DOCUMENT RESUME

ED 361 950 EC 302 418

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TITLE The Impact of Exemplary Technology-Support Programs on Students with Disabilities.
INSTITUTION National Council on Disability, Washington, DC.
PUB DATE Aug 91
NOTE 73p.
PUB TYPE Reports - Evaluative/Feasibility (142)

EDRS PRICE MF01/PC03 Plus Postage.
DESCRIPTORS *Accessibility (for Disabled); Assistive Devices (for Disabled); Colleges; College Students; Community Colleges; *Computer Oriented Programs; Computer Uses in Education; Delivery Systems; *Demonstration Programs; *Disabilities; *Educational Technology; Federal Legislation; Financial Support; Higher Education; Student Personnel Services; *Technological Advancement; Universities; Vocational Rehabilitation

ABSTRACT

This report examines effects of technology-supported programs on students with disabilities at the postsecondary level, including issues of access to technology and alternatives for acquiring assistive technology devices and services. After an introduction, the first chapter presents the report's recommendations, which deal with full technological access for students with disabilities, establishment of Rehabilitation Engineering Centers, testing services, amendment of existing federal legislation concerning technological services, increased federal funding for technology, development of model delivery mechanisms, and longitudinal research on effects of technology on educational achievement and employability. Remaining chapters then report on specific applications and programs including: Electronic Networks for Interaction (Gallaudet University, District of Columbia); Computer Center for the Visually Impaired (Baruch College, New York); Instructional Technology Division (University of Michigan); Disabled Student Services (University of Wyoming); Artificial Language Laboratory (Michigan State University); High-Tech Training Center (California Community Colleges); Assistive Technology Center (University of Minnesota); Disabled Computing Program (University of California); Desktop Computing Services (University of Washington; The Office of Services for Students with Disabilities (University of Nebraska); Adaptive Computing Technology Center (University of Missouri); Training and Resource Center for the Blind (University of New Orleans, Louisiana); Vocational Rehabilitation Programs (El Centro College, Texas); Adaptive Technology Laboratory (Southern Connecticut State University); Center for the Vocationally Challenged (Grossmont Community College, California); and the Technology Group (California State University). Appendices provide a list of sites and people interviewed and biographies of National Council members and staff. (DB)

The Impact of Exemplary Technology-Support Programs on Students With Disabilities

National Council on Disability

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Prepared by
Dr. Harry J. Murphy, Consultant
August 1991

Description of the National Council on Disability

The National Council on Disability is an independent federal agency composed of 15 members appointed by the President of the United States and confirmed by the U.S. Senate. The National Council initially was established in 1978 as an advisory board within the Department of Education (Public Law 95-602). The Rehabilitation Act Amendments of 1984 (Public Law 98-221) transformed the National Council into an independent agency. The current statutory mandate of the National Council assigns it the following duties:

- Establishing general policies for reviewing the operation of the National Institute on Disability and Rehabilitation Research (NIDRR);
- Providing advice to the Commissioner of the Rehabilitation Services Administration (RSA) on policies and conduct;
- Providing ongoing advice to the President, the Congress, the RSA Commissioner, the Assistant Secretary of the Office of Special Education and Rehabilitative Services (OSERS), and the Director of NIDRR on programs authorized in the Rehabilitation Act;
- Reviewing and evaluating on a continuous basis the effectiveness of all policies, programs, and activities concerning individuals with disabilities conducted or assisted by federal departments or agencies, and all statutes pertaining to federal programs, and assessing the extent to which they provide incentives to community-based services, promote full integration, and contribute to the independence and dignity of individuals with disabilities;
- Making recommendations of ways to improve research, service, administration, and the collection, dissemination, and implementation of research findings affecting persons with disabilities;
- Reviewing and approving standards for Independent Living programs;
- Submitting an annual report with appropriate recommendations to the Congress and the President regarding the status of research affecting persons with disabilities and the activities of RSA and NIDRR;
- Reviewing and approving standards for Projects with Industry programs;
- Providing to the Congress, on a continuous basis, advice, recommendations and any additional information that the Council or the Congress considers appropriate;
- Establishing policies for the President's Committee on the Employment of People with Disabilities; and
- Issuing an annual report to the President and the Congress on the progress that has been made in implementing the recommendations contained in the National Council's January 30, 1986, report, *Toward Independence*.

