Before We Begin

Welcome to the Second Edition of Computer Access in Higher Education for Students with Disabilities. Although this new book contains many updates to access technologies discussed in the original edition, its principle addition is an entirely new section dealing with the computer access needs of the severely disabled. Also, the product guide has been enlarged to include several new access programs and devices, plus a curriculum guide to development of courses in adapted computer technology has been included, as well as the complete text of Section 508, the so-called "electronic curb cut" legislation.

Before we begin exploring the history, philosophy and use of adapted computer technology, it would be well to understand the basic premise upon which this guide has been constructed.

In a word: practicality. This guide will probably be unlike anything you have previously used. In order to avoid the technological obsolescence such guides are subject to, we will define the functions an adaptation must be capable of in order to meet the special needs of a disabled computer user. Those needs, unlike the rapidly changing technological possibilities of computer adaptations, remain fundamentally constant. If those special access needs and requirements are thoroughly understood, new adaptive computer technologies can be evaluated within the relatively stable framework of the unique needs of disabled computer users.

This guide offers proven guidelines for making the kinds of basic decisions about adapted computer technology those in the helping professions must produce on a daily basis:

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- o **What should I buy so that a student with low vision can use the computer?**

What adaptations are available for students with learning disabilities?

How can I provide computer access to students with limited fine motor control?

What adaptations are available to help improve language skills in students who are congenitally deaf or hard of hearing?

Rather than providing a comprehensive catalogue of all available adaptations for disabled computer users, this guide presents a carefully selected array of adaptations which work extremely well for disabled students in post-secondary education. In addition to reliable guidelines for evaluating adapted computer technology, you will find an insert to the guide detailing specific product recommendations, vendor names and current prices as of this writing. The manual also includes general guidelines for instruction in the use of specific classes of adaptations (low vision adaptations, learning disabled adaptations, etc.). You will find chapters discussing the legal implications of computer access, funds acquisition, student and staff profiles, the corporate perspective and future trends in adapted computer technology.

In formulating this guide, our basic assumption was always that both staff and student had little or no computer experience. Therefore, explanations and training guidelines are presented with a minimum of technical jargon.

One final point: unlikely as it may seem, adapted computer technology is about people. It is also about opportunity and ability and persistence. Most importantly perhaps, it is about a previously unavailable resource, a resource which can provide vast numbers of people who have disabilities with the opportunity to compete and succeed as equals in the academic and job environment.

Beginnings

The birth of the High-Tech Center for the Disabled was made possible through a combination of factors which included the maturing of microcomputer technology, a fair amount of serendipity and a supportive college administrator who was willing to take a risk.

In the Spring of 1984, the Disabled Students Services program at Monterey Peninsula College began offering courses in word processing to students with disabilities. Within the first week, the difficulty of using microcomputers, even for students with relatively mild orthopedic disabilities, was obvious. How, for example, does a student who has only one finger with which to type hold down two keys at once? How can a student with limited fine motor control avoid pressing an unwanted key? How can a student with low vision see what is appearing on the computer's screen? Needless to say, we had many more questions than answers.

Through trial and error, center staff quickly developed partially effective solutions to some of the more acute access difficulties. Feeling confident that we had solved the problem of providing computer access to disabled students, we resumed the word processing courses, and the six disabled students who were enrolled completed them successfully. The following semester, fourteen disabled students enrolled in the course. In the summer, over thirty requested enrollment. On a rising tide of excitement, enthusiasm and some panic, we began trying to understand what was happening. Although our efforts to provide computer access to disabled students continued in a random and somewhat erratic fashion, we persisted in our view of solving the problems of computer access as secondary to teaching a course in word processing. Meanwhile, out in the real world, disabled individuals who had never considered post-secondary education were enrolling at Monterey Peninsula College in order to learn word

processing with adapted computers. And they were staying on to become participants in mainstream courses.

When demand for the course reached epic proportions, it was time to stop and think carefully about what was happening and what we were doing. We had created a course in word processing for students with disabilities. We had developed a few techniques and tools which made computer access easier for students with certain kinds of disabilities. That we had tapped a tremendous unmet need was obvious, but what was it? Upon closer examination, it became apparent that what students were coming for was not so much to learn word processing as to learn how to use the adaptations which gave them access to computers in general. We had tapped the enormous desire many disabled individuals felt to use computers. Much to our surprise, we discovered that we were in the business of providing computer access to students with disabilities.

