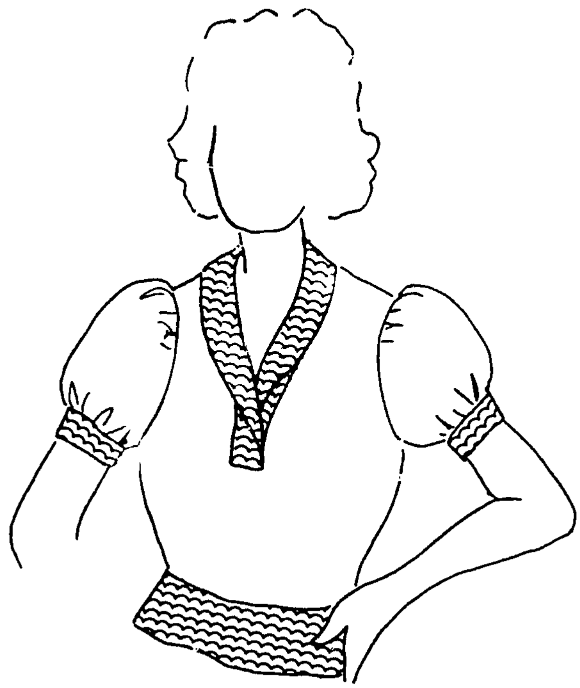
Back closures/openings/ties
Small buttons and buttonholes
Zippers without pulls
Horizontal buttonholes
Small dress hooks
Buttons without shank
Strong snaps



Avoid back closures

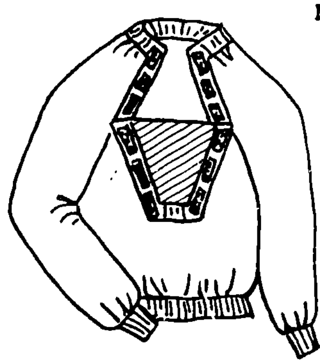
C. <u>Suggested Garments/Features to Select</u>:
(for limited small motor dexterity)

Pull-over garments requiring no fasteners
Tie adaptions
Front openings
Elastic thread on buttoned cuff
Kempner fastener
Large buttons with shanks
Hooks and eyes
Velcro replacing buttons
Zipper pulls
Vertical button holes
Easy on belts

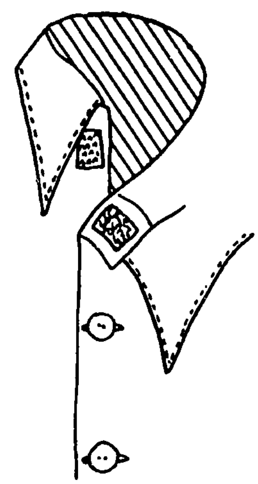


No closures

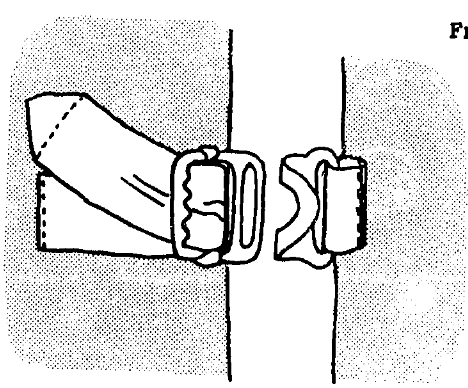
Tie adaptations



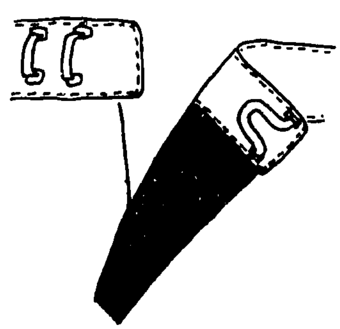
Front closures



Velcro replacing buttons



Kempner fastener

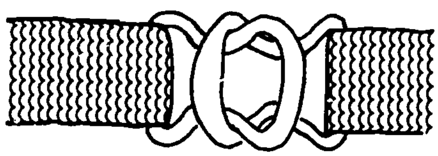


Hooks and eyes

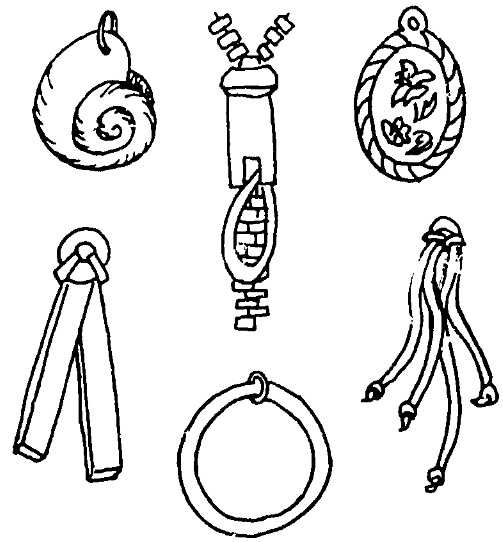
Button with shank

C. <u>Suggested Garments/Features to Select</u> (cont.):
(for limited small motor dexterity)

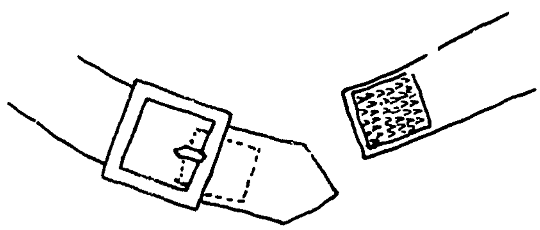
Loops at the end of a seperating zipper
Easy to reach fasteners
Wrapped garments
Elasticized waist
Pants with belt loops (easier to pull on)

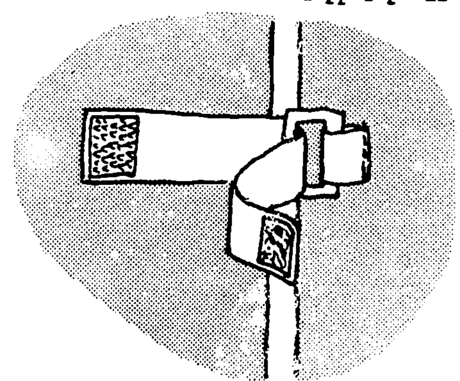


Easy-on belts

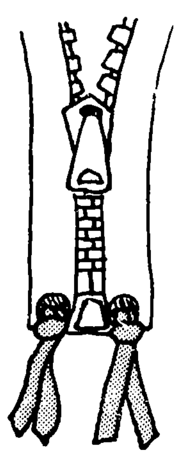


Different zipper pulls

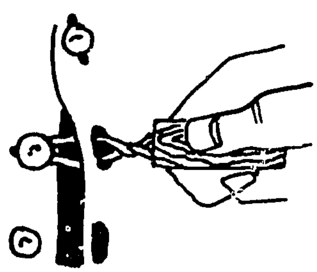




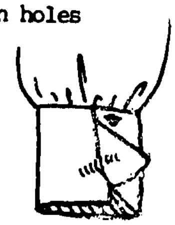
Easy to reach fastener



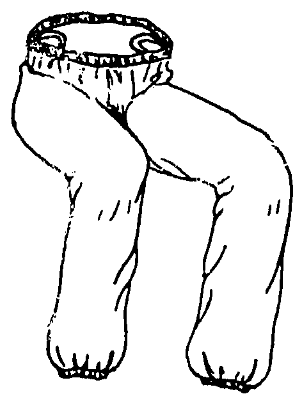
Loops at the end
of a zipper



Vertical button holes



Elastic thread on
a buttoned cuff



Hidden wrist loops

Mail Order Clothing and Devices

AIDS for Easier Living. (n.d.) Comfortably Yours, 52 West Hunter Avenue, Maywood, NJ 07607.

Dressing with PRIDE. (n.d.) 1159 Poquonnock Road, Groton, CT 06340.

Fashionable. (n.d.) 5 Crescent Avenue, Rockly Hill, NJ 08553.

Fashion Collection. (n.d.) M & M Health Care Apparel, 1541 60th Street, Brooklyn, NY 11219.

Functionally Designed Clothing and Aids for Chronically Ill and Disabled. (n.d.) 2239 East 55th Street, Cleveland, OH 44103.

Home Health Care Resource. (n.d.) Sears, Roebuck and Company, 5555 South Archer Avenue Chicago, IL 60638.

National Odd Shoe Exchange (n.d.) Jeanne Sallman, 604 North Jefferson, Indianola. IA 50125

Natural Creations, (n.d.) Kay Caddel, Textile Research Center, Texas Tech University, P.O. Box 5888, Lubbock, TX 79417

On The Rise. (n.d.) Clothing for Special People with Special Needs, 2282 Four Oaks Grange Road, Eugene, OR 97405

Pirca Fashions (n.d.) 901 3rd Avenue, Sacramento, CA 95818

PTL (Put Together with Love) Designs, Inc. (n.d.) Ann Simma, Route 3, Box 745, Perkins, OK 74059

National Odd Shoe Exchange, (n.d.). Jeanne Sallman, 604 North Jefferson, Indianola, IA 50125.

"Natural Creations", Clothing patterns for physically and mentally handicapped. (n.d.) Kay Caddel, Textile Research Center, Texas Tech University, P.O. Box 5888, Lubbock, TX 79417.

Booklets, Pamphlets and Brochures

Clothes for the Physically Handicapped Homemaker. (n.d.)Agricultural Research Service, U.S. Department of Agriculture, Washington, D.C. 20250

Clothes to Fit Your Needs. (n.d.) (For the Physically Limited) (1980) Cooperative Extension Service, Iowa State University, Ames, IA 50011

Clothing for People with Physical Handicaps. (n.d.) North Central Publication No. 101 Contact Extension Office in your County

Clothing for the Handicapped. Self-Care for the Hemiplegic, Sister Kenny Institute, Chicago Avenue at 28th Street, Minneapolis, MN 55404.

Cruzic, Kathleen, (n.d.). Disabled? Yes. Defeated? No. Lubbock, TX: Prentice Hall, Inc.

Hotte, Eleanor, (1979). Self-Help Clothing for Children Who Have Physical Disabilities. National Easter Seal Society, 2023 West Ogden Avenue, Chicago, IL 60612

Books

Bowar, Miriam T., (n.d.) Clothing for the Handicapped: Fashion Adaptations for Adults and Children. Sister Kenny Institute, Publications Department, 800 East 28th Street, Minneapolis, MN 55404

Caddell, Kay, (n.d.) Measurements, Guidelines and Solutions. Route 8, Box 12T2, Lubbock, TX 79407.

Forbes, Gillian, (1971). Clothing for the Handicapped Child. England: The Disabled Living Foundation.

Goldsworthy, Maureen, (1981). Clothes for Disabled People. England: B.T. Batsford Ltd.

Hale, Gloria, Source Book for the Disabled. (n.d.) New York: Paddington Press.

Hoffman, Adeline M., Clothing for the Handicapped, The Aged and Other People with Special Needs. (n.d.) Springfield: [illegible] stone House.

Kernaleguen, Anne P., (1978) Clothing Designs for the Handicapped. Edmonton, Alberta, Canada: University of Alberta Press.

Macartney, Patricia, (1973) Clothes Sense for Handicapped Adults of All Ages. London: Disabled Living Foundation

Mead, Marjorie, (1980) Clothing for People with Physical Handicaps Cooperative Extention Services of IN, IA, KS, MI, MN, MS, NB, ND, OH, SD, WI.

Parrish, H. and E. Nugent, (n.d.). Fit and Flattery for the Over-Fifties. Instructional Materials Laboratory, Univeristy of Missouri-Columbia, 8 Industrial Education Building, Columbia, MO 65201

Ruston, Rosemary, (1979). Dressing for Disabled People: A Manual for Nurses and Others. London: Disabled Living Foundation.

Yep, Jacquelyn, (1980). Clothes to Fit Your Needs (for the physically limited). Iowa State University Cooperative Extension Service, Ames, IA 50011.

Resource Lists

Reich, Naomi, Patricia Otten and Mari Negri Carver, (1979). Clothing for Handicapped People: An Annotated Bibliography and Resource List. University of Arizona, Tucson, Arizona 85721. Updated edition to come out Spring 1985.

Reich, Naomi A., (1980). Information Systems for the Clothing and Daily Living Needs of the Handicapped. University of Arizona Agricultural Experiment Station.

Schwab, Lois O., (1980) Rehabilitation for Independent Living. Washington, D.C.: Women's Committee, President's Committee on Employment of the Handicapped.

INNOVATIVE SOFTWARE FOR COGNITIVE REHABILITATION

PHYLLIS M. CRITER, OTR

Abstract

CREATE is a new series of software for cognitive rehabilitation with emphasis on visual memory, visual-motor integration, orientation, visual discrimination, visuospatial concepts, and visual organization. Accompanying written programs complement rehabilitation efforts offered by therapeutic intervention.

Accepting the concept that enhancement of certain processes leads to overall improvement in cognitive functioning, I have taken the challenge to identify some of these processes, their intervention models, and developed a mode of relaying this information through written materials as well as using the most innovative and versatile modality available, the computer.

CREATE series is the first to offer computer-assisted cognitive retraining exercises as well as corresponding written programs including both evaluation and treatment phases. The advantages are numerous. The computer offers information in a way not humanly possible. Of specific importance when addressing the area of cognitive retraining is its high degree of consistency and ability to offer immediate feedback, store an astronomical amount of data, and provide a hardcopy of results via an accompanying printer. Corresponding written programs are beneficial in that 1) they ensure carry over of previously learned principles via the computer, 2) supplement as home programs for those clients not able to obtain a home computer, and 3) may serve as a clinical treatment modality.

Cost

Programs of this nature currently on the market are scarce and very expensive, mainly due to the advent of specialization in this field and exhaustive efforts necessary to produce these programs. Therefore, an intentional effort has been made to contain the cost of the CREATE programs and service a wider range of potential users.

Equipment

Several programs on the market require specialized equipment, such as adaptive peripherals, which significantly raise the cost of the total purchase. CREATE computer programs necessitate only 3 pieces of hardware; an Apple computer, single disk drive, and color monitor. (Printer is optional) In certain instances, you may need to develop a means of adapting a method by which to input data to accommodate a disability, or you may simply ask for a response from the client and input it yourself.

User Friendly

CREATE programs are user friendly. Treatment programs offer immediate feedback after each response, as well as a "personal touch", inserting the user's name in feedback responses. Realizing repetition is a key factor in learning, all CREATE treatment programs were designed to repeat incorrectly answered trials, not allowing for progression until the user has successfully completed the previous trials.

Graded

CREATE programs offer the user the opportunity to grade treatment exercises in accordance with complexity. Levels have been determined in various programs [illegible] one level to another denoting progress [illegible] ring options.

A demonstration disk and brochure are available upon request

DEVELOPING EFFECTIVE REHABILITATION TRAINING CURRICULUMS IN LIGHT OF CURRENT TECHNOLOGICAL AND SOCIOECONOMIC TRENDS

Christopher A. Smith, M.S., C.V.E., C.W.A.

ABSTRACT: A review of rehabilitation curriculums and teaching methods shows that they are influenced by technological and socioeconomic trends. Current technological and socioeconomic trends indicate that rehabilitation programs must change their training curriculums to remain effective. The trends include: economic constraints and shifts in job trends, advances in medicine and rehabilitation engineering, training curriculum specializations, computerized training programs, and professional certification. These trends will force changes in vocational rehabilitation curriculums. Avenues of change are explored.

On October 5th, 1984, the Stout Vocational Rehabilitation Institute dedicated its new facilities on the campus of the University of Wisconsin-Stout in Menomonie, Wisconsin. The keynote speaker at the dedication said that the students emerging from the new facilities would be well prepared to provide vocational assessment and training for persons with disabling conditions.

In conjunction with the dedication of the new facilities, the Institute sponsored its 9th annual alumni conference with the theme "Dedicated to excellence." The keynote speaker at the conference delivered an address titled "Sometimes I Feel Like a Dinosaur." The speaker did not mean that he "felt as big as a house, slow, green, and scaly," but that even as we dedicated a brand new, model facility, the changing environment in which we prepare students can make us extinct...unless our curriculums continue to evolve as they have over the past two decades by focussing on the task of providing training in marketable skills (Thomas, 1984).