While many government agencies deal with issues and programs affecting people with disabilities, the National Council is the only federal agency charged with addressing, analyzing, and making recommendations on issues of public policy that affect people with disabilities regardless of age, disability type, perceived employment potential, economic need, specific functional ability, status as a veteran, or other individual circumstance. The National Council recognizes its unique opportunity to facilitate independent living, community integration, and employment opportunities for people with disabilities by assuring an informed and coordinated approach to addressing the concerns of persons with disabilities and eliminating barriers to their active participation in community and family life.

The Impact of Exemplary Technology-Support Programs on Students with Disabilities

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Message from the Chairperson

In the last 20 years significant progress has been made to give people with disabilities access to higher education. Section 504 of the Rehabilitation Act calls for a body of educational support services such as interpreters, readers and note takers. The Americans with Disabilities Act (ADA) opens increased employment opportunities for those who graduate from institutions of higher education.

The National Council on Disability (NCD) is encouraged to support increased electronic access for people with disabilities in postsecondary institutions. The technology revolution affects all people—with or without disabilities. For those with disabilities, the NCD is optimistic that access to technology will help develop well-trained individuals who will make significant contributions to society.

While this study dealt only with postsecondary education, it is clear that access to technology at all levels of education and employment is the greater goal and one we wholeheartedly support. In a related study, the NCD is examining financing assistive technology for people with disabilities. This report will shed light on the question of access to technology and will recommend alternatives for acquiring assistive technology devices and services.

The availability of assistive technology and technology-related services can mean the difference between an isolated, dependent life and an integrated, independent life. With the aid of technological devices, people who do not have the physiological ability to speak can speak through a computer. People who cannot hear can use the telephone with a telephone device for the deaf. For some with disabilities, the independence gained in acquiring the ability to speak or use a telephone may be the key to exercising their rights under the ADA.

Sandra Swift Parrino
National Council on Disability

Preface

The formal title of this report is *The Impact of Exemplary Technology-Support Programs on Students With Disabilities*. The working title, *Centers of Energy*, grew out of a conversation with Dr. Trent Batson, director of Gallaudet University's Electronic Networks for Interaction (ENFI) Project. Explaining his work, Dr. Batson used the wonderful term Centers of Energy to identify a common denominator of the projects in this report.

The ENFI Project began as a technological, educational support service for deaf students in English courses at Gallaudet. It became a model for deaf students at the University of Minnesota and, later, a model for *non-traditional* students (without disabilities) with applications to older students and to those for whom English is a second language. Ultimately it became a model for the entire field of general education, in use today at more than 150 colleges, universities and high schools in the United States and Canada.

ENFI is a Center of Energy in that this exemplary project became a valuable, influential resource in its own institution and to others. The ENFI Center of Energy, as well as others described in this report, offered that energy to many constituencies: elementary and secondary schools; colleges and universities; international, national, state and local organizations and associations; the rehabilitation community; parent groups; and others.

Even when an exemplary program was conceived as a finite resource in a single institution to a limited number of people, it soon reached out—often to its own surprise—to others. In so doing, these Centers of Energy became vehicles for systems change, touched thousands of lives, and have in turn created other Centers of Energy.

I am grateful to Dr. Batson for identifying this phenomenon, for describing it succinctly, and for supplying this report's working title. I am also grateful to Dr. Danny Hilton-Chalfen of UCLA, chair of the Equal Access to Software for Instruction (EASI) special interest group of EDUCOM, a large annual conference on educational computing in postsecondary institutions, for helping identify exemplary postsecondary institutions that offer technological support services to students with disabilities.

Harry Murphy
Consultant

Contents

Acknowledgment

The National Council expresses its gratitude to Dr. Harry J. Murphy, director, Office of Disabled Student Services, California State University, Northridge (CSUN), for conducting this study, *The Impact of Exemplary Technology-Support Programs on Students With Disabilities*.

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Introduction

Wheelchairs help those unable to walk. Artificial limbs help those who lack them. Hearing aids help those with impaired hearing. Canes help people who are blind. Terms such as *assistive* or *adaptive devices* describe a cluster of high and low technologies that give people access to their environment. In recent years, these technologies have become more sophisticated electronically and mechanically, and more computer-based. In their *Assistive Technology Sourcebook*, Enders and Hall (1990) define an assistive technology device as any item, piece of equipment or product system, acquired commercially off-the-shelf, modified or customized, that is used to increase, maintain or improve functional capabilities of people with disabilities.