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Over the course of the next few weeks, a number of decisions were made which were to have far reaching consequences on the future of adapted computer tech nology at Monterey Peninsula College, the California Community Colleges Chancellor's Office, the State Department of Rehabilitation and the United States Department of Education.

After careful consideration, we determined that a real need existed for a systematic program of identification, testing and implementation of adapted com puter technology at Monterey Peninsula College. And here we made a decision which dramatically altered our approach to adapted computer technology. Rather than build a facility by acquiring traditional adaptive devices as if they were the only options available, we decided to determine what an ideal adaptation ought to do and then set out to find or create it.

But first there were the twin issues of project approval and funding.

As a group, directors of Disabled Student Services programs in the California community colleges are a dedicated and resourceful collection of individuals intensely committed to supporting the success of disabled students in post-secondary education. As a group they are, as well, shockingly underbudgeted for the task at hand. The director of the disabled students program at Monterey Peninsula College was a staunch supporter of new technologies for the disabled. When we met to discuss the prospect of developing such a program, she was immediately enthusiastic about the concept and somewhat pessimistic about the availability of funding. Project approval was awarded immediately; funding for equipment and supplies would have to wait. But, as it turned out, not for long. A one-time windfall funding source became available within the month. Rather than spend this surplus on other equally worthy projects, she elected to gamble on the future, and so the High-Tech Center for the Disabled was born.

What Is Adapted Computer Technology?

In the early 1960's, when microcomputers first began to appear, they were hailed as the great equalizers-the technological breakthrough which would at last allow disabled individuals to compete as equals with their non-disabled peers. Until recently, the unfortunate reality of computer use by the disabled has been a history of frustration and disappointment. This was due, in large measure, to a basic design feature of computers in general.

Screen and keyboard are the primary channels of

communication between people and computers. Persons with orthopedic, learning or visual disabilities frequently experience great difficulty seeing the screen or manipulating the keyboard. In the past, this often presented an insurmountable barrier to successful use of microcomputers by disabled individuals.

Adapted computer technology, as defined by the High-Tech Center for the Disabled, refers to any computer program or device which restores a disabled person's ability to see the screen and use the keyboard. Within the context of adapted computer technology, however, "seeing the screen" and "using the keyboard" take on new meaning and dimension undreamed of by designers of the original screen/keyboard interface between people and computers.

Given the advanced state of microcomputer technology and programming environments, recent breakthroughs in manufacturing procedures and the tremendous wealth of new and emerging software, we felt the time was right for a radical change in the traditional approaches to providing computer access to persons with disabilities. We established as our primary goal the replacement of expensive hardware-based computer modifications with high-quality software adaptations. These adaptations had to be easy to use and commercially available. Given the current state of microcomputer and software technology, we felt that these adaptations ought to cost one-half to two-thirds less than previous adaptive devices.

With these goals in mind and our experiences with the needs of disabled students as guidelines, we formulated the following set of criteria for evaluating possible adaptive technology.

Every adaptation employed by the High-Tech Center must:

Provide the disabled individual with significantly improved access to microcomputers.

Function with industry standard software such as Lotus, WordStar and dBASE.

Function concurrently and harmoniously with many other adaptations. Disabling conditions frequently require the simultaneous use of several adaptations in order to restore full access.

Be easy to teach, learn and maintain. With rare exception, the disabled individual should be trained in less than thirty minutes.

Be affordable-generally, less than three hundred dollars.

Function on the IBM PC, PC compatible, Apple IIe or Macintosh computer (although a particular adaptation might not necessarily be interchangeable between PC and Apple computers).

The intent of our criteria was to make adapted computer technology available as a practical tool for the disabled individual in both the college and work environment. Each item in our list of criteria represented an essential element in the overall structure of adapted computer technology. In order to better understand the overall concept of the High-Tech Center, it is important to be aware of the reasoning behind each of these criteria.

Providing disabled individuals with significantly improved access to microcomputers was vital. Learning to use a computer can be a somewhat perplexing experience for anyone. We saw disabled individuals as being doubly burdened, first by the problems everyone typically experiences in learning to use a computer and secondarily by the inherent difficulty of using the currently available adaptive computer devices. The thousands of tiny frustrations associated with the constant use of clumsy adaptations regularly prevented disabled students from enjoying the labor saving benefits of

computer access. The need for much more effortless, elegant and natural adaptations was obvious. Fortunately, with the advent of new microcomputer technologies, such adaptations were now possible.