Today I will give you some ideas to consider that, with vision (a necessary sub-theme of this and any conference dealing with technologies), courage, and objectivity, may help keep your training programs off the endangered curriculums list.

Trends effecting curriculum development

I believe there are five primary areas of importance in preparing to deal with the future of rehabilitation curriculums in the many settings in which they are found today.

First, economic constraints and shifts in job trends will necessitate that rehabilitation curriculums place emphasis in [illegible] areas and that we carefully evaluate potential students before entering them in specialized training programs.

Second, we must pay careful attention to advances in medicine and rehabilitation engineering because their runaway fields are changing the needs for training programs and the way that jobs will be performed.

Third, new political and market environments make it imperative that we develop training curriculum specializations and form service networks that link specialty training disciplines toward a common goal.

Fourth, computerized training programs must be examined critically, and carefully integrated into the training process.

Fifth, a new era of professional competence will be demanded where professional certification will be of paramount importance.

Economic Constraints and Shifts in job Trends

Shifts in economy reflecting a general shift from manufacturing to information have major implications for the development of rehabilitation training programs.

Training programs need to place greater emphasis on developing the ability of clients to work with data and people as well as fine motor and attending skills. Instructors are going to need to constantly study the labor market in a quickly changing environment. There will be a constant need for retraining and updating of skills as older skills rapidly become obsolete. New technologies and methods have always created new jobs and eliminated older ones. Change must be seen as a constant.

All this change has actually opened new doors for rehabilitation training programs. One result we are already experiencing is the movement of rehabilitation services from the facility to the community.

Because of the need to get into the community and the current stress on immediate job placement as opposed to helping each person reach their greatest potential, there are two major changes in instructional techniques. First, there is now increased emphasis on job site training (the contemporary "supported employment" program) and sheltered employment within a competitive industry, sometimes called "enclaves." Second, more stress is being placed on instructional activities in the transferable skills area. This means more stress being placed on evaluation specialists to determine the work fields and materials, products, subject matter, and services from the client's job history and relating them to present functional limitations. It is critical that evaluation programs be closely tied to training programs. If curriculums are to be successful, they must carefully match the abilities of students to skills needed in the community (Botterbusch, 1984).

Advances in Medicine and Rehabilitation Engineering

The past several years have brought an avalanche of conferences dealing exclusively with the topics of "computers" or "technologies" in the rehabilitation field. Conference attendees can have no doubts that technological changes will have a profound impact on the lives of those disabled persons who are the beneficiaries of the diverse advances. At least for those clients who receive the benefits of these new technologies, their potentials for job placement and satisfaction will be dramatically changed.

Northwestern University has been working on the implantation of microcircuity in the body to take place of damaged nerves. The Veterans Administration and other research institutions are also attempting the same things, and they have had successes!

Diagnostic tools developed at the Gunderson Clinic in La Crosse, Wisconsin are making possible the identification of nerve abnormalities in spinal cord injured patients who had been previously suspected of malingering because the common diagnostic procedures could not reveal extant problems. These patients are now receiving treatments that would not have been, could not have been, provided.

Computer devices and creative engineering are teaming to develop prosthetic's that increase the work potentials of many. In the mental health field, continuing research leads many medical professionals to suspect that drug therapies can provide as dramatic an impact on individuals exhibiting schizophrenic disorders as lithium did for depressed individuals.

All this must lead rehabilitation training staff to move toward the identification and exploitation, not only of extant skills, but also areas where the use of devices may provide an improvement of vocational potentials.

Specialization

The model of a rehabilitation agency as a broker between the needs of business and the needs of workers who are disabled must be carefully considered.

Rehabilitation vocational training programs must seriously attempt to work in cooperation with community medical agencies, schools, insurance companies, business enterprises, welfare agencies as well as vocational rehabilitation agencies to provide an overall community service.

Many incentives exist for the development of service networks. Networks of agencies can lead to direct labor cost reduction, a reduction of risk, an absorbing of turnover or other personnel costs, the reduction of training costs, the sharing of recruitment costs, the procurement of new markets, and the provision of services in marginal economic areas. Networks are sure to be attractive to funding bodies. And, they can make optimum use of scarce resources (Como, 1984).

Computerized Training Programs

Many computerized instructional systems have been developed to make it possible for educational and human service personnel to provide training in a quick, more cost effective manner to people exhibiting a wide variety of disabling conditions.

Part of this computer revolution is the availability of systems and programs designed to measure and match job related characteristics, such as aptitudes, physical limitations, and interests to specific occupations requiring the identical or similar aptitudes, physical limitations, and interests. Because of their speed, these programs permit the manipulation of variables in ways that were nearly impossible to perform using manual techniques. Additionally, computer assisted instructional programs can help able bodied and seriously disabled persons with their learning tasks.

The decision to purchase a computerized system, whether for assessment, job matching, or instructional support, should be based on a real need to improve service, save time or cut costs. Decisions must be based on the goals of the instructors as related to student outcomes. You <u>must not</u> buy a computerized instructional or assessment system and attempt to <u>fit it</u> in to part of your curriculum. Know your needs. Seek a system that meets those needs (Botterbusch, 1983).

Professional Certification

Instructors in non-public institutional settings are barred from practicing their trade in school systems where a teaching certificate is required for employment.

Physical and work capacity assessments and work hardening programs are growing in popularity among the allied health professionals who feel that traditionally trained vocational instructors and work adjustment specialists do not have the sufficient medical background or training to adequately conduct their services.

Private-for-profit or proprietary rehabilitation instructors often are seen as having their highly specialized forms of rehabilitation at the pinnacle of the professional. In fact, a recent survey of students in university based rehabilitation programs (Fong, 1986) put the private practitioner at the top of their "prestigious rehabilitation professions" list.

It will be important to build credibility for your training curriculums. They must be developed and carried out by instructors whose credentials will not be questioned.

Developing the curriculum

Now lets change our focus to the development of curriculums themselves.

Curriculums need to develop in a planned and orderly fashion if the implications of the above trends are to be incorporated into them. Seven steps are involved:

1. Do a marketing audit.
2. Determine specialty areas on the basis of the marketing study.
3. Conduct needs analysis in your specialty fields.
4. Create the curriculum with attention to technological and socioeconomic factors.
5. Certify your instructors.
6. Promote your services.
7. Thoroughly evaluate your students before entering them into the curriculum studies.

Do a marketing audit

Lewis Thomas in The Medusa and the Snail commented that "If you want to fix something you are first obligated to understand, in detail, the whole system." Changes in part of an instructional system will most certainly affect other parts in unforeseen ways. Just as a physician will certainly check his patient's whole system before venturing a diagnosis of the possible causes of the manifest symptoms, you must examine your entire internal and external marketing environment in order to plan new curriculums (Smith, 1985).

Your marketing review should give your organization a pretty good look at the present rehabilitation instructional system within your community. Be sure to consider your organizations sources of referrals, the clients who will be entering your programs, your competitors, and your general operating environment. It is important to know your internal strengths and weaknesses and the instructional needs of your community's job market.

Determine Specialty areas on the basis of marketing analysis

Using the market study you can choose some specialty areas. Facility researcher, Thomas Czerlinsky found that facilities had basically two approaches to specialization open to them. With an overall average of 51% of the clients his study of facilities having a primary diagnosis of mental retardation, these facilities may choose to sharpen their marketing strategies with their existing clientele, by expanding the scope of their services to mentally retarded clients as a primary specialty area. Or they could broaden their service base to provide instructional services for other disability populations that have training needs closely allied to the services provided to mentally retarded persons. The most successful strategies will probably incorporate elements of both approaches. Training programs, therefore, can specialize both their instructional services and their services populations.

Conduct a Needs Assessment.

Needs assessment is the identification and validation of needs and establishment of need priorities. An assessment can cover the entire instructional spectrum or be confined to one specific area. Whatever the scope of an assessment, there are two steps in determining needs: problem identification and competency modeling.

The emphasis of needs assessment for developing training programs depends upon how well established your training program is. New programs may use competency modeling exclusively. Existing programs will need to discover gaps (or differences) between the desired level of competent performance and present behavior. In either case, needs assessment starts with the determination of competent performance. An examination of community performance objectives within your target areas and of the average degree of competency likely within your entering students to carry out those objectives will define the areas in which the training program will be developed.

Needs assessments must also provide data on future performance needs. New skills should be integrated into the assessment information. This data may take the form of known technologies effecting the jobs, changing quantity and quality standards, or the provision of new services.

After collecting information about desired work performance, it is necessary to compare this desired performance with the actual performance of people in their jobs. Job analysis is the primary source of actual performance data. The data resulting from the comparison of job analysis and the desired performance are used to determine the objectives, content, sequence, emphasis, and means of conducting and evaluating training programs.

Effective curriculum development moves from the determination that training is needed, to curriculum development and implementation, to evaluation and redevelopment. New programs are developed on the basis of evaluation data and the periodic gathering of training need data. A cyclical training path results to serve curriculum needs for many years.

Create the curriculum with attention to technological and socio economic factors.

Today's vocational curriculums must provide training for transferable skills, with limited numbers of instructors to conduct training, shortened training times, and lowered overall operating costs. Drawn from those needs a nine step process to lead in the development of rehabilitation curriculums is shown below:

1. Select training objectives using data from your market specialty.
2. Write performance objectives using technologically sound techniques.
3. Set course prerequisites in terms that do not preclude the use of adaptive aids.
4. Select and sequence course content.
5. Construct competency tests.
6. Select an instructional method with an emphasis on the use of computers and other technologically innovative techniques.
7. Determine instructor requirements paying attention to t[illegible] credentials and technological knowledge.
8. Select and prepare training aids.
9. Determine equipment requirements.

These steps proceed through a logical sequence to arrive at the creation of an instructional program.

Paramount in the creation of the program is an initial review of state of the art technology. This may need to be an initial step in all of the training programs that you prepare and could be a mandatory step in the evaluation of potential clients.

Certify your instructors.

The Commission on Certification of Work Adjustment and Vocational Evaluation Specialists (CCWAVES) was formed in 1981 to address the issue of certification of professional trainers and evaluators.

The intent of the CCWAVES certification process is to recognize the professional qualifications of specialists who will work in a variety of settings, schools, rehabilitation facilities, manpower programs, and many others. The commission is composed of representatives of eight organizations, and will help insure that specialists can be recognized in many disciplines (Peterson, 1984).

Certification will give your program a tool to use in promoting services as well as helping you insure that your programs are being prepared and carried out by competent instructors.

Promote your services.

An instructional program is only useful if it does what enough people want it to do. You must gain referrals and then provide the training that people want.

Know your instructional product and make sure that those people who can make referrals to your program know that it exists and know that it is good and cost effective. Part of this process has been completed in the development of marketing plans. You know what is desired and you have created a curriculum around those needs. Now: decide how to package the program to the potential referral sources, identify others who will support you, make a pitch to the sources using all strengths at your disposal, and be flexible.

Thoroughly evaluate your students before entering them into the curriculum studies.

"Vocational evaluation is a comprehensive process that utilizes work, real or simulated, as the focal point for assessment and... counseling to assist individuals in vocational development. Vocational evaluation incorporates medical, psychological, social, vocational, educational, cultural, and economic data to assist in the attainment of the goals of the evaluative process." (Pruitt, 1977, p. 3).

Four major assessment techniques are presently in use. Psychological testing, work samples, situational assessment, and job site evaluation.

A fifth evaluation must now be applied to the assessment of individual aptitudes and functional abilities. This is an evaluation of potential adaptive aids, communicative devises, and other technologically advanced products that may increase the functioning abilities of potential trainees. Because this area is rapidly expanding, many new programs and data bases are being develop to provide information to potential users. Recognizing the need to bridge the gap between the professional engineer and the professional rehabilitationist, Stout created one of the first undergraduate degree programs in rehabilitation engineering technology one year ago. The graduates of this new program will work with evaluators, training instructors, and engineers to create expanded opportunities for potential students who have disabling conditions.

Characteristics of effective curriculums

Most commercially available curriculums will have to be modified to be useful in today's dynamic state. At any rate, they will need to be flexible.

To be useful, a training curriculum must be fully developed with at least three elements:

(1) The curriculum must have set procedures that allow inexperienced instcuctors to train without needing to develop materials.
(2) The curriculum must be based on solid job analysis data that is relevant in today's technologically oriented work environment.
(3) The curriculum must allow you to train for both knowledge and skill.

Procedure based curriculums allow the novice or experienced instructor to quickly prepare lessons for their clients. Modifications of the training procedures can still be made to suit individual facility and instructor needs.

Instruction should be developed in logical task sequence so that each step can aid in the learning of the next step. Your target clients (as determined through your initial marketing efforts) will dictate the stress you put on this curriculum feature.

The first part of your teaching task will be to present knowledge of job performance. The second part is to insure that performance meets acceptable quality and work pace standards. Your curriculum must be based on standards reported as the minimum acceptable score that the client may receive on a test of knowledge or performance and still be said to have exhibited adequate skill and knowledge to perform the job by community standards.

Summary

Making changes will take courage. Courage to know where the field is going and to boldly strike out to provide exemplary services. Courage also to seek the trends you will need to be brutally frank with your abilities and positions.

The simple solutions and strategies to the creation of rehabilitation curriculums will likely be the most successful. Use as your criteria: "Will this change enhance our ability to effectively place people in jobs?"

Finally, you must be market centered. That means looking for curriculum gaps that will meet existing desires. Today's curriculum planners must not be content to ride the waves. They must scan the horizon for areas of need not yet addressed: ...or they may be part of a historical review tomorrow (Ries, 1981).

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CHOOSING APPROPRIATE INPUT MODE/DEVICE FOR THE PEDIATRIC CLIENT

SADAKO VARGAS, M. A., O. T. R.

ABSTRACT

Many handicapped children now have access to electronic devices using adaptive input systems such as special switches. The successful use of technical devices depends largely upon the appropriate selection of the device and input modes. Key considerations in selecting appropriate devices and input modes for the pediatric client and discussion of commonly used input modes and computer input methods will be presented.

Recent advances in rehabilitation technology have made many electronic devices available, offering severely handicapped children new experiences to actively manipulate environment to play, learn, communicate and to perform functional tasks. However, the success in the use of these devices depends largely on the appropriate selection of available devices and input modes from the vast collection of the devices. In choosing appropriate devices to meet the child's specific needs, various factors should be considered.

Identification of the Purpose (Treatment Media vs. Functional Aids)

Treatment Media

Technical devices can be used in a variety of ways in treatment intervention. The approach for choosing a device is exactly the same for choosing any other treatment methods or tools. The specific objectives of the treatment should be determined and the features of the device related to the objectives should be identified. Most technical devices, from simple toys to computers, are particularly helpful tools for developing perceptual and cognitive skills. By appropriate choice and placement of switches and keys, those devices can also be used to train specific movement. It should be remembered, however, that none of these devices provide sufficient sensori-motor inputs which a child needs for the child's development.

Functional Aid

The purpose of a functional aid is to help a child achieve maximum independence in the performance of a certain task. The focus here is on the performance outcome. The effect of the use of the device, and consequently enhanced independence, should favorably influence the total development processes of the child.

Evaluation Processes in Choosing Appropriate Functional Device & Input Modes

Evaluation should be an interdisciplinary process in which all those involved in the child's rehabilitation, education, and health care should participate, including the family and the child himself.

A. Assess the child's need for a functional device. The child's total needs should be examined and prioritiezed, including feasibility for successful use of the device. Indicated in this process are the child's cognitive readiness, family involvement, funding, and training programs.

B. Investigate different situations in which the child may need the particular functional device. Different devices or input modes may be necessary for different positions or situations (i.e., computer access with a head pointer when sitting, and with a voice recognition system when lying in bed).
C. Examine child's posture. Correct posture enhances functional movements, facilitates the most normal muscle tone possible, and prevents deformity. The evaluation process should not continue until the child is provided with the correct postural support, if indicated.
D. Determine functional movement to be used. The movement used to activate the device should be:

1. easiest for the child to use.
2. should not induce undesirable postural or movement patterns.