Such technologies range from velcro on clothing (to help people with disabilities dress independently) and adaptations to eating utensils, mouthpieces and headpointers; to electrical stimulation of paralyzed muscles, robots that help those who have limited control of their limbs, and navigational devices and talking signs for the blind. Most technology for people with disabilities in U.S. colleges and universities has a computer interface.

Computers that have been adapted for use by people with disabilities have given them new education and employment opportunities and allowed them to create work products that are the equal of those created by people who have not experienced disabilities. Speech output devices allow a blind person to access information that normally appears visually on a computer screen. Other devices speak for those who can't. Large-print technologies allow a person with low vision to use a computer. Braille printers give quick and easy access to text. Speech recognition devices allow someone who cannot physically access a keyboard to *talk* to the computer. Simple, single-switch devices allow a severely physically challenged person to access a computer by moving a single muscle.

Colleges and universities have taken a leadership role in providing such access devices to students with disabilities. Most students use such devices to secure a liberal arts education and a career in a profession not directly related to technology. Some use access devices to master a technical skill such as computer programming. Since the postsecondary community deals primarily with adults whose studies lead to employment, this report focuses on that area.

In the past five or six years, postsecondary institutions have adopted many different technology programs for students with disabilities. Some have initiated well-developed master plans throughout an entire system, others have a computer or two in the corner of an Office of Disabled Student Services. Many have no access resources at all for students with disabilities.

Today, technology is a drumbeat at the heart of the disability field. Off in the distance, a growing number of drums are responding. It is difficult to attend a conference in the disability field that does not deal with applications

of technology to problems faced by people with disabilities. Those who work with technology want more and better technology. Those who don't have it now want it soon. This is for good reason. One need only observe a situation where, using assistive devices, severely physically challenged people can operate computers when they could not do so 15 minutes earlier. They can do word processing or develop spread sheets, they have skills that will help in school, skills that will get them jobs. They are in control.

For this report, interviews were conducted at 16 sites across the country. The common denominator was technology services to students with disabilities. Most programs are still gathering momentum, but it seems safe to predict their cumulative impact a few years from now will be many times what it is in this report. Each program's history grows out of a unique set of conditions in unique institutions. Yet, several common themes reoccur.

The leaders of these programs do not view students with disabilities in a vacuum. They recognize that such students interact dynamically with parents and rehabilitation and community agencies. These leaders also focus on employment as a result of the postsecondary experience and use technology accordingly. It is not surprising that the program leaders in this report are leaders in other areas as well. They are active in the Equal Access to Software for Instruction special interest group of the EDUCOM annual conference, Association on Handicapped Student Service Programs in Postsecondary Education (AHSSPPE), RESNA and others. After years spent designing creative, model programs and securing the resources to initiate them, the vision of these leaders is still clear and in sharp focus, validated by their contributions to their institutions and to the field at large.

Chapter 1
Recommendations

Several recommendations generated by this report involve creating new programs in colleges and universities; others involve a greater emphasis on technology in legislation.

Because postsecondary institutions are obliged to provide all students with informational access:

RECOMMENDATION 1. All colleges and universities should incorporate full technological access into programs for students with disabilities as soon as possible. One approach should involve general research on the impact of technology on the lives of people with disabilities; another should involve developing a model of technological services for minority populations of people with disabilities.

Because of the impact of exemplary postsecondary programs on encouraging the use of technology among people with disabilities:

RECOMMENDATION 2. NIDRR should establish a series of Rehabilitation Engineering Centers (RECs) specializing in issues dealing with computers and higher education.

Because technology offers a way to deliver curricula and standardized tests:

RECOMMENDATION 3. Colleges and universities should take a leadership role in developing strategies for delivering testing services to students with disabilities.

Because technology holds such promise for improving the lives of people with disabilities:

RECOMMENDATION 4. The Rehabilitation Act of 1972 and the Americans with Disabilities Act of 1990 should be amended to include mandated technological services.

Because the Rehabilitation Act of 1973 and the Americans with Disabilities Act of 1990 hold such promise to deliver technological services to people with disabilities:

RECOMMENDATION 5. Significant funding should be made available in each program to encourage the creative development and use of technology.

Because there are no clear-cut models for serving minority students:

RECOMMENDATION 6. Colleges and universities serving minority students should seek institutional and external funding to develop ways to deliver technological support services and widely disseminate these findings.

Because technology as an educational support service is in its early stages, and because its effect on the educational achievement and employability of people with disabilities is largely anecdotal:

RECOMMENDATION 7. Longitudinal research be undertaken to track technology as a major variable in educational achievement and employability for those with disabilities.