A tremendous library of software exists for microcomputers: word processing, spread sheets, programming languages, accounting, communications, database management, computer assisted instruction and computer assisted design to name a few. To fully open the world of possibilities available to disabled students through access to microcomputers, it was essential that we introduce adaptations which would function harmoniously with commercially available software. There was also a deeper philosophical position underlying the need for access to commercially available software.

We saw the High-Tech Center as a training facility rather than a cloister. Our expectation was that disabled students would come to the High-Tech Center to learn the use of computer adaptations appropriate to their disability. When a functional level of competency had been attained, disabled students would make the transition to mainstream courses where, if computers were used, adapted computer technology would be available at the various computer facilities on campus.

In providing access to commercially available software and transitioning disabled students into a wide range of courses which used computers (i.e., accounting, drafting, word processing and computer science) we hoped to begin breaking down a long standing equation concerning computers and the disabled. The equation went like this: Disabled Person + Computer = Computer Programmer. We felt that access to adapted computer technology could provide many other career opportunities in addition to computer programming.

Our decision to seek or develop adaptations which
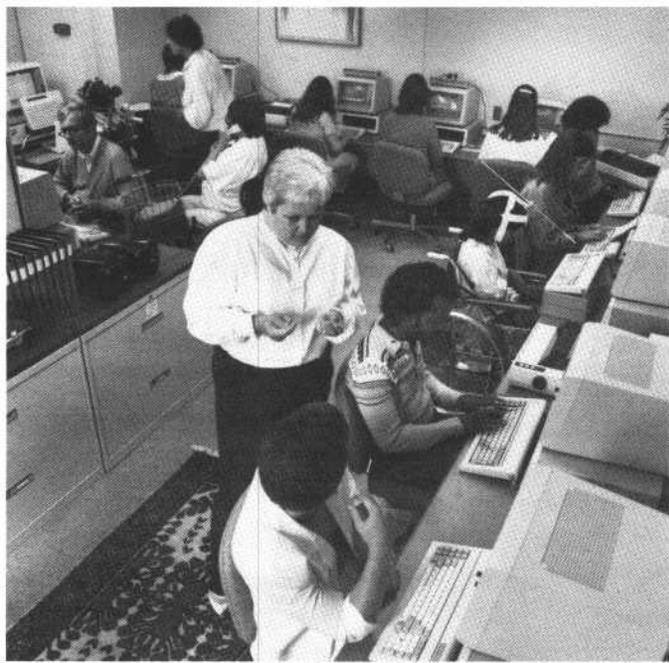
could function together concurrently and harmoni-
ously reflected a major design component of the High
Tech Center: adaptations must be adaptable to various
disabilities. Disabling conditions came in a variety of
configurations; it made sense that adaptations should
also. In order to meet the special access requirements
presented by combinations of disabling conditions, we
wanted to develop a set of adaptations which could be
assembled like building blocks into a myriad of differ-
ent configurations. This would allow us to meet the
access needs of students with multiple disabilities, but
it would also address a more subtle problem.

Very rarely do disabling conditions such as blind-
ness, low vision or mild to profound orthopedic
disabilities take place as discrete, self-contained phe
nomena. More typically, even a single disabling condi-
tion has multiple secondary consequences directly or
indirectly related to the disability. Many of these con-
sequences require intervention in order to provide ef-
fective computer access. A few examples: the blind
computer user who unknowingly triggers the auto-
matic key repeat function by not releasing the keys
quickly enough, the learning disabled computer user
with limited fine motor control, the orthopedically dis-
abled computer user who has been educationally dis-
advantaged and needs continuous spell checking in
order to compose a sentence.

Although it had long been possible to meet, after
a fashion, the gross access requirements of disabled
computer users, we felt that the myriad of small diffi
culties created as a secondary consequence of the dis-
ability must be removed in order to build confidence
and create truly unobstructed computer access. By de-
veloping a library of adaptations which could be dy-
namically assembled to address these requirements,
a much higher level of computer access could be
achieved.

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In our experience, one of the principal roadblocks to the widespread use of adapted computer technology was the expense and complexity of early computer adaptations. Disabled Student Services program directors and members of the helping professions in general are intensely busy people. A computer adaptation which requires a month or more of an instructor's time to learn and additional months to teach is not an effective tool. Even the most dedicated of staff simply do not have enough hours in a day to deal with such equipment. The hallmark of advanced technology is simplicity and ease of use. We saw no reason why adapted computer equipment should be exempt from such a standard. The majority of program administrators, instructors and helping professionals are not computer technicians. Many are wary of the historical complexity of computer adaptations in general. Unfortunately, this wariness all too often translates itself into a reluctance to provide computer adaptations on campus. It was evident that, to be effective, computer adaptations must not require excessive time or technical expertise from staff or students.