Considerations are:

a) child's motor control: reaching range, strength, consistency, accuracy, speed, and ability to sustain movements.
b) undesirable movement patterns: movement overflow, involuntary movements, poor posture during movements.
c) need for adaptation, external support or stabilization.

3. Child's percepto/cognitive skills.

a) somato-sensory systems (movement and/or tactual awareness).
b) visual/auditory acuity and perception.
c) cognitive language skills development.

4. Child's and family's preference.

E. Investigate different input devices and determine input system appropriate to the child's function and needs.

Different Input Methods & Devices

Direct vs. Indirect Selection

Direct selection method allows the child to access a device directly, such as using a computer through keyboard entry. In direct selection mode, one switch or key activates one function only.

Indirect selection method allows the child to have access to many functions through a limited number of switches.

Direct method is usually preferred because it is simpler, faster, and makes less demands of percepto/cognitive functions. Indirect selection method is usually more difficult to use, is slower and more complicated than the direct method. Therefore, indirect selection is usually chosen when direct selection is not possible due to the child's limited motor control. In using direct selection method, a child needs to have sufficient reaching range and accuracy of movement.

The advantage of using indirect selection is that the motor demand is minimal. A single switch can be used in this method, and any controlled movement can activate it. There are numerous switches which any part of the body can activate.

There are two common methods of indirect selection: scanning and encoding. Scanning allows a child to choose many different items or functions by the use of a single switch. In the encoding system, certain tasks, or words, or phrases are represented by codes (i.e., Handivoice communicator). Encoding method is usually faster to perform, but demands sufficient cognitive abilities to understand and remember the system. A child may need to use a headpointer, mouth stick or pointer splint for switch access. Need for additional assistance in donning, removing, and frequent adjustment should also be taken into consideration.

Description of Switches

Push Switch/Touch Switch

They both come in different sizes, styles and feedback features. Push switches offer stronger feedback features than touch switches as they have varied degrees of resistance and an audible "click"as feedback. Touch switches have minimal resistance and they are appropriate for those with limited reach and strength but with adequate touch and movement sensations. The surface of both switches can be covered by different textures if indicated. They are both easily mounted.

Pneumatic Switches

Sip & Puff: requires adequate oral and breath control. It is not appropriate for a child with drooling problems. The tube should be placed so that saliva does not enter the unit. Sanitary precaution should be taken. There may be an auditory feedback.

Cushion Switch: Due to soft texture, it is usually well tolerated around facial areas. Also safe to be used in bed. Has audible feedback. Resistance is usually minimal.

Grip Switch: the gripping action may increase abnormal flexion postures. This may be used with a delay module to encourage grasp/release movements. It can be activated also by bending in any direction. The texture is soft and easily tolerated. Audible feedback may be present. Resistance is minimal.

Wobble Switch

It can be activated by deflection in any direction. Deflection distance varies. Resistance is minimal. Sound feedback is usually absent. For activation of a computer, it may cause repeated input due to rebounding. Involuntary movement can accidentally trigger the switch. Appropriate for early introduction of a switch for a child with poor motor control. Can be mounted on a flexible tubing or microphone stand.

Leaf Switch

Resistance is minimal. It is activated by bending in two directions. It can be used by taping it across joints (i.e., elbow, wrist or fingers) and bending it with the joint movements. Feedback is minimal.

Sound/Voice Activating Switch:

It may pick up other environmental sound. It requires ease of vocalization or sound making. By placing it on the table top, it can be activated by tapping or hitting on the table surface, thus providing the child with a very large "switch" surface. Useful for training vocalization. Unintended body movement may trigger the switch.

Eyebrow Wrinkle Switch:

It requires fine isolated movement control. Sound feedback present. It may be used on any other part of the body. It may be activated accidently by facial movements. May require frequent readjustment during use. Usually not appropriate for young children.

Eye Blink Switch:

It is usually mounted on eye glasses. It blocks the view and often is not well tolerated. Reflexive eye blinking may be picked up, causing erroneous inputs. Feedback is absent. Not appropriate for young children.

Joy Stick

They come in various styles and sizes. Generally, there is no direct feedback. Chin controllled joy sticks require good neck and head control. Often not tolerated due to poor cosmetic appearance.

Arm Slot Switch

Often used for a child with marked involuntary movement. There is no differentiation of feedback feature of each different switch and adequate somatosensory processing may be necessary for successful use.

Some of these switches can be easily fabricated.

Use of Interfacing Modules

Push On - Push Off Module:

When connected between switch plug and toy, will alternately turn device on or off each time switch closure is made. It is useful when a child is unable to sustain switch closure.

Timer Module:

This will activate device for an adjustable, presetable time. It is useful in encouraging repeated active movements.

Counter Module:

This counts the number of switch closures made. May be useful for assesment.

Computer Access

One Switch Input Method:

Any of the switches can be used as an input to a computer. The switch can be plugged into an adapted game paddle, to game IO, or joy stick port via switch interface. For Apple IIe, it can be connected to the IO of the Adaptive Firmware Card.

A single switch input can be used with:

Software for Single Switch Use

The major disadvantage is that there is a very limited number of software available for young children who use single switch input. For school age children, there are some more programs which use scanning methods.

Instead of a single switch, an entire keyboard may be used as a switch, using programs with "any key" or "space bar" inputs. The keyboard covered with a sheet of cardboard will act as a single switch.

Use of Adaptive Firmware Card (Apple IIe)

Adaptive firmware cards offer different modes of scanning. The speed can be altered. Keyboard characters are displayed under the screen in 40 column size letters and can be used with most of the commercially available software. Scanning can be custom made using only those letters used in the specific programs. Adaptive firmware cards can also offer assisted keyboard modes and expanded keyboard modes. It can slow down games.

Use of External Keyboard Emulator (i.e. [illegible] Talker, Express III, Tetra Scan, Zygo 100)

If a child needs or already owns such a communication device, it can be used as an emulator.

Devices to Assist Direct Access

Expanded Keyboard

The keys are usually about one inch in diameter. The keyboard can easily be placed in the desired position. This is a true keyboard substitute and can operate standard software on the computer. The Unicorn Expanded Keyboard is plugged into Adaptive Firmware Card. Sufficient reaching range is necessary.

Remote Keyboard

Advantage is that it accomodates well to any position.

Keyguard

The keyguard assists the child with poor accuracy control. The guard provides a stabilizing surface for the hand and also prevents accidental input. Most of the keyboards have a latching feature which enables a one finger typist to use "shift" and "control" functions.

Adaptive Firmware Card (Assistive Keyboard Mode)

"Shift" and "Control" functions can be performed by single key input. Also, the repeat function can be disabled to prevent erroneously repeated inputs which occur when a child is not able to release the key rapidly.

Voice Entry System

It requires consistent speech patterns which is often difficult for a child, as change in position, fatigue, emotional states, etc., can all alter the speech pattern.

Head Pointer (headwand & chinwand)

Good head control is necessary for successful use. The advantage of the chinwand is that the pointer is not in the visual field. It requires assistance in donning, removing and adjusting. It is often not preferred because of weight and discomfort, and poor cosmetic appearance.

Optical Head Pointer

Use is more difficult than the head pointer as it does not give feedback of actually touching the surface. It can reach a larger area than the head pointer.

Mouth Sticks

The advantage is that it can be readily accessed and removed independently. It requires good oral motor control and interferes with speech and swallowing functions. Usually recommended for a short duration, i.e., use of the telephone. For young children, consultation with the dentist is recommended before determining the use of the mouth stick.

Splint, Pointers, etc.

They are usually custom made. Extra assistance in donning and removing is necessary.

Easels

Placing a keyboard on an easel provides easy viewing of the keys.

Arm Support

Use of arm slings, mobile arm support or an arm support bar may aid those children who are not able to maintain arms at the height of the keyboard.

SUMMARY

In order to choose appropriate technical device for the child, a careful evaluation of the child's needs and funtions, as well as an analysis of the technical analysis of the technical device are necessary. The total approach should be a team process with the focus on the child's developmental needs.

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COMMUNICATE to EDUCATE

John J Joseph

Abstract

This paper discusses some of the potential classroom computers can offer nonverbal students and their teachers.

There is no "new" material here. All teachers must work to establish interaction with their students. When the students are unable to speak, the difficulty of this task is compounded. This is a reminder to professional educators that critically important solutions may be available through microcomputer systems.

"Communicator: ...one who participates"
(Webster's New World Dictionary)

Communication--participation--is prerequisite to learning and learning is essential to personal growth. Teachers of disabled persons must often bridge communication gaps before teaching can begin. This paper will discuss some obvious steps on the road to communicating with nonverbal students.

A Simplistic Learning Model

Learning takes place through participation. A teacher presents a task or concept. Students consider the material, digest it, work with it, and demonstrate their understanding. When students convince the teacher they have mastered a concept, s/he moves on to a next, more complex task or concept.

As a model for learning, the preceding paragraph oversimplifies a complex process, but it does describe what occurs in many classrooms. Essentially, the simplified model presents two, interwoven concepts. First, learning is a building block process--progressively more advanced topics build on previously mastered concepts. Second, student communication of understanding is prerequisite to advancement.

The Role of Communication

Communication clearly impacts the learning process, especially when students lack the ability to communicate fluently. Time spent establishing communication is time spent away from central learning tasks. The reverse is also true. Improving communication frees more time for teaching/learning activities and enhances learning. When there are nonverbal students in a classroom, establishing two-way communication is prerequisite to teaching and learning.

The Impact of Disability

Each nonverbal student is an individual. There is no single approach to communication that will work in all cases. Still, learning cannot procede faster than the ability to communicate. In other words, the speed of communication can dictate the progress of learning.

Augmentative communication devices may satisfy interaction needs within the classroom. While it may be desirable for each nonverbal person to have his or her own personal communication device, that may not be possible. Nor is it practical to propose that public schools provide a separate device for each speech- disabled student. Computers are versatile and can provide a viable basis for augmentative classroom communication. Computers are adaptable--serving the needs of all students, from disabled to gifted.

Augmentative Communication

Nonverbal students, with fine motor control ability, can access speech synthesizers and printers through a computer keyboard.

If a speech disability is compounded by lack of fine motor control, the keyboard loses its viability as an input medium. Other tools may be used to replace the keyboard: single switches, game paddles, joy sticks, and pressure sensitive tablets serve different levels of disability. Each tool is appropriate to a particular level of fine motor control disability. Input devices that use pressure sensitive tablets (touch pads) offer great adaptability and potential for teachers and students.

Because abilities and needs differ, teachers must be able to adjust students' communication tools to accommodate varying levels. Here, the versatility offered by classroom computers can be a powerful asset.

A Computer System

Generally, an entire, integrated system (computer, peripheral hardware, and software) is required to satisfy a teacher's needs. A successful, augmentative classroom computer system will have two, distinct parts. The most visible portion consists of the system as used by a student: an input medium and the resulting oral or printed communication. Less visible, but critically important, is the system segment used by the teacher to create the student communication application. Often called an "authoring system," it allows a teacher to create customized applications that meet specific student needs.

An Example

One such system, based on Control Without Keyboards (CWK) software, uses an Apple II+ or IIe computer, an Echo II or Echo + speech synthesizer, a Chalk Board touch pad, and an Epson 80-column printer. The teacher specifies the layout and content of the touch pad. It is 12 by 12 inches square, and can be divided into "keys" of varying sizes, to suit a student's dexterity. Each key contains a letter, number, special character, word, or short phrase. Working from a template plan, the teacher defines the keys on a plastic overlay which will be attached to the tablet. S/he then defines the synthesized speech the computer will produce when the keys are touched. When the two definitions are complete, the system is ready for use.

A student uses only the pad and the computer monitor. When the pad is touched, the results (letter, number, or phrase) are displayed on the monitor. Another touch on the pad directs computer output to the speech synthesizer, the printer, or to a diskette for storage. Students can communicate directly or store responses for later recall and review.

The Result

Technically, students are using computer-based, augmentative electronic communication, prepared by a teacher, using an authoring system. In practice, technical terms have little meaning, especially to a student who has become "one who participates" for the first time.

ADAPTING AN INFORMATION DESK JOB SETTING FOR THE VISUALLY-IMPAIRED

RANDY G. BLACK

Abstract

The four major topic areas to be discussed in my paper are listed below. Because their areas are so intertwined, however, I want to note that no attempt has been made to formally segregate these topics in this paper.

1. Special adaptive equipment needed at the job site. The primary focus of discussion will be the Total Talk Personal Computer manufactured by Maryland Computer Services, Inc. It is the most expensive and important piece of equipment used in this office. How it's used and why we chose to purchase a talking terminal rather than a braille output device will be analyzed.

2. How to set up a filing system for effective retrieval of necessary information. The Total Talk utilizes two types of filing systems. I'll discuss the advantages and limitations of each.

3. Modification of existing office equipment. I'll discuss changes made in our telephone system and the Braille labeling of certain key office areas. These modifications aren't very expensive but they are essential for handling this kind of job effectively.

4. When hiring a visually-impaired person, it's essential to know where to look for specialized equipment. I'll discuss some of the resources we've used to help us achieve that goal.

Before discussing how I've adapted the Information Specialist position, I ought to tell you that I wasn't the first person to hold down this job. Gordon Haas, also visually-impaired, was the supervisor of the Registrar's Information Desk from 1973-1980. He required minimal adaptation. He had a well above average memory and because of that, he chose to keep few records, either in Braille or on tape.

There were two major adaptations made for him. The first was the installation of a buzzer on the information desk itself. It was designed to solve one of the most common problems we have in handling this kind of position: knowing when someone wants help. Theoretically, a person needing information would push the buzzer when they came to the desk. This would tell Gordon that someone needed assistance. Unfortunately, what usually happened was that people put their backpack or books on top of the buzzer whether they needed assistance or not. They would then wonder why the buzzer was buzzing at them. The buzzer is still installed, but until recently, I have chosen not to use it. But because I'm going to be spending much more of my time setting up office files with my new Talking Terminal, I'm hoping that the sign, "Please buzz for service," will tell people to push the buzzer when they need help. If this works, it will mean that I won't have to spend as much time sitting by the desk waiting for people to come by who need help. If that doesn't work, I'll go back to the ways I've used in the past to determine when people need assistance. I'll discuss those techniques a little later in this presentation.

The other adaptation that was made for Gordon was on our telephone system. We have three incoming phone lines to our office. Since he couldn't see any light, the only way to tell the lines apart was to modify their rings audially. This was done by putting different amounts of scotch tape around each of the bells underneath the desk where the phone box was located. Thus, each line sounds differently.

Aside from those changes, he found that little adaptation at the job site was needed. But I didn't know that. When I came to work for my first day on the job in March of 1981, I was assuming that there would be written lists of names and addresses, loads of phone number lists, and cabinets with Braille labels on them so that I would know where to find the materials. Boy, was I surprised! Except for the buzzer and the phone system, you wouldn't have known that a visually-impaired person worked in the office. That statement isn't meant to criticize Mr. Haas. What I'm trying to point out is that no two disabled people make the same adaptations to the same job setting. The next person who fills my shoes will be asking the same questions I did. "Why isn't this procedure written down? or "How did he survive with such a poorly-organized office?"

With that introduction out of the way, we can now begin discussing what we do at the information desk. While we do provide certain services for students, like inputting address changes and handing out course description bulletins, we are primarily a referral service telling people how they can get access to various types of University information. People get this information by either coming to the information desk in person or by calling us on one of our three incoming phone lines.

For people who visit the booth in person, the only way they'll know that a visually-impaired person works there is if they see either the "Please Buzz" sign or another sign posted above the desk which says, "Please Speak. Information Specialist is Visually-Impaired." If they don't see these signs, one of two things will happen. Most often, a person will stand there wondering why you're ignoring them. The other reaction occurs when my student employees are running the booth. Some people will believe my student is the person with the visual impairment. This has caused some rather awkward moments for my people in the past.