Chapter 2

Electronic Networks for Interaction

Gallaudet University, Washington, D.C.

English professor Dr. Trent Batson started the Electronics Network for Interaction (ENFI) project in 1984 at Gallaudet University, an institution committed to higher education for deaf and hearing-impaired students. His aim was to help deaf students learn a language they cannot hear, and express it in writing. IBM donated computers, a local firm donated a local area network, and Batson's English students participated in the start-up. The network quickly generated interest among other institutions serving students of all kinds. Today, ENFI is in place in 50 colleges and universities and 100 high schools in the United States and Canada.

Many attempts have been made to use technology to help those with hearing loss. The literature is full of approaches, many pioneered by Gallaudet—hearing aids, audio loops, cochlear implants, telecommunication devices for the deaf (TDDs), and linked overhead projectors (to make language more visual) are a few examples. By 1984, computer-related technology offered improved educational and occupational opportunities for people with disabilities of all kinds.

Batson, using computers to enhance language flow for Gallaudet English students, established a project originally called English Natural Form Instruction, which taught writing. He received equipment from IBM and a commitment for space from Gallaudet. Realtime Learning Systems in Washington, D.C., donated a local area network (LAN) that gave students access to others on the network. The original network consisted of students who communicated with each other, and an instructor to offer technical assistance.

The deaf students, already familiar with TDDs, readily took to ENFI. One immediate benefit was that it gave deaf students the ability to engage in group discussions. Batson began teaching ENFI's interactive strategies to other English instructors, who often had to modify their own teaching strategies as a result. He also published a newsletter to reach colleges and universities that did not deal with disability, and talked about ENFI at a dozen universities and at two or three conferences a month.

Ohlone College, a Gallaudet Regional Center in Fremont, California, was the first to implement ENFI for its deaf and hearing-impaired students. In 1987, Batson secured a three-year, $535,000 grant from the Annenberg Foundation/Corp. for Public Broadcasting to implement ENFI in a five-member consortium of colleges and universities, including the University of Minnesota,

Carnegie-Mellon University, the New York Institute of Technology (NYIT) and Northern Virginia Community College.

At the same time, still chairing Gallaudet's ENFI project, he became a visiting professor at Carnegie-Mellon University in Pittsburgh. There, Batson sought to move ENFI applications beyond deaf education. Eventually, ENFI was seen as a help to non-traditional students—commuters, those to whom English is a second language, older returning students, and students with other disabilities.

Batson has compiled a body of literature documenting ENFI-generated language gains. Under the Annenberg grant, the consortium project validated ENFI as equal to other means of teaching writing and found that ENFI students tended to write more conversationally. At Minnesota, students in ENFI courses were more likely to complete the course than those in non-ENFI courses. At NYIT, ENFI prompted more professors to engage in research.

With each application, ENFI evolved. Each university discovered new applications or applied different applications with each population. Some schools used ENFI at multiple sites on campus instead of in one room, as at Gallaudet. An upcoming conference, Network-Supported Writing '92, will focus on those who use networks to support writing. Today, Gallaudet offers three- to five-day training classes for those who want to learn and implement ENFI.

ENFI is widely used in Gallaudet's Preparatory Program, which helps build English skills then transitions students to the freshman class level. About 1,200 Gallaudet students have used ENFI, which is a good introduction to computers and a friendly vehicle used for social and formal conversation.

ENFI has received the EDUCOM/NCRIPTAL Award for best innovation, which carried a $5,000 cash prize. EDUCOM is the national consortium of computing facilities in colleges and universities; NCRIPTAL is the National Center for the Improvement of Postsecondary Teaching and Learning at the University of Michigan.

Funding

IBM donated enough equipment for two laboratories, RealTime Laboratories donated local area network software and modified it to meet ENFI needs, and Gallaudet contributed space to initiate the ENFI project.

Gallaudet's then-president Dr. Jerry Lee gave ENFI three Presidential Awards for innovative projects that totaled $106,000 over three years, and granted funds for travel. Gallaudet committed Batson's time, allocated space and supported him in securing the Dana Foundation fellowship to spend a year at Carnegie-Mellon.

The $535,000 Annenberg grant has ended but another smaller Annenberg grant is supporting research and a book on ENFI. The Adapso Foundation provided four years of funding at $25,000 per year to support laboratory staff and software development (Mac/ENFI).