Cost of adapted computer equipment was an equally problematic issue both for colleges and the ultimate users of adapted equipment, disabled students themselves. Adaptations with twenty-five hundred to four thousand dollar price tags might be affordable in limited quantities to colleges or universities, but few, if any, disabled students in post-secondary education would be able to purchase such a device, to say nothing of a computer to go with it. It is during a disabled student's term in post-secondary education when continuous access to such equipment, a degree of access which can only be practically attained through ownership, may be most critically needed. We determined that computer adaptations must be affordable to colleges and more importantly to disabled students. There
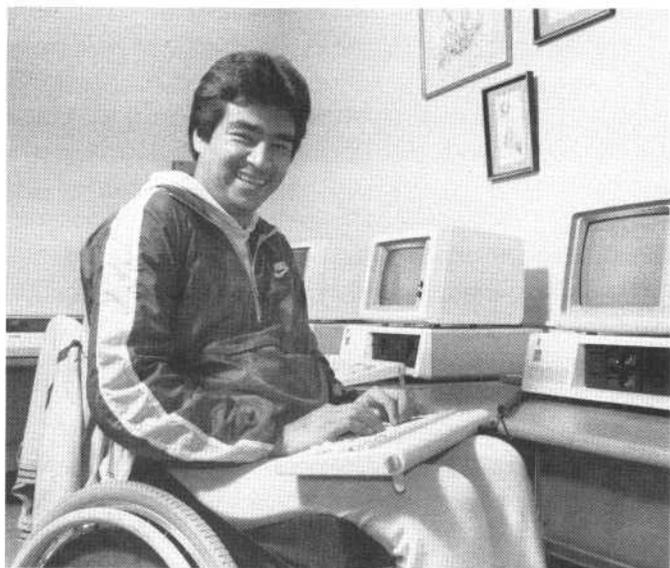
is very little point in teaching a disabled individual to use a splendid adaptive device which he or she can never afford to purchase.

Our approach to determining which computing environment to develop adaptations for was somewhat eclectic. The traditional computing environment for disabled students was the Apple computer. Rather than begin with the assumption that we would use Apple computers, we established a set of criteria defining the level and quality of adaptations we proposed to provide and then went looking for a computing environment which would support our criteria. We found IBM PC and PC compatible computers ideally suited to our needs. The MS DOS operating system, expanded memory and faster processing speed provided the sophistication required to support advanced computer adaptations. In line with our intention of providing meaningful computer access, we found PC computers dominating the business world and rapidly replacing Apple computers in post-secondary education. They were affordable, easy to repair and much nearer to state-of-the-art microcomputer technology. We would focus primarily on PC computers while continuing to explore effective adaptations for Macintosh computers.

In this way, we established the conceptual framework of the High-Tech Center for the Disabled at Monterey Peninsula College. During the next two years, we explored, experimented, tested and evaluated a variety of software and hardware adaptations. Many were failures. Some worked moderately well under controlled conditions. A few proved to work very well indeed.

The following pages summarize the use of the best of these practical and effective adaptations for low vision, blind, learning disabled, deaf and hard of hearing and mild to moderately orthopedically disabled indi-

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viduals. It is our most sincere hope that removing the guesswork and uncertainty from the process of implementing adapted computer technology will usher in a new era of computer access for disabled students.

In support of this exciting new opportunity, the California Community Colleges Chancellor's Office has established the statewide Office of Adapted Computer Technology in Sacramento, California. Its task is to provide support and training to California's 106 community colleges in the area of computer adaptations. As of this writing, the California State Department of Rehabilitation has awarded the Community Colleges Foundation a multi-million dollar grant to establish High-Tech Centers in California community colleges based on the model developed at Monterey Peninsula College. Presently, there are 58 High-Tech Centers funded through this cooperative undertaking located at colleges and universities across the state. This year, more than 5000 disabled students will participate in the program, making it the largest project ever undertaken to provide disabled students in post-secondary education with full access to microcomputers. Representatives from colleges and universities across the country have visited the High-Tech Center and left to establish centers of their own. We are currently working with major computer manufacturing corporations on a plan to create a continuum of adaptations which function identically on mainframe, mini and microcomputers. The future of computer access for disabled individuals is truly extraordinary. This book will show you how to become a part of that future right now!

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