As I've said previously, the buzzer and the phone system modification were the only two adaptations made to the office by Gordon Haas. When I began working in March of 1981, I began making changes immediately. First, I put Braille labels on cabinets and file drawers so that I'd know the location of all printed brochures. I also labeled file folders and notebooks where necessary so that I could effectively organize my own Braille materials. For this purpose, I used a BTW-400 Braille dymo labeler. It's a very handy device which I should be using more than I do. I find that I sometimes don't label things and later regret that decision when I can't find the right description bulletin.

Then I began the long process of Brailling commonly asked for University phone numbers. Other lists also put into Braille include deans' offices, office employee names, University office locations, and University library listings. I also Brailled policy statements on student rights and the release of student information to the public. My student employees spend many hours putting this information on tape so I can transcribe it into Braille. Some of my people were quite willing to tell me if they felt most of this material was pretty boring stuff.

Once I had assimulated all of this material, I was ready to begin running the operation.

Our day begins at 7:45 a.m. and ends at 4:30 p.m. We are one of the few offices on campus that stays open during the lunch hour which runs from 11:40-12:30 p.m. We get a wide variety of questions from people about the campus. The standard ones like, "When is registration week,"and "When is the last day to add courses," are fairly basic questions and easy to answer. But asking for student data information like a phone number or helping to change a student's address required modification on the part of the office so that I can handle these requests effectively.

It's a rare desk in our office that doesn't have a CRT screen on it. Unfortunately, without sight, these standard and relatively inexpensive terminals are useless to me. To read the data they contain, the information must either be printed in Braille or spoken.

I'm currently using the Total Talk Personal Computer manufactured by Maryland Computer Services, Inc. Until August of 1985, I had been using Braille output terminals manufactured by Triformations Systems, Inc. These units were the LED-15 and LED-120, respectively.

What does this Total Talk PC do? First of all it does all of the things that both Triformation units did previously, which is to access student data. The SBRA program is still my primary source of looking up student data. It contains the following information: name, campus address, campus phone number, home address, major, birthdate, classification, matriculation date, last registered, semester/year, degree credits, credits in progress, last degree earned and date granted, and the last educational institution attended. Legally, we can give out this information to the public, unless a student has filled out with the University an information withhold form. While some campuses require that a student must withhold either none or all of their information, U.W.-Madison allows them to withhold any part of their normally releasable information. In some instances, students want their addresses withheld, while others don't want their birthdates given out for fear of age discrimination. The nice thing about the Talking Terminal is the way it expresses withheld information. While the Braille terminals have the dollar sign symbol before any piece of withheld information was listed, it was quite possible to misread that sign if you were trying to do too many things at once. It's hard to miss it with the speech terminal when you hear the words, "dollar sign" before each piece of student withheld information is spoken.

The STNM or student name program is used primarily as a searching program. It allows you to enter the last name of the person and determine if anyone by that last name attended the University since 1970. This program contains a mixture of both releasable and nonreleasable information. The releasable information in STNM includes the name of the student, the classification, and when they were last registered or if they are eligible to register for the upcoming semester. If any of that information is withheld by the student, the word "star" will appear before that particular piece of information. Nonreleasable information in STNM include the student's ID number, their sex, marital and residency status. On the standard CRT screen, releaseable student information in STNM is highlighted while nonreleaseable information isn't. The Talking Terminal makes no such audio distinction. You simply must know which information is releaseable and which isn't. This problem also existed with the Braille terminals as well.

STBK or student book is similar to STNM. It contains a mix of both releaseable and unreleaseable information. It has a demographic screen which contains much of the information available in SBRA, including name, campus and home addresses, major, etc. This program also has screens which contain alot of nonreleasable information including the name and address of a person to notify in case of an emergency, their class schedule and whether or not they owe fines to the University. Like STNM, this program makes no audio distinctions of whether or not it's reading releasable or nonreleasable information.

Besides doing student look-ups, this terminal will allow me to change student addresses with the SUAD or student address program. The 40 character Braille line made inputting addresses with the Braille terminal impossible without program reformatting. The Talking Terminal has no such limitation. The SUAD program allows the operator to change a student's campus or home addresses, their phone number, and their emergency address. They can also change the address where they want their grades to be sent. Since we accept both in-person and telephone address changes, the purchase of this unit will make my employee work load much easier. Until now, my students have handled all address changes. The Total Talk terminal will allow me to input at least the telephone address change requests we receive.

Let's leave the student data retrieval system to look at what else the Total Talk PC can do.

We don't have enough space to discuss everything that this terminal can do. I'll therefore limit my discussion of its capabilities to its two types of filing systems that I've used so far to search for, save, and retrieve data.

Before discussing these systems in depth, I should tell you that the program that contains the information and retrieval system package is called TIM which stands for Talking Information Manager. It also allows the terminal to work as a talking computer in the first place.

The first system that allows an operator to save and retrieve data is called ERRS which stands for Easy Record Retrieval System. It's very much like a card file system. You can make your own ERRS file system as large as you wish. The one that comes with the unit limits each entry to no longer than 250 characters in length. This means that you can use the system for short lists, phone numbers, names and addresses, etc. What the ERRS system does best is to locate quickly pieces of information that you need at your finger tips.

I currently have stored in ERRS the Registrar's Office employee list, phone numbers of the Deans' Offices, and a listing of University libraries.

While this system works well with short pieces of information like phone numbers, addresses, etc., more lengthy documents like the University Tuition Schedule and my Student Office Budget must be saved in a different way.

The system that handles this kind of information is called Display and Store. It can save and retrieve directories of information without regard to length. Rather than retrieving information one piece at a time, this system allows you to access information screen by screen. Each CRT screen is 24 lines long. Display and Store works quite well for lengthier documents like the Tuition Schedule mentioned earlier.

After receiving the terminal, I began inputting lists of phone numbers using the Display and Store System. After some use of this system, I found that it was much easier to look up and edit phone numbers with the ERRS program.

With ERRS you can edit each item of information separately. With Display and Store, editing problems can occur if your directory is more than 2 screens long. For example, let's say that the tuition directory is three screens in length. A few days after creating the directory, I discover an error in the first screen of that file. I fix the mistake and then press the "Store Text" key to save the edited file. If I do that and forget to store the other two unedited screens, I've probably destroyed two-thirds of my directory. That's why I'm only using this system to save information that doesn't change very often.

The second data retrieval system available with this unit is called the "display and store" program. This system allows you to produce directories without regard to length. I have used this system to input the locations of the deans' offices, and the campus-wide listing of all lost and found centers.

Along with the Total Talk PC, we also purchased a new modified Perkins Electronic Brailler. Maryland Computer Services also manufactures this unit and affectionately calls it "Perky." It's hooked up to the Total Talk PC and it can be used as a Braille printout device. Perky also has word processing capabilities as well.

Its one major problem is noise. When it's printing, my student's complain that they can't hear themselves think. We hope to find some kind of an enclosure for the unit that will dampen the noise. The Total Talk PC and the modified Brailler as a package costs this office about $14,000. I also use a standard Perkins Braille Writer which costs about $150. I'm currently using my own dymo labeler in the office, but if they were to purchase one, it would cost around $50. Braille paper for the Braille Writer varies in cost, but an average rate would be about $10.00 a ream.

From my prospective, this was an easy position to modify. Aside from equipment purchases, little or no job site adaptation was needed for most of the tasks we handle in the office.

In this day of tight budgets, hiring a visually-impaired or disabled person for that matter, might not be the most popular thing to do. After all, what about all that expensive equipment I've discussed during this presentation? And what if the person I've hired doesn't work out after the investment is made? And some employers and prospective disabled employees may not be informed where to get this equipment in the first place, making the hiring of a visually-impaired person seem like a very risky business.

All of these questions are legitimate ones which you'll have to think about, but it's my belief that it's worth the risk to hire a visually-impaired person.

Yes, there is a chance that a particular person for whom you buy a particular piece of hardware might be terrible at communicating with people. Remember, however, that you're taking a risk when hiring anyone new for a job. I'll bet that all of you can thing of at least one person you regret either hiring or working with. Considering the cost of equipment, it is significant. However, in the computer terminal area, many are being made in such a way that they can be used by anyone with or without a visual impairment. For example, the speech on the Total Talk PC can be turned off. The unit can then be used as a standard CRT terminal. The keyboard isn't quite the same as the standard CRT's we use in our office so it will take a little time before other employees will become comfortable with this unit, but it can be done.

Finally, the most difficult question for some is where to look for this specialized equipment. Information is available, but if you ask your average computer programmer, they may not know much about it. But don't let that scare you off. There are several resources that may help you in this area. The Aids and Appliances Review which I mentioned earlier is produced by the Carroll Center for the Blind. It was very helpful to us in our search for a Talking Terminal.

A second resource is the Hadley's School for the Blind. They are now producing a computer course for credit. If you're not blind, you can't take the course and it won't help you. But I'm sure that those teaching it are very up-to-date on new systems that may be relevant for your needs. If nothing else, they will know how you can go about searching for the equipment you need.

Finally, there are companies around like Maryland Computer Services, Triformation Systems, and Telesensory Systems which specialize in the manufacture of computer equipment for the visually-impaired. If possible, you'll want to talk to all of them and learn as much as you can.

When looking for computer equipment, try to have some idea of what you want. If you only want your employee to look up data, you might be able to look at one type of hardware. If you want alot of data entry done, you'll want to make sure that the unit you choose will have the ability to accomplish that goal.

Finally, remember that what's right for me may not be right for someone else. Your budget may limit you to a certain equipment price range. Or perhaps your potential employee may be more comfortable with either Braille or computerized speech. If you are buying hardware for the first time, you'll want to take that into consideration. If you've already invested, you have every right to hire a new person that can work with the equipment you already have on hand. You wouldn't hire a secretary who hated working with a word processor if you already had one. That wouldn't make any sense. The same logic applies here. If you decide on a Braille terminal you'll want to hire someone with the knowledge of Braille.

I've tried to answer all of the questions that I can think of concerning the type of job that I have and how I've adapted it to handle my responsibilities effectively.

If you need any further information, you can either write or call me at the Registrar's Information Desk, 750 University Avenue, Madison, Wisconsin 53706, phone: 608/262-3712.

The Implementation of Computer Technology in a Special Education/Clinical Setting

By Rita M. Lashway

Abstract

This paper presents considerations that should be made when implementing computer technology in special education and clinical settings. Areas of consideration are grouped into administration, in-service, and support service applications of computerized systems.

The Implementation of Computer Technology in a Special Education/Clinical Setting

By Rita M. Lashway

"Effective planning for microcomputers". We've all heard the term. Yet, what does it mean to those of us serving the needs of the disabled? How can we plan effectively; and more importantly, how can we support a microcomputer project once implemented? These concerns have been expressed by all who have undergone the experience of introducing computers to classrooms and/or intervention programs. The following pages will serve as a guide thru implementation and beyond.

For purpose of clarification, we will discuss implementation strategies as three major categories - administrative responsibilities, in-service topics, and support services:

I. Administrative Responsibilities

A. Planning. 1. Clearly define the administrative goals and objectives. Review the population and determine a phase-in approach best suited to your needs. 2. Determine the budgetary requirements for each phase of the project. 3. Identify available resources. a) Consider staff, parents, local high school computer clubs and area colleges as "people resources". b) Funding resources include local foundations, state agencies, etc. Research the history of grants previously awarded and write for guidelines. Parent associations and local clubs may also be willing to organize fund raisers for equipment.

B. Organization. 1. Include in the budget a computer coordinator who will be responsible for the organization and implementation of the project, as well as the on-going support necessary to ensure its continued success. 2. Organize a series of in-services prior to installation to introduce staff to the role computers can play in their teaching/therapy environment. 3. Consider the equipment location or rotation schedule. Be prepared to be flexible. What is an appropriate schedule during the early months may not be appropriate later on. If it is necessary to rotate, consider implementing a policy of mandatory turn-taking by all teachers.

Support the classroom teacher during the early stages by accompanying the computer into the classroom and demonstrating one-on-one and group activities. Once the teachers are feeling comfortable with use, the scheduling can usually be turned over to them to orchestrate.

C. Control. 1. Set the guidelines for appropriate use of hardware and software. a) Know where the equipment is at all times. Establish sign-out procedures for the borrowing of software, switches, etc.; and overnight equipment use by staff. (Check your insurance coverage). b) Set a formal "copy policy" and be sure that staff (and parents) are aware of it. 2. Determine the method of evaluation for measuring the success of the project. Not only will a successful first year serve as motivation, but it will also be the justification for Phase II. Evaluation will help to target in on strengths and, more importantly, weaknesses which need to be addressed.

D. Commitment. 1. One of the most important administrative responsibilities is demonstrating commitment to the project. a) strong leadership is reinforcing. b) Time made available for staff in-servicing demonstrates support of the project.

II. In-Service Topics

A. General Introduction to the Project. 1. Identify goals and objectives in terms of what the project hopes to accomplish and how. 2. Identify roles and how all will contribute to its success.

B. Hardware Review. 1. Cover terminology. 2. Allow staff to participate in the assembling of the equipment. Handling of firmware cards, etc. will help to overcome the fear of technology.

C. Operation Review. 1. Care of equipment, disks, etc. should be taught and posted near workstations as a reminder. 2. Common procedures and commands, such as initializing a disk, saving, copying, etc. should be taught. It is not necessary to make programmers of staff, but rather comfortable users of the basics.

D. Software Review. 1. Evaluate all software entering the agency or school for its appropriateness for the population on whom it will be used. Involve several people, if possible, in this process. Many good evaluation forms are available which can be used as a resource in the development of meeting program criteria. Educate staff in this process. Although some may not be directly involved in the formal software evaluation; they do need to be aware of the process of software selection and utilize those techniques in choosing appropriate software for their needs. Encourage staff to review and be familiar with software prior to use with a student or client. 2. Arrange with a local vendor or school to borrow software of various levels for a demonstration and hands-on experience prior to the ordering process. As a preinstallation in-service, it serves as a significant motivator and provides preliminary training in software evaluation and usage.

E. Adaptive Peripherals. 1. Demonstrations of speech synthesizers, expanded keyboards, switch input, etc. can be presented as an overview of available devices to spur interest. 2. Remember that expertise can only be developed with extensive hands-on experience in each topical area. Be prepared to make a substantial time investment.

III. Support Services

A. Establish a library of computer-related articles and publications in an accessible location and encourage its use.

B. Establish a computer committee representative of all disciplines (PT, OT, ST, Teacher, etc.) to share in decision making and information dissemination. This committee should include building, floor, wing, or group representative - whatever is appropriate to relate to the computer coordinator the particular computer needs in their areas.

C. Offer On-going Training and Support. 1. Group sessions should be limited to two persons per computer whenever possible. Hands-on time should be emphasized. With three or more per computer, the most reluctant (and needy) usually do not get a turn. 2. Individual sessions are usually necessary in advanced training for peripherals or diagnostic software. The newly trained person then becomes a resource to other staff in need of training. 3. Develop (and update periodically) software listings for staff. a) A listing of software which is readily available should include pre-requisite skills. b) A software listing by task will enable the professional to determine which piece of software corresponds to the specific cognitive skill currently being developed. This can also develop into a classroom activity software list.

At this point, I would like to take a few moments to expand on the importance of computer access assessments. They are indeed a contributing factor toward the success of the project. It is strongly recommended that a team assessment be done a minimum of once per year on all disabled students in special education programs. Reassessment allows different team members to approach a problem case with a new outlook. Again, the team approach (physical therapist, occupational therapist, speech therapist, teacher, computer coordinator, when available) is important in determining body and switch positions, cognitive ability, appropriate software, etc. Since it is extremely difficult for one person to keep abreast of technology, "brainstorming" assures that the client/student will reap the benefits of pooled knowledge.

Incorporation of computer use into the IEP can be effectively accomplished by writing a specific goal, ie., letter recognition, and stating that the computer will be utilized as a tool to achieve the goal.

Ultimately, the success of the project is highly dependent on staff attitudes. A friend and colleague is fond of saying that computers are "technology looking for a purpose". We, as professionals, should be committed to providing that purpose by combining our efforts to serve the special needs of the disabled.

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Abstract

This presentation will explore some of the possible ways a special educator could utilize integrated software packages. Integrated software packages have been developed for business which combine word processing, data management, and spreadsheet functions into one program. These integrated software packages are designed to be easily used, yet have a great deal of versatility and depth. Special educators are struggling to apply the microcomputer to help with instruction and management in the special education classroom. It would be logical to utilize a tool in education which has become so popular in business.