Gallaudet secured a Department of Education grant for a researcher to explore the use of ENFI among children at Gallaudet's demonstration site, the Kendall School. Ohlone College in California received in-house institutional support through California Lottery Funds, targeted for exemplary activities. Batson now is involved in a new project with IBM, *Project Common Ground*, which will bring in new labs and equipment.

Starting An Assistive Technology Program

Tips from Dr. Trent Batson

• Two types of people are needed to back such a system. One must be a theoretician who can integrate the system and the institution's mission, and who is imaginative enough to implement and modify the system. The other should be a technical person who can support the local area network. Both are needed for success.

• Students will love the system—it's the faculty that must be convinced. Initiate a faculty training program or allow them to attend one elsewhere. Stay in touch with others who use such systems to share problems and successes.

Chapter 3
Computer Center for the Visually Impaired
Baruch College, New York

The Computer Center for the Visually Impaired (CCVI) was one of the earliest technology programs for people with disabilities. It began in 1977 as an educational support service to blind and visually impaired students in the Education Computing Center at Baruch College, part of the City University of New York system. Program Director Dr. Karen Luxton was one of CCVI's first students. The CCVI is an independent department that offers blind and low-vision students a range of educational services, including training in word processing, accounting and database management software. Each semester, about 15 blind and visually impaired students, most of them business majors, use the CCVI. The CCVI, a resource to blind and visually impaired community members, also serves corporations, other colleges and universities, and rehabilitation professionals.

Like most programs described in this report, CCVI has no hard data on the academic or occupational success of those who use the center, but there is compelling anecdotal data—the young artist who lost her sight to diabetes, then became a computer programmer; and the cinematographer who lost his sight, then used assistive technology to enter an MBA program targeting film industry finance.

The CCVI is an independent department, located in the university's Education Computing Center, which works closely with educators, counselors and the business community to demonstrate how visually impaired people can use computer technology.

CCVI offers students and community members non-credit short courses in WordPerfect, PC DOS, Lotus 1-2-3 and dBASE III Plus. An evaluation and training program, Practical Evaluation of Programmer Aptitude, is for those with no computer or technology experience. The course is an introduction to adaptive computing, the IBM microcomputer and word processing. Participants and referring agencies receive progress reports and evaluations of participants' computing aptitude.

Partnership In Technology, a course funded by the Department of Education, Office of Special Education and Rehabilitation Services (OSERS), gives counselors, teachers and business people an overview of the role technology can play in the lives of visually impaired people. Course participants can work in conditions of simulated visual impairment in laboratory segments.

The center also performs consulting on the job or at home for blind or visually impaired people, and offers PC training and career counseling to people with disabilities. CCVI markets services for blind and low-vision students through Baruch's Office of Disabled Students. CCVI previews its services at an annual orientation for new faculty, and CCVI activities are reported in the university's student newspaper.

CCVI also has worked with Baruch faculty and staff, as consultants to other City and State University of New York (CUNY and SUNY) campuses, private universities such as Columbia and New York University, state and Federal Departments of Rehabilitation, Commissions for the Blind in New York and New Jersey, the Metropolitan Transit Authority, the Lincoln Center, local banks, the Social Security Administration, the Internal Revenue Service (IRS), IBM Corp. and others.

Inside the university, the library is writing grant proposals to use assistive technology to make the card catalog fully accessible to blind and low-vision users. For those outside the university, CCVI brailles concert programs for Lincoln Center headliners, as well as materials for the Social Security Administration, the IRS and IBM. CCVI is a resource for brailled materials for Baruch students, faculty and staff.

As part of the Tactual Graphics Project, with support from the New York Science and Technology Foundation and the New York Community Trust, CCVI produces raised-line graphics, drawings and maps of the New York City subway system under contract with the Metropolitan Transit Authority. Because users must be trained to use the tactual materials, CCVI is planning training classes.

CCVI also is working on a grant from the Department of Education to offer training for teachers, counselors, parents and employers of Independent Living Centers, which serve people with disabilities.

Funding

In March 1978, Baruch gave the fledgling CCVI one full-time position, and the Education Computing Center director donated a portion of his time. The university contributed space and some equipment. To secure outside funding, the founding members worked with the New York Commission for the Blind, local banks and the Rehabilitation Services Administration (RSA), now part of the Department of Education.

Some grants to the Education Computing Center were used to support the CCVI in its earliest days. The New York Commission for the Blind paid $600 per-person tuition for 15 participants during the second year of summer programming workshops. In later years, the New Jersey Commission sent participants.