A microcomputer can be found in virtually every special education classroom these days, presenting a special challenge for the special educator. Microcomputers have revolutionized so many areas in business and industry. It would appear that in education the microcomputer presents great promise. But this promise is also the challenge to make use of this technology in providing and managing effective instructional programs for handicapped learners. The applications are open to the imagination and would include utilization of the microcomputer in direct instructional activities, teacher utilities such as instructional materials development, storage and retrieval, and data management such as IEP information, grades, and other daily measurements. The development of these applications will fall heavily upon classroom special educators. The sudden recent proliferation of microcomputers in special education has created a situation where most special education teachers have had their microcomputers for less than three years. This means that special educators will have to learn how to utilize this technology by themselves. If special educators are to take the time, effort, and initiative to learn how to utilize and apply this technology in their classrooms, then perceived payoffs will have to be immediate and significant. By borrowing successful applications of the microcomputer from business, special educators may realize some immediate rewards which will facilitate further utilization of this technology in the classroom.

The obvious application of microcomputers in special education is in direct instructional applications. These are in the form of drill and practice activities, tutorial activities, simulations, problem-solving activities, and composition through word processing. Unlike a lot of the early microcomputer utilization in education, very little instruction in programming languages other than logo will be found in most special education classrooms. Most of these applications will involve specific purpose programs such as drill in math facts, or word recognition drill. A fairly large number of these specific purpose programs will have to be purchased. It will take time before special educators will be able to develop a software library of sufficient size to make extensive utilization of the microcomputer in instruction. Evaluation of instructional programs will also be a major problem for the special educator in this area.

There are a significant number of programs available which generate instructional materials or support materials. A typical example of this kind of software is one that generates arithmetic problems and prints out a worksheet of arithmetic problems. Another example is a test generating utility which automatically sets up text in test format. There are appearing other kinds of utility programs for teachers such as grade books, IEP generating programs, test score analysis programs, and special programs to plot daily measurement data on semilogarithmic charts.

Out of the business applications field comes three sophisticated types of software: the word processor, the file-handling programs, and the spreadsheet programs. The evolution of these three microcomputer applications has led to the integration of these functions into one software package so that compatibility of function and information could be greatly enhanced.

A word-processing program turns the computer into a very versatile typing and composition aid. Word processors handle the composition and editing of text on a monitor screen rather than on paper. This allows the teacher and student to create text, correct or modify the text, save, and retrieve the text all quite easily. A teacher could utilize a word-processing program to generate study guides, tests, worksheets, language experience reading materials and other instructional materials. The major problem with word processor utilization in special education is with keyboard skills. Most of the advantages of word processing are lost if the student or teacher cannot input text with some proficiency. Typing tutorials have been developed which are quite effective at improving keyboard skills.

Data management applications have had more extensive use in business and research. Business has fostered software development in file-handling and accounting functions. In the file-handling area, software has been developed which allows for the entry of information on records in fields which can be scanned and manipulated in a variety of ways. For example, files can be arranged in alphabetical order based upon any field selected such as name, program, parent's name, teacher's name, or school name. Records can also be arranged in ascending or descending order if the field has a numerical entry such as age, dates, number of hours in a program, or credits earned. Records can also be scanned and selected for a special list based upon criteria for one or more fields of information. The number of fields from which selections can be considered is the true test of power for data-management software. Thus, if the teacher wanted to have a list selected out of a group of records of all the students whose IEP's were up for review during the month of March and who were in the 9th grade and were born in the month of January in the year of 1970, the data-management program could be used to quickly select all records which met those criteria if that information was contained in readable fields.

Another name for a file management program is a data base. Data bases can be used for a variety of student and program applications. Secondary special educators could use it to help monitor students in mainstream classes. Class schedules can be put in a data base with the name of the subject, teacher's name, and grade average in separate fields. Then periodic progress reports can be generated by selecting those records with poor grades and merging the teacher's name with a progress report form from the word processor.

Another use for a data base is in matching students with appropriate instructional materials and activities. A teacher or group of teachers could design a materials and activities classification system according to the skill objectives, ability level, input and output modalities, or motivational factors. With all the relevant factors about instructional materials listed as a field, the teacher could then use the data base to select all the materials and activities stored in the system appropriate for a particular need. The teacher would then choose what he/she wanted to use and also enter into the system the results for future reference. A system like this is not new but the ability for "home grown" curriculum catalogues is what makes this application of data bases interesting.

This same kind of application could also be used in note-taking and study skills. A student could establish a data base for a mainstreamed class which requires note taking in which the records become major concepts from the notes. The fields could be built to contain specific information supporting the main ideas. The system would be similar to an outline with Roman numerals and capital letters as the main record identifiers. The lower-case letters and Arabic numerals in an outline would then become fields in those records. Studying for a test would then become a matter of scanning the records trying to recall what information is in each field. The student could then examine those fields when recall is weak. A teacher could then keep a composite field from year to year with a comprehensive set of notes for mainstream classes. These could then be used in various ways to help students with note-taking skills.

Another data-management program that was developed for business applications is the spreadsheet. This type of software was developed as an accounting and forecasting tool for business managers. Spreadsheets primarily deal with numeric data and can easily perform calculations on numbers contained in rows and columns. Spreadsheets can be set up easily to perform sums and averages on rows or columns of numbers. They are also capable of doing sophisticated calculations with the numbers in these rows and columns even to the point of making logic decisions like if-then. Spreadsheets could have a variety of functions in token economies. Keeping track of tokens with debits and credits is simple with a spreadsheet.

Spreadsheets can be very easily set up for grade book applications. Daily test or performance data can be entered for each student. In this setup the students' names would be listed in the left-most column with columns to the right holding each day's grade. In a nine-week quarter, the 47th column would have a summing function entered which would total the points earned for the quarter. Column 48 could have an averaging function which would automatically average the daily points for the quarter. Minimum and maximum points earned in a day could be displayed or the spreadsheet could assign a letter grade based upon the teacher's specifications.

VOCATIONALEVALUATION UPGRADE PROGRAM

DAVID TRAVER. M.S.. CVE

ABSTRACT

The Vocational Evaluation-Upgrade Program (VE-UP) was necessitated by the massive amount of paper generated in the traditional vocational evaluation process. IBM compatible personal computers were used in combination with readily available business software to manage cases with improved services to the community, and significantly reduced costs.

As a result of VE-UP, case management practices have changed dramatically. During the evaluation process, the Evaluators enter basic client demographics, test scores, observations and recommendations. At the end of the evaluation a final evaluation report, staffing report, case notes, termination letter, and related documentation is prepared automatically.

Benefits include expansion of the scope of services, reduced evaluator stress, and better service to referring agency's. Over 400 reports have been written in the new format and the response has been unanimously positive. Counselors are especially happy with the report turn-around time and the easy reading format.

This project was partially funded through a grant by the Milwaukee Foundation, and was recognized by Goodwill Industries of America as the Outstanding Rehabilitation Program of the Year in 1985.

INTRODUCTION

Goodwill Industries, Milwaukee Area, Inc. has been a community service agency for over 65 years, providing a full range of rehabilitation services to disabled and disadvantaged citizens of the Milwaukee metropolitan area. Milwaukee Goodwill's vocational evaluation program has provided quality assessment services for physically and mentally disabled individuals for more than 15 years. In the past 15 years Goodwill has performed over 7,700 vocational evaluations. In 1985, over 700 individuals were evaluated.

The majority of clients are referred for services by the Wisconsin Division of Vocational Rehabilitation. Other users of vocational evaluation include the Social Secruity Administration, Insurance companies (worker's compensation), Veteran's Administration, and Milwaukee County's programs serving the developmentally disabled and mentally ill individuals.

A project, the Vocational Evaluation - Upgrade Program (VE-UP) was necessitated by heavy client flow, and massive amounts of paper generated by the evaluation process. The goal was to increase the quality of the one to one evaluations, and to reduce the time and paper work associated with psychometric and work sample testing. It was also necessary to address the overall case management and final evaluation report development with the same purpose, to create more time for meaningful one-to-one evaluator/client contact.

In the Fall of 1983, a commitment was made to computerize the evaluation department. An important feature of this project was that all computer programming and software development was completed by vocational evaluation staff, and when possible, inexpensive and readily available business software was used to keep costs to a minimum.

As the project developed, it became clear that it involved two phases, the development and implementation phase, and an expansion phase. The first phase lasted approximately one year, and the second phase is still in progress.

Phase One - Development and Implementation

Paper Work Reduction

Before implementing VE-UP, the final evaluation report turn-around time was frequently sited as a problem area with our major customer - the State Division of Vocational Rehabilitation. Reports were long and sometimes incomprehensible to non-evaluators. Reports included several dozen pages of check lists describing the client's vocational performance, often written in terminology developed by the Department of Labor and work sample system manufacturers.

When asked for input, the referring counselors said they wanted reports that were on-time, short, and which clearly outlined the client's assets, limitations, and vocational recommendations. The counselors already knew the client's social and work history, and were not interested in pages of checklists.

Goodwill purchased the Nutshell Data base program to reduce the amount of time required for report development and case management. This is an extremely easy to use data base program for the IBM-PC. Nutshell was adapted to handle all reporting functions involved in evaluation caseload management. The Nutshell program is a clever combination of database management and word processing, and cost only $100. It was purchased "over the counter" at a local computer supply store.

As a result of VE-UP, case management practices have changed dramatically. During the evaluation process, the evaluators enter basic client demographics, test scores, and observations, on an on-going basis. At the end of the evaluation, the Nutshell program automatically sorts all original entries made by the evaluator and creates the final report, staffing report, case notes, letter to the client, and related documentation, as required.

A decision was made to implement this project on the IBM-PC and IBM compatible computers rather than the IBM System 38 mainframe computer owned by Milwaukee Goodwill. The rationale for this decision included availability of software, user control, response time, and development speed. The IBM System 38 utilizes RPG-2 and RPG-3 languages, and no vocational assessment software is available in these codes. Software such as Nutshell, Lotus 1-2-3 a mathematical spread sheet, (which is great for norming work samples and budgeting) and word processing programs, were inexpensive and readily available for the IBM-PC. Similar programs for the larger IBM mainframe System were very expensive and use large amounts of machine capacity. The evaluation deparmtnet staff quickly became comfortable managing the more user friendly IBM-PC. The evaluators knew where their data could be found at any time, and did not need to learn mainframe languages or operating systems to initiate the project.

The purchase of the IBM-PC printer and software, as well as all testing equipment was supported through a grant from the Milwaukee Foundation. This generous gift was the result of a proposal to the Milwaukee Foundation which outlined the project and requested $15,000 for equipment and development costs.

Simplification of Vocational Testing

Milwaukee Goodwill provides ten-day vocational assessments to approximately 700 individuals per year. Assessments include two days of work sample and psychometric testing followed by eight days of situational assessment in occupational areas such as clerical, electronic assembly, food service, custodial, commercial laundry, and bench assembly. At the start of the project, three evaluators handled this case load with clerical support for intake, billing and work processing only. VE-UP attacked the cumbersome process of laboratory assessment by replacing many of the Valpar and J.E.V.S. work samples with tests that were administered quickly, and often in groups, and quickly scored hand or by computer. These tests included the General Aptitude Test Battery, the McCarron Dial System, McCarron Dial Street Survival Skills, Nelson Reading Skills Test, and the Wide Range Achievement Test, Revised, Level Two.

Following the purchase of a IBM-PC, and after considerable research, two vocational testing systems were purchased: the McCarron Dial and the General Aptitude Test Battery. The McCarron Dial was intended for assessment of individuals with sensory-neural impairments, mental retardation, or related disablilities. The General Aptitude Test Battery was selected for its ease of administration and powerful normative base.

The McCarron Dial company supplied computer programs to interpret and generate a written report on the IBM-PC. The General Aptitude Test Battery required some software development utilizing the Lotus 1-2-3 spread sheet program. This writer created a computer program that scored the G.A.T.B. and listed appropriate job classifications selected from 66 Department of Labor Occupational Aptitude Patterns. Goodwill evaluated other computer assisted assessment systems and software packages, but decided against them due to their apparent lack of relevance to the population served, poor normative bases, and frequently excessive price tags.

McCarron Dial and General Aptitude Test Battery results are analyzed by computer the same day the tests are administered, and extensive interpretive reports are available to the evaluators immediately. This facilitates updating of meaningful vocational evaluation plans, and more efficient use of the limited ten day evaluation period.

Phase Two - Expansion

Demand for "Time on the Computer"

Demand for access to the original single "evaluation computer" was unexpectedly strong. The daily report development activities of three evaluators required more time than was anticipated. New requests for computers services were frequent and several new projects were undertaken. Goodwill's Community Employment Program took the McCarron Dial system "on the road" and tested residents in a local nursing home. Reports for each of these assessments were produced on the evaluation department PC. Also, an evaluation program was developed by Goodwill at the Milwaukee County House of Corrections, and over 70 G.A.T.B.'s, and dozens of McCarron Dials were administered each month.

A new problem had developed - insufficient availability of computer time. To solve this problem, two additional computers and printers were purchased, and an optical scanner was obtained from National Computer Systems to machine score the G.A.T.B and the Interest Inventory.

After considerable shopping, two Leading Edge Model-D, IBM compatible computers were installed in evaluator offices. These machines were loaded with all available memory (640K) and hard disk storage systems. Dot matrix printers were also provided for each machine.

The National Computer System scanner was selected sloely on the basis of the availability of the V.I.P. report development system. The scanner reads the original answer sheets, eliminating manual input of raw scores, and the V.I.P. software analyzes scores and interprets the G.A.T.B. and the United States Employment Service Interest Inventory. Using this software, the computer generates a comprehensive report which includes aptitude patterns, interest levels, and relates the two in an understandable fashion.

With the addition of this new equipment, expansion of the scope of services was feasible. For example, Milwaukee County has over 12,000 individuals receiving Gerneral Assistance due to unemployment and poverty. In October and November, 1985, for employment counseling purposes, 370 individuals were screened with the use of the G.A.T.B. This testing was performed without adding staff and assistance.

Appraisal of the Effects of the Program

Evaluator Reaction

One aspect of the VE-UP program that could not be predicted was the reaction of the evaluators to the new process. There were significant changes in tests, documentation, report development, and reporting style plus overall day to day procedures.

Through careful planning, attention to training and demonstration, the conversion process went smoothly. One staff member, a vocational evaluator with 20 years of experience, comented, "(the computer) is the best thing to happen here in 20 years".

Planning included months of preparation. All evaluation forms generated by computer were, whenever possible, exact images of their handwritten predecessors. There were discussions with evaluators andother staff about the logic of the new report formats, and their suggestions were followed. Variations in the formats were permitted for each evaluator, allowing personalized evaluation report formats.

Training began with the evaluator expressing the greatest fear of computers. The commercial tutorial program provided with the Nutshell program was used, and sample reports were developed and corrected. After successfully handling several cases, this evaluator then trained the other evaluators.

Demonstrations of the program, and of the computer, added to the smooth transition for the other evaluators. They were not only told about the advantages, but were shown, by one of their peers.

Customer Reaction

Evaluation is a service, not a tangible product. However, there is one durable result of an evaluation the written report. In effect, the report is the "product" purchased by the referring counselor. Marketing the new report format was much easier than expected, and the response was gratifying.

As requested by the referring counselors, a two page report is now developed and available to the counselor at the time of the staffing. Long narratives citing client social history and demographic information are no longer provided. There are no check lists, and, the reports are easily understood by non-vocational professionals, the clients, and the concerned family members.

Over 400 reports have been written in the new form and the response has been unanimously positive. Counselors are especially happy with the report turnaround time, and the easy reading format.

Fiscal Impact

Improved performance was measured in case management tasks, and in the quality of assessment accuracy and feedback to the client. Readily available business software, used without adaptation, resulted in a significant cost savings, and provided a powerful and flexible development base.

Before implementing the project, a twelve month study revealed that final vocational evaluation reports were ready for mailing to the referring counselor 14 working days after the final evaluation staffing. Cost for report development included an average of 1.5 hours of evaluator report development time (including test interpretation), .5 hour typing time, .25 hour re-write and proofing time, and an additional .5 hour re-typing. Two photocopies of the report would be made, and the original would be mailed. Average development cost for each report was 2.75 hours of staff time or approximately $70.00.

In addition to the final vocational evaluation report other case management paperwork included a termination letter to the individual receiving services (in duplicate), an in-house termination summary, billing report, and a case note, or $12.50 of evaluator time. In 1984, this process was repeated 675 times (once for each client) and cost Goodwill $55,688.00.

The report turnaround period has been reduced from 14 days to 30 minutes. Final vocational evaluation reports are now handed to the referring counselor at the final staffing. All other paper work (case notes, letter, and billing information) is generated by the computer as an incidental function of the evaluation report process. A typist is no longer required, and work is proofed by the evaluator as the report is written. A separate staffing report is no longer required. Cost per report is now only .5 hour of staff time, or $12.50. The net result is a cost reduction of over 80% per report, to a total of less than $8,500 per year, compared to the previous figure of $55,688.00.

Traditional Valpar and J.E.V.S. work sample administration required one to one testing by three evaluators working simultaneously. This testing was replaced by one evaluator working with groups of eight clients on a rotating basis. This allowed more time for individual attention by the other evaluators. Weekly testing by one evaluator replaced similar one to one testingby three evaluators, and a weekly savings of six hours of staff time ($150.00) was realized.

Conclusion

The experience gained in the VE-UP project has demonstrated to management in other departments that the use of computers has a place in the human services business. We are now involved in the development of a comprehensive Management Information System which will include multiple departments, (Intake, Evaluation, Placement, Billing, etc.) and combine the PC and IBM system 38 environments.

The project, funded in part by a donation, has proven successful in several surprising ways, and had the following effects:

1. Improved services to the client
2. Improved customer relations
3. Increased time spent in professional evaluation functions, rather than report writing tasks
4. Improved evaluator morale
5. Significant annual dollar savings
6. Simplification of the evaluation report format, and reduction in report turn-around time
7. As a marketing tool, ther eis access to new markets, such as nursing homes, correction centers, and public assistance agencies

Summary

In the past 15 years Goodwill has performed over 7,700 vocational evaluations. In 1985, over 700 individuals were evaluated.

The Vocational Evaluation - Upgrade Program (VE-UP) was necessitated by massive amounts of paper generated by the evaluation process. The goal was to increase the quality of the one to one evaluations, and to reduce the time and paper work associated with psychometric and work sample testing.

When commercially available software was not suitable, computer programming and software development was completed by vocational evaluation staff, and when possible, inexpensive and readily available business software was used to keep costs to a minimum.

As a result of VE-UP, case management practices have changed dramatically. During the evaluation process, the evaluators enter basic client demographics, test scores, and observations, on an on-going basis. At the end of the evaluation, the computer program automatically sorts all original entries made by the evaluator and creates the final report, staffing report, case notes, letter to the client, and related documentation, as required.

Benefits include expansion of the scope of services, reduced evaluator stress, and better service to referring agencies. A vocational evaluator with 20 years of experience, commented, "(the computer) is the best thing to happen here in 20 years". Over 400 reports have been written in the new form and the response has been unanimously positive. Counselors are especially happy with the report turnaround time, and the easy reading format.

A cost reduction of over 80% per report was realized, a total of less than $8,500 per year, compared to the previous figure of $55,688.00.

VOCATIONAL REHABILITATION ENGINEERING -
WHAT IS IT?

LEONARD L. ANDERSON, M.S.E.M.
LEAH M. ROSS, M.Ed.

Abstract

Vocational rehabilitation engineering techniques which have been developed through research by the Rehabilitation Engineering Center in Wichita, Kansas, are described. The majority of examples cited are those adaptations designed for manufacturing operations.

Vocational Rehabilitation Engineering

Rehabilitation engineering is not a unique science within the engineering discipline. Rather, it is a unique application of traditional engineering problem solving techniques. Vocational rehabilitation engineering allows individuals with severe multiple disabilities to perform useful work in an industrial setting. The application of vocational rehabilitation engineering at Wichita, by the Rehabilitation Engineering Center, has been principally at Center Industries Corporation, or CIC.

Center Industries Corporation

Center Industries Corporation is the practical laboratory in which research is carried out. At Center, handicapped persons are integrated with able-bodied employees in manufacturing and, where necessary, machines and work stations are modified so that handicapped individuals can operate them at a competitive rate. This adaptation effort has been the responsibility of staff of the Rehabilitation Engineering Center.

Center Industries Corporation has been in existence for over 10 years. Most of the job modifications that are to be discussed have been derived from experience at CIC. The basic purpose or philosophy of Center Industries is to provide access for individuals with moderate impairments to entry level jobs and eventually to mainstream industry, as well as to provide access to individuals with severe physical impairments to vocational placements which have specialized transportation and aide support.

Available Motions Inventory

The AMI, or Available Motions Inventory, provides the data base for most of the engineering modifications designed and fabricated at CIC. It provides information relative to the upper extremity dexterity in individuals, measured in an objective form. The scoring system yields both inter- and intra-individual ability comparisons.

The Available Motions Inventory (AMI) is an assessment system developed by the Wichita REC. It documents residual capabilities of physically disabled persons to carry out specific actions and activities required for performing work. An analysis of an individual's set of abilities yields a profile of types of tasks which could be carried out by that person. In addition, the profile defines the modifications which would be required to enable that person to operate a particular worksite, thus enabling the individual to carry out tasks that are beyond that person's currently existing capabilities.

Worksite Modifications

Two individuals with severe cerebral palsy have been enabled to work in a fairly sophisticated work environment through individual specific task modification. The following paragraphs describe the modified work stations designed and fabricated for their use. Both stations were a part of the same product line, one producing a spring-loaded strut to support the rear window of a recreation vehicle. A beading machine redesigned for the first worker was formerly operated by a worker in a standing position. The machine was lowered so that a handicapped worker in a wheelchair could operate it. The actuation levers were fitted with air cylinders to allow pneumatically powered operation. An electronic timer was constructed to control the length of time the machine head was engaged. A holding fixture (Fig. 1) was fabricated to align the tube properly during the machine operation. This modification allowed a formerly unemployable severely disabled person to be employed.

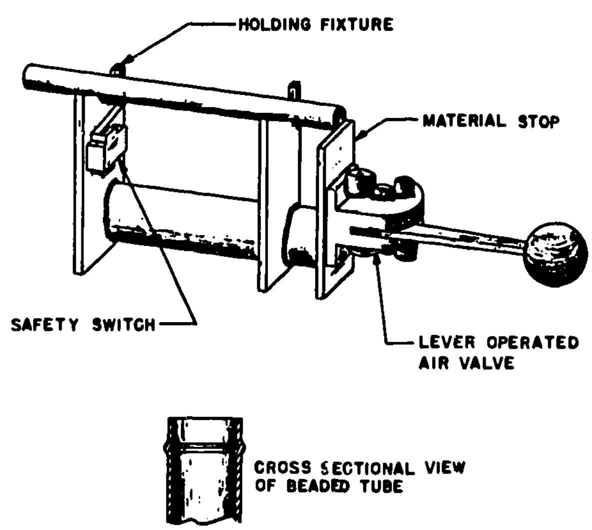

Figure 1 Tube Beading Machine Modification

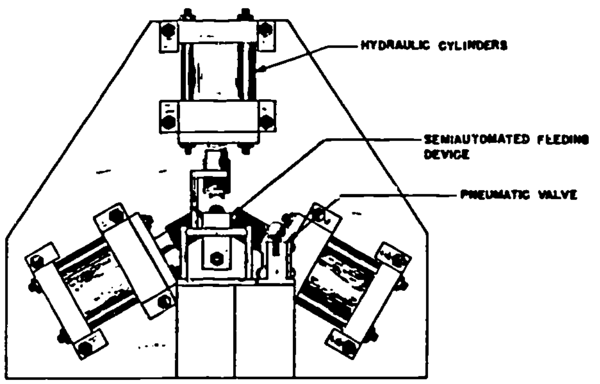

Figure 2 Three-Axis Crimper

A crimping machine was modified for the second worker's use (Fig. 2). An important facet of the redesign is a part feeder which is designed on the same format as a toothpick feeder (Fig. 3). It presented one tube at a time to the machine operator. These modifications allowed a severely disabled person affected by spastic cerebral palsy to operate this machine at an economically feasible rate.

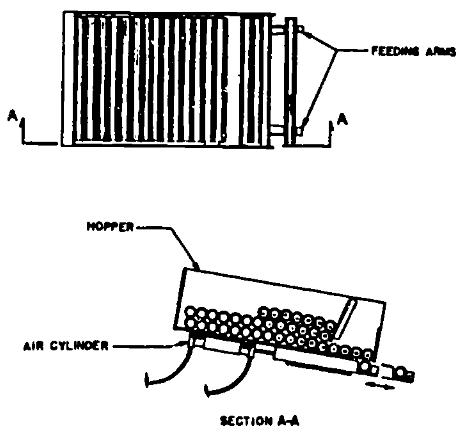

Figure 3 Cylindrical Parts Feeder

Strut line modifications have also been made for individuals with less severe disabilities. They were designed for frequently occurring functional limitations. The limitations are those of material handling, maintaining proper alignment of parts being processed, and control actuation.

Mounting brackets were attached to the ends of the struts by 1/4 inch diameter rod which extends through the bracket and strut tube. The rod was cut to length and preformed in a sub-assembly operation. The rod and bracket were assembled. The assembly was placed in a specially designed clamp which held the assembly as a sliding actuator moved the rod into position beneath the head of the punch press (Fig. 4). After the press was actuated, the air valve was placed in the reverse position. This prevented the operator from having to place the assembly directly beneath the machine head.

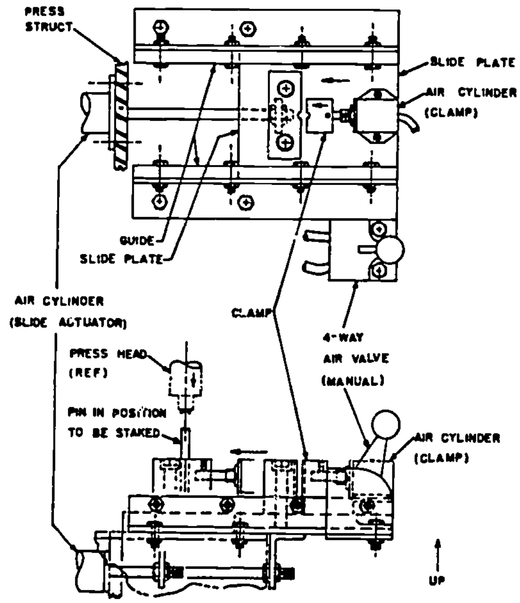

Figure 4 Pin Staking Modification

One frequently occurring need which is found is to adjust the orientation of equipment to fit an individual, thus allowing access by an individual in a seated position to a worksite which normally requires a standing position. The following illustrates one such modification.

One of the more extensive machine modifications which was undertaken by Rehabilitation Engineering Center personnel was to make a rather complex drilling operation accessible to a seated worker. Formerly, the operation had been performed only by ambulatory persons, either able-bodied or mildly handicapped. The entire machine was lowered to make it accessible. In addition, the work surface and machine were tilted away from the operator. This made it easier to position parts properly as well as giving the operator handier access. The machine modifications were achieved by cutting and rewelding the frame of the drill press, as opposed to altering the machine itself.

The job station was designed for a general class of handicapped worker. The operator was required to have near normal strength of hands and arms, as the part to be drilled was relatively heavy, 4-1/2 pounds. The worker did not have to perform operations with his hands at a rapid rate. This was due to the fact that the time required for the drilling operation itself was relatively high, 80 seconds of a two-minute cycle.

Before the machine modification was complete, a worker was identified to perform the operation. His disability was due to his having been injured in an automobile accident. His primary injuries were to the brain, and he was confined to a wheelchair. His strength was adequate. Although his rate of performing hand operations was substandard, this did not hamper his being able to perform the manufacturing cycle at an adequate rate.

Another frequently occurrring functional limitation is hemiplegia, that is, limited use of one arm and hand or complete loss of the use of one arm and hand. An employee of Center Industries was a person with an arm completely disabled by accidental injury. He performed a variety of operations ably. CIC has two numerically controlled lathes. Although this was a highly automated process, there is one point at which two hands were required, when the part was loaded or unloaded from the chuck. A head-actuated switch was mounted on the machine (Fig. 5). It was wired in parallel with the

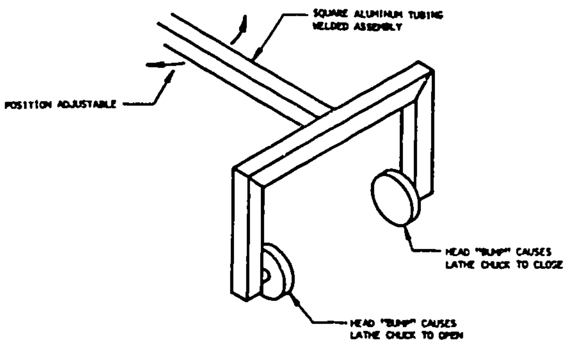

Figure 5 Head-Actuated Switch

regular switch. The one-handed employee could use the head switch to open or close the jaws of the chuck while he supported the part with one hand. An able-bodied worker could also operate the machine by swinging the device out of the way and operating the machine in the usual manner. A second lathe was modified in a similar manner. The substitution of the switch was carried out somewhat differently since the chuck was actuated pneumatically rather than electrically.

A 32-ton press was equipped with a two-hand trip as required by OSHA (Occupational Safety and Health Administration) to prevent an able-bodied operator's hand being caught. The handicapped employee who was proposed to operate this machine had only one functioning hand. The task of modifying the machine so that only one-handed actuation was required was done with the following limitations in mind. The job modification was to alter the function of the machine only when the specific handicapped worker was using it, thus retaining the required protection for a two-handed operator. The key converting the press to one-handed operation was to be kept at all time by the one-handed operator, the only person having the right to operate the press in that mode. The trip button was placed at least 27 inches from any pinch on the press bed, considering the OSHA formulas which take into account the speed of the press head and the time required for the head to stop when the button is pressed (Fig. 6). A variety of activities could be performed on the press, thus enhancing this individual's job security.

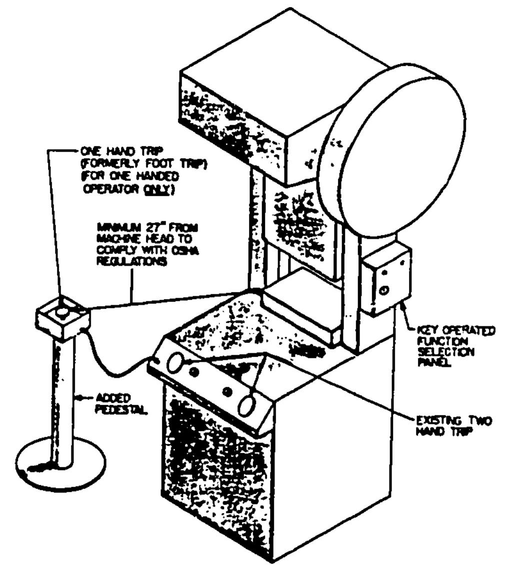

Figure 6 One-Handed Punch Press Trip

This modification can be utilized for others with hemiplegia. A principle of industrial worksite modification has been demonstrated, that is, that the modification should not reduce the access of the able-bodied co-workers to performing the task.

Analysis of motion achieved on the AMI by handicapped persons reveals that controlled motion with three-dimensional components is difficult, especially for the cerebral palsied. The following devices allow one- or two-dimensional actions to be substituted for three-dimensional activity.

A young woman who is ambulatory but has some limitations of her hand function found a possible job assignment assembling a nozzle for a welding torch. Assembling of the part was difficult because it required proper positioning. This is essentially an operation requiring coordination in a two-dimensional plane.