In 1980, CCVI secured a one-year RSA grant to train rehabilitation counselors in technologies for blind and visually impaired clients. Other, later RSA grants included a three-year Employability Grant (16 weeks of training for

blind and visually impaired clients), fees for services from the state commissions, and tuition from Manufacturers Hanover Trust Bank, Chemical Bank, Chase Manhattan and the National Westminster Bank. Later OSERS funding included a Career Path Information System grant, a joint venture with the *New York Times* to make job information accessible to blind and visually impaired job seekers.

Baruch has increased the CCVI budget for equipment and increased staff positions to three. CCVI offers for-fee, non-credit courses in data management and programming to a growing number of off-campus clients.

Starting an Assistive Technology Program

Tips from Dr. Karen Luxton

• Funding has been a problem from the beginning. We deal with a low-incidence population that is expensive to serve well. There is a need for small classes and individual instruction. With permission from those involved, we tell compelling stories. Even better, our graduates tell the story for us.

• Space is a scarce commodity on most college and university campuses; it represents a significant contribution and commitment on the part of campus administration.

• Know your environment, your allies, your resources. Tell them what you intend to do in terms of extra effort and late hours writing grants. Seek out friends at the executive level and market, market, market. Be prepared to cover both bases in your lab: disability and technical. Build in administration and fund-raising capability. No one person can do all these things.

• Use students as allies. Find out how to bring in student workers. The Financial Aid Office often can help find students who qualify under Work Study Programs and who cost the technology program very little.

• In the initial plans, consider where should such a lab be housed, would students be best served in an Office of Disabled Student Services or within an Educational or Academic Computing Lab, who will maintain equipment, where will the lab get technical help?

• When it is time to expand, do so in a certain direction, rather than multiple directions. Avoid the temptation to meet all the needs you uncover.

Chapter 4
Instructional Technology Division
University of Michigan, Ann Arbor

Ten years ago, Dr. James Knox became aware of the problems of students with disabilities when students new to campus asked what was available in the way of computing. Knox, in what is now the university's Instructional Technology Division, managed a consulting staff and questions came to him by default. He especially perceived a need among a group of visually impaired students, and thought the university should respond. A Low-Vision User Area was set up for visually impaired students. Knox felt an organization could be formed based on offering such support services to students with disabilities. At Knox's suggestion, a persistent blind student founded a group, with Knox as adviser. This became BFUG—the BARRIER-FREE COMPUTER USERS GROUP.

BFUG immediately began raising consciousness on campus about accessibility issues. Group members became campus advisers on issues and recommended equipment purchases to the Instructional Technology Division (ITD). BFUG is open to students, faculty and staff, and community members. Membership cuts across all disabilities. Meeting agendas cover topics such as hardware and software for users with disabilities, developments in information technology, and general information on computer use.

A graduate library science student with an interest in library accessibility joined Knox at the early BFUG meetings. A lab, jointly managed by the undergraduate library and ITD, was established in the library for blind and low-vision students. The lab is in a larger university-wide lab, staffed by computer-literate students. Impaired-hearing users can request interpreters. BFUG, now with 45 members, holds monthly meetings.

All University of Michigan students pay a $100 per-semester computing fee, which gives them access to campus computer facilities, consultation, electronic-mail and electronic conferences. BFUG members use electronic mail (from home or campus) to contact each other, ask and answer questions, and access bulletin boards and BFUG meeting minutes. Each Friday, BFUG members are encouraged to drop by ITD for informal questions and answers, and consulting help is available.

The group often evaluates adaptive technology products. Their recommendations help ITD purchase equipment and software. BFUG offers help on a member-to-member basis: more experienced members help less experienced, and they help Knox provide consulting services within the group. Knox is available at monthly meetings, Friday afternoon sessions, by appointment, and through e-mail conferences and bulletin boards.

In 1989 the University of Michigan hosted EDUCOM, a large, annual conference on educational computing in postsecondary institutions. Knox chaired an EDUCOM Special Interest Group on disability—Equal Access to Software for Instruction, or EASI. BFUG helped plan EASI and other sessions. EDUCOM '89 increased the level of computing consciousness of adaptive technology and general computing.

Several issues of the *University Record*, a weekly publication for faculty and staff, have featured adaptive computing and BFUG. *Expressions*, a community newsletter edited by a BFUG member, gets the word out in the community about people with disabilities. ITD newsletters and catalogs offer information about university adaptive technology resources. Knox soon will teach a non-credit course on adaptive computing.

Funding

The University of Michigan adaptive technology program is funded entirely by the university. This grows out of a desire to eliminate the need on campus for separate adaptive computing sites. Knox seeks an environment where all campus computing sites are physically and informationally accessible.

Starting An Assistive Technology Program

Tips from Dr. James Knox

• BFUG is a good model for starting a new program. It takes no money and it gets you into the business. It gives a guiding hand in developing a program on technology, allows students to make contributions, gains visibility for adaptive technology, and raises consciousness and expectations. Let students drive the program, evaluate technology and make purchase recommendations.

• Invite new students with disabilities and their parents to meetings of such groups. It encourages students and parents and is a good introduction to the group.

• Enlist support from high-level administrators. Grass-roots support is easy, but it's hard to convince people to fund programs.

Chapter 5
Disabled Student Services
University of Wyoming, Laramie

Ms. Chris Primus, director of Disabled Student Services (DSS) at the University of Wyoming, views accessibility to technology in the context of the Rehabilitation Act of 1973. Under Section 504, a college or university must provide such basic services as interpreters for deaf students, readers for blind students and test accommodations. The university also is responsible for physical access to all facilities. The introduction in recent years of computing support for all students prompts a new look at accessibility. In Laramie, the DSS program shows how a university program can offer support to students in a rural state. As DSS director, Primus suggests ways for the University of Wyoming to comply with Section 504, and deals with physical and informational access.

The DSS program Primus joined seven years ago was funded under a Department of Education TRIO grant, with university funding provided by the state of Wyoming. Like most directors of such programs, Primus saw a growing number of students with learning disabilities. She knew about the University of Minnesota computer-based program on Writing and Learning Disabilities and sought funding for a similar program at Wyoming. At the same time, the university was setting up campus microcomputer labs.

Combining the needs of students with disabilities with the university's need to give *all* students access to computers, Primus submitted a proposal to the Office of Special Education and Rehabilitation Services (OSERS) for a demonstration program to develop evaluation software that would identify appropriate software for students with learning disabilities.

Primus received a three-year grant, Computer Assistance Model for Learning Disabled (CAMLD), to implement a two-phased research-based model of adaptive education for postsecondary education students with learning disabilities, to be developed in cooperation with the departments of English, psychology and educational foundation and instructional technology; the university's Media Center; and the Wyoming Division of Vocational Rehabilitation.

Phase One developed criteria to evaluate computer software for user-friendly capabilities for college-level students with learning disabilities. CAMLD evaluated software for word processing, spell checking, spelling and keyboard skills, career exploration and job-seeking skills by using the "user friendly characteristics evaluation criteria" to determine the most effective software for these students. Phase Two taught students with learning disabilities about the microcomputers and software selected in Phase One.

Within DSS, students with disabilities took classroom tests using computers. Tests were read to blind students, who typed in answers for essay tests. Learning-disabled students used spell checkers and the thesaurus. Data were collected and evaluated to determine the microcomputer intervention's effectiveness. Comparing English grades and semester and cumulative grade point averages showed that using microcomputers for writing has a significant impact on the academic performance of students with learning disabilities.

This look at grades compared learning-disabled computer and non-computer users. Grades were higher over two semesters for computer users in freshman English. There were fewer academic probations and suspensions among learning-disabled computer over non-computer users. Students reported feeling more articulate, less frustrated with written work, more efficient. They represented themselves more competently and finished assignments in less time.

Learning-disabled and blind and visually impaired students seem to benefit most from computers. Students with learning disabilities who are education majors, and blind and visually impaired students who are social work majors seem especially proficient in computer use.

Primus's three-year grant produced an instrument and identified software that was purchased and made available to students. Students with learning disabilities were given an overview and encouraged to use computers. Results were disseminated on campus through talks to faculty; to instructors and staff in the English Department, freshman English and the Writing Center; and at Student Affairs Awareness Week.

Articles in the campus newspaper discussed the program, and an in-house fact sheet was distributed to freshman-level instructors. The CAMLD effort raised university awareness about the need for an evaluation team in the area of disability. CAMLD results were widely disseminated through presentations at the California State University (Northridge) conference, Technology and Persons with Disabilities and other meetings. Almost 200 copies of the CAMLD final report were sent to peers in the field.

Because the grant threw a spotlight on services for students with learning disabilities, more such students enrolled at the university and sought services.