An alignment tool was designed (Fig. 7) which guided the part into position, changing the required motion from two to one dimension. Initially this young woman was placed on the job for a typical probationary period. In a short time her performance proved her to be ready for additional operations. The larger her repertoire of activities, the more job security she had.

A holding fixture enabled a handicapped client to position drill in a desired location over the work before actuating the tool. The fixture consisted of an arm which pivoted horizontally about one end. Ordinary drawer guides were used for the fixture arm, which allowed the arm to telescope in length. A special clamp held the drill motor at the end of the arm (Fig. 8).

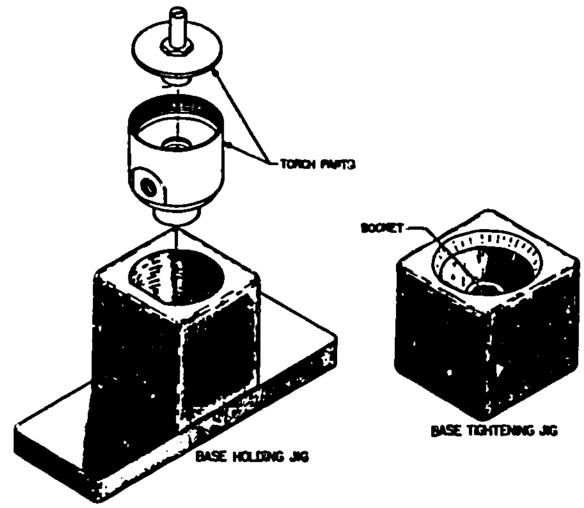

Figure 7 Alignment Tool

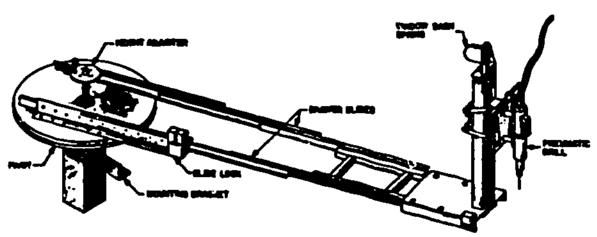

Figure 8 Drill Alignment Fixture

A research project was undertaken to explore the possibility of assigning most of the physical motion of an industrial task to a small robotic arm, and decision-making functions to a person with physical limitations. A specific task was identified at Center Industries, that of tinning or coating leads of small electronic components with solder. The Microbot, manufactured by Microbot, Inc., Mountain View, CA, was chosen as being functional and within the economic limitations of this project. The operator's responsibility was to place the component in an appropriate location to be picked up by the robot. For axial lead components, one lead of the component was dipped, the part was turned end-for-end so that the second lead could be tinned. Axial lead components of various sizes were processed by the disabled operator, utilizing the robot.

Some persons with severe multiple disabilities are quite adept at quality control or inspection types of task. A mirror placed in an appropriate location enabled an inspector to see the digits on license plates, manufactured at CIC, in normal order. A desk area was provided for a list of required tag numbers for comparison. An air jet provided the capability of ejecting a particular plate from the production line. It was actuated by a single large push-button switch placed near the inspector. If the inspector perceived a major malfunction in the press operation affecting all tags, she could actuate another button which would shut down the embossing press operation until the malfunction could be analyzed and corrected.

A final inspection was made of the license plates for sequence of numbers and quality control. A particular individual has worked at this station throughout the production of license plates at CIC. He is severely physically handicapped, has adequate eye sight, good judgment, and is very conscientious. When he first worked at the inspection, his flailing due to cerebral palsy was so severe that the engineers built a stall so he would not kick the conveyer. As he became accustomed to the work, the flailing ceased, and the stall was removed.

Another very fruitful area for job modification accomodation is clerical or knowledged based work. The seated nature of clerical work makes it compatible with many wheelchair users. A young woman who had been injured in a motor vehicle accident came to Center Industries with an ambition to be a receptionist. She had little training for such a job. She received on-the-job training from Center's clerical staff and has turned out to be a very satisfactory employee. Some relatively minor modifications were made to enable this young woman to perform her job. A desk-level switch was designed and built to replace the standard foot control for the dictaphone. The copy machine was lowered so she could operate it; six inches were cut off the legs of the machine.

Some modifications seek to alleviate other than physical limitations, that is, cognitive or perceptual impairments. The following is an example of such a modification developed for CIC's license plate manufacture. Separate dies must be loaded for each digit of each license plate. The employee who first performed this job was relatively able-bodied but aphasic from head injury. A digital counter was designed to monitor the next die to be loaded. It was placed where it could be readily seen by the operator. One of the by-products of this operation was that the aphasic employee learned his numbers in sequence again. Able-bodied operators also benefitted from using the counter to keep track of the required dies to be loaded.

One of the responsibilities of the Rehabilitation Engineering Center is to support a handicapped person placed in an employment setting by responding to problems that arise after placement. A young man with cerebral palsy achieved a mainstream job placement in a large medical center in Wichita. He worked as a grounds maintenance man. The employer felt that it might be dangerous for the cerebral palsied employee to operate powered equipment. As the employee expressed it, the restriction made him feel handicapped. Engineers inquired into the matter and proposed equipping a power mower with a "dead man" switch. This consisted of a bicycle hand brake lever which would spring open

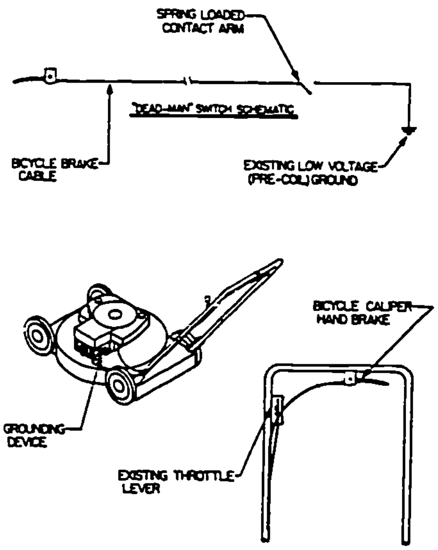

Figure 9 "Dead Man" Switch

when pressure was released, thus grounding the electrical system and cutting off power to the engine (Fig. 9). This was connected to the low voltage coil circuitry on the mower.

Another problem arose when the employee found it hard to operate outside water faucets equipped with only a square shaft. The tool provided by the employer did not allow for sufficient leverage to be applied to operate the faucets. A "cheater bar" was designed with two sizes of square holes in the faucet tool (Fig. 10). Both the faucet tool and the "cheater bar" were provided with carrying lanyards. With engineering assistance, this employee was enabled to carry out a full range of maintenance activities.

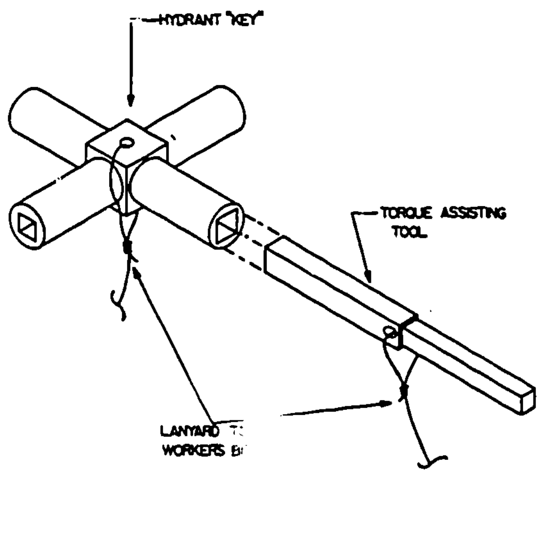

Figure 10 Torque Assist Tool

For many adults with an acquired disability, their first choice for an occupation or a job is the one that they had before their illness or injury. This is particularly true for a person who has been the primary manager and worker on his own farm.

One such farmer had a stroke which left him hemiplegic, affected on the left side. One of the things that he wanted to do in his rehabilitation process was to get up on his John Deere tractor and do some work again on his farm. The barrier to this farmer's access to the tractor was the wide placement of the steps. Limited strength and range of motion of the affected left leg prevented his climbing the steps to the tractor seat. The farmer's own welding equipment was utilized to make the alterations. Additional steps were fabricated and attached to the side of the tractor. The added steps were then painted John Deere green. Two principles of job site modification have been demonstrated: 1) the engineer usually needs to observe the actual workplace to develop appropriate changes and 2) the alteration should be as simple and unobtrusive as possible.

Timing was very important in this instance. The farmer was eager to return to his accustomed work, and the Vocational Rehabilitation counselor sought the assistance of engineers to perform the worksite modifications. This was done outside the domain of the Rehabilitation Engineering Center grant, on a fee-for-service basis, utilizing techniques which have been developed within the REC research. A simple, straightforward change rendered a man and machine operational again.

Conclusion:

Persons with disabilities can be enabled to perform work that is satisfying to both the worker and the employer by application of vocational rehabilitation engineering.

ACKNOWLEDGEMENT

The authors wish to acknowledge the National Institute of Handicapped Research for its support of the research activity in which the principles of vocational rehabilitation engineering were being developed.

PERSONAL COMPUTER ASSISTED VOCATIONAL EVALUATION (P-CAVE)™
Counselor-Friendly Software
IBM-Compatible

Marilyn Tuck, CRC

In an age of technological miracles, electronic advances are all too often limited in their utility in rehabilitation applications. The primary culprits seem to be the expense of the technology and the whizgadgetry of the devices, as both frequently exceed the parameters within which rehabilitation facilities and counselors customarily work.

P-CAVE is IBM-compatible software which searches the entire DOT database of 12,375 job titles in minutes, producing a wide range of options for even the most severely limited, lower-functioning clients. Each job title is described by DOT code, GOE code, SOC code, GATB aptitudes, physical demands, environmental conditions and GED levels. P-CAVE is state-of-the-art technology with sleek, sophisticated, elegant programming, but is also eminently practical. It was designed by a practicing counselor for use by counselors and has utility in litigation evaluations as well as more routine evaluations.

In recent years, technological advances and electronic whizgadgetry have become so commonplace in rehabilitation that responses to new equipment or concepts are often, "ho-hum. . ." When the latest bit of magic is trotted out, it is often a) too expensive for most facilities, b) too technical for most counselors, or c) both.

At last! There is a technological advance in rehabilitation that is both eminently practical and very affordable!

The Personal Computer Assisted Vocational Evaluation (P-CAVE)™ is a software package which searches the entire Dictionary of Occupational Titles in a matter of minutes, matching client capabilities to appropriate job titles. It was designed by a practicing counselor for use by other counselors -- and best of all, you don't have to know a bit from a byte!

P-CAVE includes the following features:

1. P-CAVE contains the entire DOT database of 12,375 job titles, described by DOT code, GOE code, SOC code, GATB aptitudes, physical demands, environmental conditions, and GED levels.
2. P-CAVE is flexible. You can match client profiles by tested aptitudes, critical aptitudes, work history, reduced physical or mental functioning, or by comparable jobs within the demonstrated functioning level.
3. P-CAVE is thorough. Because it contains the entire DOT database, it provides the most number of options for lower-functioning clients.
4. P-CAVE is useful in litigation. It can provide both pre- and post-injury job counts within the person's previous functional capacities and current level of functioning. This provides an objective basis on which to make a functional disability rating. No more going into court armed solely with professional judgement!
5. P-CAVE can be tailored to provide a great deal of information or to retrieve only very specific kinds of jobs. For example, in the printed job list, you can obtain a listing of everything that fits, every third (for instance) fit, the first 150 matches, or whatever combination you please.
6. P-CAVE meets EEOC testing criterion, in that every match is job-specific based on demonstrated past performance and evaluated by the Federal Government's own data.

7. P-CAVE is electronic technology at its best -- designed by a practicing counselor for use by other counselors.

8. P-CAVE is state-of-the-art technology at a very affordable price. The programming is elegant, sleek and sophisticated at an economical cost.

9. P-CAVE is service-oriented and provides the best follow-up support in the industry. The first 90 days we provide technical back-up free. After that, you may either contract with us for a low-cost computer support personnel maintenance agreement or you may purchase our technical support on an hourly, as-needed basis. No other software package in the field offers such thorough follow-up.

10. P-CAVE is available in a variety of forms. You may purchase the software only; you may purchase from us one of three pre-programmed computers, depending on your other computer needs; or you may contact us with client profiles and purchase individual client printouts.

Introduction to Microprocessing and Academic Strategies for Developmental-Level College Students

Quentin L. Griffey, Ph.D.

Abstract

Eight learning disabled freshmen college students at the Community College of Allegheny County, Pittsburgh, PA were enrolled in a specially designed study skills course which included instruction in writing term papers using a word processing program. These students were selected for this course based on assessment procedures which established the presence of severe writing deficits. During the fifteen week semester the students recieved instruction in appropriate study skills such as notetaking, anxiety reduction, reading strategies, mnemonic learning devices, and the mechanics of writing a term paper. The word processing portion of the course provided instruction in becoming familiar with the computer and developing acceptable skills in using a word processing software package. One of the major desired outcomes of the course was to equip learning disabled students with a tool for writing adequate term papers. During the second half of the term the students concentrated on the skills acquired in the study skills and word processing classes to produce a term paper which consisted of a title page, outline, content, and references. Each term paper was evaluated by examining the students' ability to logically organize and sequence the information necessary to produce the papers. The results of this course suggest that learning disabled college students with writing deficits can, with proper instruction, develop an adequate term paper. All the students were able to utilize a word processer to develop an acceptable paper. Based on evaluations by the students, the instructor, and college officials this course will be offered as a regular course at the college.

Introduction

If I made the statement that the ability to write well is an important measure of a student's success in college there would probably be no disagreement with that statement among this audience. Further, if I indicated that there are many students in college today who lack good writing skills and consequently will either not complete their college programs or encounter much difficulty along the way there would be little disagreement. Nor would there be much dissent that there will be many more students with inadequate writing skills enrolling in college programs in the near future.

There are many colleges and universities that abate this problem by requiring prospective students to submit evidence of at least some minimum writing skills prior to acceptance. However, there are also a large number of institutions, particularly community and junior colleges, that operate under the "open door" policy of admission. These colleges generally only require that the incoming student complete the appropriate application forms and submit evidence of a high school diploma or GED. These institutions, therefore, attract students who often would be denied admission to more selective colleges.

Fortunately, many community and junior colleges have recognized the fact that many students who are accepted will not possess the academic skills necessary to successfully complete their chosen programs. As a result of this awareness they have instituted programs to assist new and previously enrolled students who experience academic difficulties. It is not the intent of this presentation to elaborate on the components of supportive programs for developmental level students, rather, it is my intention to briefly dscribe the program available at the Community College of Allegheny County in Pittsburgh and its relationship to a specifically designed course for students exhibiting writing deficits. Students at this community college who are experiencing learning problems have several programs available to them. These include developmental level coures in reading, English, mathematics, and study skills; learning counseling for students with test anxiety and poor study habits; a learning center for individual and group tutoring; a pre-college program offered during the summer for new students who need basic skill development in academic subjects; and the Office of Special Services for Handicapped Students which provides a variety of services to students who have been classified as learning disabled, emotionally handicapped, physically handicapped, or visually or hearing impaired. Currently the Office of Special Services for Handicapped Students provides services for over 75 learning disabled students and employs a part-time Learning Disabilities Specialist on its staff. Classification as learning disabled is determined either by prior enrollment of the student in a program at the elementary or high school level or as a result of an assessment process conducted on campus.

Program Rationale

A large number of students entering the Community College of Allegheny County lack the prerequisites necessary to enroll in regular academic courses which require adequate reading, mathematics, writing, and study skills. Academic levels of the students are determined by requiring all students to participate in placement testing in reading, mathematics, and English prior to their first term of enrollment. They also submit a writing sample in which they are asked to state why they want to go to college in one hundred words or more. Prospective students who score below a specific socre on these tests must enroll in developmental (remedial) level courses for the specific area of deficit. Additionally, they are required to enroll in a study skills course. One of the purposes of the study skills course is to assist the student in acquiring elementary knowledge in the mechanics of writing a term paper. Term paper writing, as we all know, is a procedure used by colleges to measure students' knowledge of course material and writing ability.

It was recognized that many students, particularly students classified as learning disabled, exhibited severe writing deficits and that the existing study skills course was not effective in aiding these students to develop the skills necessary to write adquate term papers. Therefore, the Learning Disabilities Specialist, along with the Director of the Office of Special Services for Handicapped Students, and the Chairperson of the Developmental Studies Department investigated the feasibility of restructuring the existing study skills course to make it more appropriate for students with writing difficulties.

Recognizing the problems that many learning disabled students have in the area of written language (Deshler, Farrell & Kass, 1978 Alley & Deshler, 1979; Kirk & Chalfant, 1984) and after reviewing the current literature on using word processing as a means for improving the written expression of learning disabled students (Lerner, 1985; Schiffman, Tobin & Buchanan, 1984; Torgeson & Young, 1984) we decided to include instruction in word processing into the existing study skills course.

Program Description

Of course, there were many decisions involved in actually setting up this revised course which will not be discussed as this point. Rather, I would now like to concentrate on the structure of the course itself. I will also present the "unofficial" outcomes of the pilot course and offer several recommendations.

Students

Of the students identified as potential candidates for this course nine ultimately enrolled and eight completed the course. The one student who dropped the course was not an appropriate candidate since he had severe visual problem and had been declared legally blind. The support needed by this student was beyond the scope of the course and he was referred to a more appropriate program.

The eight students completing the course initially met the following criteria:

1-They were entering freshmen (3 female, 5 male).

2-They had either been classified as learning disabled through prior evaluations or as the result of evaluations conducted by the staff of the Office of Special Services for Handicapped Students.

3-Their placement scores in reading or English were at the 10th grade level or below.

4-Analysis of their writing samples indicated some or all of the following:

- a). Nonspecific sentences and/or paragraphs.
- b). Inadequate proofreading and error detection.
- c). Lack of content elaboration.
- d). Lack of organization.
- e). Discrepancy between oral and written expression.

5-No background in knowledge of computers or word processing was required.

6-They were given information concerning the difference between this course and the typical two credit study skills course and had the option to enroll in either one.

Setting and Instructor

Instruction took place in three locations. Since there was a small number of students the classroom instruction took place in a conference type room containing a large rectangular table with the instructor at one end. All instruction pertaining to the acquisition of appropriate study skills occurred in that room.

In addition, the students had access to one computer located in the Office of Special Services for Handicapped Students. Demonstrations and instruction relating to word processing took place at this site. The third site was in the Computer Suite located directly above the Office of Special Services for Handicapped Students. Three computers were available for use by the students for independent practice. These computers were reserved for the exclusive use of our students.

The instructor, who was also the Learning Disabilities Specialist, had a Master's degree in Special Education and had completed most of the requirements for the Doctorate in Special Education (Mildly Handicapped area). The instructor had had twelve years experiences as a teacher and administrator for students with learning and behavioral problems. Other than being fairly competent in word processing the instructor had no special expertise in computers.

Equipment

All students were requested to purchase a study skills text which was used throughout the course. The computer equipment consisted of four Apple IIe computers (one in the Office of Special Services for Handicapped Students and three in the Computer Suite located directly above the Office of Special Services. Each of these computers were modified for mouse use. The word processing software used throughout the course was MouseWrite. This software package was selected because of its ease of operation and learning. We decided that requiring the students to learn to use the mouse with menu driven commands would be more beneficial since the students would be able to separate commands from text. All commands are mouse oriented and text production is keyboard oriented. Each student was provided with their own disk and required to bring it with them whenever they were going to use the word processeser.

Procedure

Since we wanted to integrate the word processing unit into the study skills course without sacrificing any of the study skills content we increased the number of credit hours from two to four, therefore the students recieved two hours of instruction in study skills and in word processing per week over the fifteen week semester.

Classes met twice a week with the first half of each class used for study skills instruction and the second half for word processing instruction. During the first half of the semester (pre mid-term) the students recieved study skills instruction in various areas such as effective use of the library, notetaking from text and classes, test anxiety reduction, use of mnemonic learning devices, and efficient reading strategies. Word processing instruction consisted of an introduction to word processing, keyboarding, basic computer and word processing terminology, care of equipment and software, use of the MouseWrite software package, and group and individual practice. Each student was required to schedule a one hour independent session per week. Students were encouraged to use the computer located in the Office of Special Services for Handicapped Students for practice since the Learning Disabilities Specialist (Instructor) was also located there and could provide assistance during times of independent practice. As they gained experience and confidence they were encouraged to use the computers in the Computer Suite. No restrictions were placed on the students as to the amount of time they could practice other than that they had to practice at least one hour a week and that they did not use another student's practice time. In fact, they were encouraged to use the computers to complete work from other courses.

As stated previously, during the placement testing (prior to enrollment at the college) each student was asked to write a one hundred word essay on why they wanted to attend college. This writing sample now became the basis for their term papers that they would eventually write using the word processer. The students were given a copy of their original essay and were asked to transcribe it on the computer, complete with errors.

During the second half of the term (post mid-term) the study skills portion of the class involved the students primarily in learning the mechanics of writing a term paper. Word processing instruction was concerned with the actual production of the term papers using the skills acquired in the study skills course and word processing instruction.

By mid-term most of the students had developed at least acceptable word processing skills, therefore, they were able to concentrate on their terms papers and editing. During the class period the students brought their latest edited papers to be evaluated by the instructor. Recommendations for editing and elaboration were made by the instructor. In the event that the students needed additional instruction in editing with the word processer the instructor demonstrated the necessary procedures and observed the students to insure proper acquisition.

In addition to the instruction that the students recieved in class and on the computer we were fortunate to have an Enlish tutor who came to the classroom and met with individuals and small groups. The tutor provided additional assistance to the students, particularly in the areas of using proper grammar, syntax, etc. The students were not required to use the services of the tutor, however, six of the eight students did take advanatge of this extra assistance.

To recieve acceptable credit each student was required to submit a term paper which met the following criteria:

1-Format (must include all of the following)
  a) Title page
  b) Outline
  c) Two-three pages of content
  d) Reference page
2-Demonstration of word processing ability.
3-A logically developed paper which included:
  a) An introduction to the main theme
  b) Main statement and supporting details
  c) Appropriate conclusion

The term papers expanded on the original writing sample and the students were required to state:

1-Why they wanted to go to college
2-What program of study they found to be interesting to them.
3-What career goal they had an interest in.
4-How attending Community College of Allegheny County would help them prepare for their careers.
5-What additional training would they need if they

could not receive it all there.

6-A general description of the career areas in which they were interested.

It should be obvious that the students had to integrate a number of skills in order to produce an acceptable paper. They had to apply the mechanics of writing a paper which they learned in the study skills class, demonstrate proficiency in word processing, research an area of interest, and logically present a sequence of activities necessary to reach a goal.

Outcomes

Although this course was offered in response to the needs of a specific population of students and was not intended to produce empirical research data, there are, however, some outcomes which can be suggested.

1-The average term paper grade for this class was a B. The average grade for another study skills class taught by the same instructor which did not include word processing instruction was a C. However, the better results for the study skills plus word processing class can not necessarily be attributed to the effects of the word processing instruction. Since we were not concerned with the research data which could have been generated if proper controls and designs had been implemented the two groups can not be considered to be comparable. There were a number of differences between the study skills plus word processing class and the study skills only class. These differences include some of the following:

a) There were eight students in the study skills plus word processing class and sixteen students in the study skills only class.

b) More personal contact by the instructor for the study skills plus word processing class.

c) A feeling of companionship among the study skills plus word processing class members which was not evident among the study skills only class members.

d) The possibility of an attitude difference on part of the instructor in favor of the study skills plus word processing class.

2-One student progressed at such a rate that he is now being employed by the college as a word processing tutor for other students in the Office of Special Services for Handicapped Students. This student had no previous computer experience prior to taking this course.

3-The course was evaluated by the students and by college officials and, as a result, it will be offered on a regular basis each year. Hopefully, an appropriate research design can be constructed to more accurately measure the impact of the course.

4-Students who have completed the course are now permitted to use the computers to complete their other class assignments as long as they are enrolled at the college.

Recommendations

1-The MouseWrite software package used in this course was appropriate for these students, however, there are other software items which could be used just as effectively. For example, institutions which have Macintosh computers could use the MacWrite software package which is comparable to MouseWrite for the Apple IIe. A careful examination of the software products available on the market should be made before selecting the one to be used in a program such as the one just described.

2-Ideally, prospective students should be carefully screened before being enrolled in a program. Institutions which staff personnel with expertise in disabilities should coordinate their efforts to develop appropriate assessment procedures.

3-The instructor should be knowledgeable about the disability area and should have a thorough knowledge of the software package being used.

4-Class size should be small enough to insure ongoing personal contact and feedback by the instructor with the students.

5-Scheduling and monitoring of independent practice is a critical feature. Students who practiced one hour or more a week produced better papers than those who practiced less than the minimum.

6-Finally, and perhaps most importantly, students such as the ones participating in this course have often experienced much academic failure and will need a great deal of support and encouragement, particularly at the beginning of their college careers. A course like the one just described can be the vehicle for providing this structure.

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NU-VUE-CUE: Verbal Eyes Verbalize

Roselyn Doyne F.Clark

Abstract

Nu-Vue-Cue™ Statistical Abstract

Nu-Vue-Cue is a system of communication for the nonverbal multiply handicapped, based visually upon the phonetic construction of Cued Speech. Developed by Roselyn Doyne Clark and successfully piloted at the Northwest Indiana Special Education Cooperative, Nu-Vue-Cue is beginning to fill a great deficit in nonverbal communication. The system is simple yet comprehensive, enabling the nonverbal educable individual to communicate any thought or concept. The system is limited only by the individuals developmental level.

The Nu-Vue-Cue Chart

Nu-Vue-Cue utilizes a plexiglas chart with the twenty-five consonant sounds of English placed at the eight points of the "tic-tac-cue" diagram. (See figure I) These sounds correspond in their placement to the eight phonetic hand symbols of Cued Speech. Vowel phonemes are placed in the corners of the chart, at locations designated by the Cued Speech mouth, chin, side and throat.

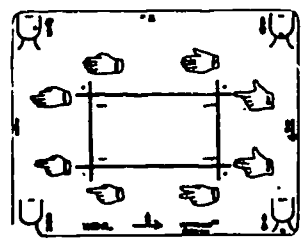

Figure I Nu-Vue-Cue™

Because Cued Speech requires mouth configurations which are impossible for some multiply handicapped persons, N V C provides color coding in the center of the chart, the particular phoneme order being indicated by the chosen color: red, blue, yellow, orange and green.

Additional sounds, such as adaptive phonemes for foreign languages, (i.e. the French "u") and letter symbols not found in standard phonetics are placed on some charts. Thus, Nu-Vue-Cue can be utilized successfully with students of a non-English or a bilingual/multilingual background. Higher functioning students who are extremely familiar with the Nu- Vue - Cue system have successfully eliminated the Nu-Vue-Cue chart from the communication process, and simply use eye-gaze on an imaginary chart between the sender and receiver. This is called 'skytalking' and has proved to be one of the most convenient features of the Nu- Vue- Cue system. With no visible means of communication, the nonverbal individual may communicate any message.

The Method

The plexiglas chart is placed between the message sender and the receiver. By using eye-gaze, that is, only the eyes to trace the word formations, the sender builds words phonetically. First, the sender looks in the center of the chart to indicate a new word and the desire to communicate. Second, the sender chooses the appropriate hand position found at the "tic-tac-cue" then looks again to the color section to determine the specific sound within that hand position. The sender repeats this process choosing a vowel or consonant phoneme, until the word has been completed phonetically. In this manner, words and sentences are formed, and communication facilitated without the vocabularic inadequacies of "word-charts" or the necessity of proper spelling with "alphabet charts".

Generally, the receiver of messages reinforces the sender by verbalizing the words as they are constructed phonetically. However, students in a classroom at the Northwest Indiana Special Education Cooperative have used Nu-Vue-Cue to communicate with each other, both the sender and the receiver being nonverbal.

Materials

Although Nu-Vue-Cue is a relatively new method of communication, many teaching materials and classroom adaptations are available. Two books, including the latest teaching manual, Guidelines for Nu-Vue-Cue, have been written by Roselyn Clark, with the purpose of introducing Nu-Vue-Cue as a communication alternative for the nonverbal classroom student. Additional materials, flashcards, resource charts and information are also available. Computer assisted instruction, as well as computer programs for the practice of the Nu-Vue-Cue have also been developed, to provide the most advanced classroom with Nu-Vue-Cue materials. Seminars on nonverbal communication using the NVC method are given by Roselyn Clark and available upon arrangement.

Use of the System

Nu-Vue-Cue has been used with great success for nearly five years. Nonverbal students who had been previously considered ineducable up to their potential, have responded to the NVC system and begun to communicate with teachers, family, and classmates. Children as young as four years of age have used the phonetic systems of Nu-Vue-Cue, and successfully transferred their learning into other classrooms. Nu-Vue-Cue is a comprehensive system which has enabled many nonverbal individuals to communicate, and afforded them a freedom of expression which was once impossible. There has been a transfer of knowledge to other areas of learning.

Integrating Assistive Device Machine-Readable Databases with Design. Fabrication and Testing of Devices and Components for Successful Work Adjustment

D.A.Shafer Ed.D.

Abstract

Assistive devices machine-readable databases available either free or fee-based are identified and described briefly. Acquisition, transformation and evaluation of information from these sources are outlined as a simple process that aids the design, fabrication and test of combinations of components and extant devices to return persons to as close to original productivity as possible.

With the inexpensive availability of access to machine-readable databases has come the golden opportunity to compress the time and cost for producing turnkey assistive devices for persons who are physically challenged.

The First Step

Beginning with the all-important face-to-face rehabilitation engineering evaluation the clarifying power of engineering and other databases comes into play. As is frequently the case a client arrives with a preconceived notion--even crude drawings--of what they perceive as the solution to their need. Armed with the results of both the engineer's comments and prelimary drawings, as well as the client's comments and, yes, the crude drawings, staff can generate a search strategy that, when implemented with multiple machine-readable databases, can yield a cornucopia of switches, servo-mechanisms, components and, in some cases, devices intended for an industrial application which, with minor modifications, can become turnkey for a client at greatly reduced cost.

The Search Strategy

Readers are urged to consult a session paper that is companion to this discussion. It is entitled: Integrating Assistive Devices for Successful Work Adjustment: Database Sources That Aid the Design, Fabrication and Test of Assistive Devices. It was distributed to attendees at Discovery III at a session with the author. Additional copies may be obtained for ten dollars.

Having identified words, figures and diagrams that focus on the client's needs staff consult the following sources:

1. Database of Databases (Dialog)

2. Directory of Online Databases (Cuadro, 1986)

3. BRS Directory (BRS, 1986)

4. Dialog Directory (Dialog, 1986)

5. Compuserv Directory (Compuserv,1986)

6. Source Directory (Source, 1986)

7. Minet Directory, (Minet, 1986)

Having identified database targets the staff consult individual database thesauri. These thesauri, when used with intelligence, sharpen the approach to a specific database. Training in both database interaction and use of thesaurii can be obtained at many locations in the USA, including the Human Resources Center's READI-DATA training center on Long Island.

Staff begin to interrogate each database with a superrefined search strategy and armed with cost-cutting tactics that master searchers must possess to keep costs at least in a feasible vein. The average time in a specific database is under five minutes.

The Secret to Multiple Database

It is no secret. While in a specific database the trained and alert rehabilitation engineering searcher notes fugitive terms. It is these terms that open the information product possibilities heretofore shielded from even the best searcher. These fugitive terms become the basis for even finer-tuned interrogation of databases. The result is a yield of useful products available off the shelf, listed in obtuse databases that one would probably have not considered.

Run to Stay in Place

With six thousand machine-readable verbal, spatial and numeric databases available by subscription in the USA, and with three new ones coming online every business day, it behoves the dedicated rehabilitation engineering professional to constantly seek "try-on" access to at least 15 new databases each week. Most producers are willing to give an hour's try-out to any searcher who is organizationally credentialled. For more information on the ideas in this paper and the specifics of the paper distributed at Discovery III, contact the author at the Human Resources Center.

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