As the grant phased out, Primus approached the university for financial support for basic services to these and other disabled students, and pursued funding to supplement basic services and provide leadership in the use of technology. She applied to the Montgomery Home for the Blind Trust Fund for funds to improve basic services for blind students and to help the university give such students access to its computer labs.

Primus gives talks on adaptive technology to computer instructors, who visit the office, sometimes with their classes, to see the assistive technology first-hand. She cooperates with the university's Department of Special Education, which also received a Montgomery Trust grant to orient pre-service

and in-service teachers to equipment available to school-age children with visual impairments.

Funding

With the Montgomery Trust grant, an interagency agreement was developed with DSS, the Department of Vocational Rehabilitation and State Services for the Visually Impaired to better coordinate services. Primus is seeking more physical space at the university so the Blind/VI Project can serve more students and people with disabilities in the community. By charging community members a fee for services, the program could support more staff devoted to training for employment skills.

Primus uses Section 504 to motivate the university to provide basic services. When she first came to the university, her program was funded under a Department of Education grant. Institutional support was minimal. In securing grants, she continues to educate the university about its legal responsibility to initiate, supplement and enrich services to students with disabilities.

Today, the grant has expired and the program for learning-disabled students is almost completely institutionalized. The state legislature increased the university budget to meet basic service needs for the learning-disabled population. For anything extra, Primus still looks for grants.

Starting an Assistive Technology Program

Tips from Chris Primus

• New programs should first develop a baseline of what needs to be done: Who are the students? What are their disabilities? Why do they need to be served? How can they be accommodated with general and technological services?

• Educate the college or university every step of the way. Grants enrich a program; they do not relieve the institution of the responsibility to provide services, including technology as a way to carry out 504 regulations.

• Work closely with the administration. Know which committees to approach to meet your needs.

• Start slow and be realistic in what you ask for.

• Use a high degree of personal contact with students, and a high degree of input from students about their basic service needs and their suggestions for equipment purchases.

• The Department of Vocational Rehabilitation (DVR) can be a helpful ally in counseling students and influencing the university, providing a backdrop for the university to take on financial responsibility, including the responsibility to provide space for the program.

• Educate university officials about basic services, university responsibilities, how the DVR can provide early funding with the understanding the funding will phase out and the university will pick it up. Keep the focus on the university's ultimate responsibility to provide services.

Chapter 6

Artificial Language Laboratory

Michigan State University, East Lansing

Dr. John Eulenberg directs the Artificial Language (AL) Laboratory, a teaching and research facility in the Department of Audiology and Speech Sciences, College of Communication Arts and Sciences at Michigan State University (MSU). The Lab's mission is to pursue research and development in using voice synthesis, voice recognition and computer-based technologies to detect body movements, access to computers and other language or communication-related purposes. Much research and many technology applications for people with disabilities are tailored to individual needs. Early technology applications developed in the AL Laboratory preceded many commercially available products. Today, applications include recommendations for using off-the-shelf technologies, adapting existing technologies, and creating new equipment and applications.

The AL Laboratory specializes in computer applications to help those with communication handicaps—MSU students and others who are blind or have limited physical access to communication tools (those with cerebral palsy, stroke or traumatic brain injury).

Clients who undergo evaluation and technology development typically have been seen elsewhere and referred to the AL Lab because off-the-shelf technologies do not meet their needs. Often, the evaluation team (occupational therapist, speech and language pathologist) accompanies the client to meet with the Lab's evaluation team.

The AL Lab markets its services in several ways, including in university publications for new students, programs and services. Articles about the Lab have appeared in campus and local newspapers. For several years, MSU football and basketball games featured the Lab during half-time promotional spots.

The Lab has been the subject of several television shows, including *Finding a Voice*, a NOVA documentary, and *A Gift for Sevina*, a documentary that featured a nine-year-old girl "speaking" her first words on an augmentive communication device. This show won a Michigan Emmy Award.

MSU is a teaching institution, and graduate students may carry out course and licensing requirements by working on university evaluation teams, including time spent with clients in the AL Lab. As a result, clients with disabilities are served, and graduate students learn strategies they will use in their careers.

Many graduates see technology's potential for the first time when working with the Lab. At the very least, they become more sensitive to the ways people with disabilities function and compete. MSU graduates, some with only a fleeting knowledge of the program, make referrals to the Lab. Some who have worked in the Lab and earned degrees at MSU include the head of research for Prentke Romich Co., one of the largest manufacturers of augmentive communication devices. Several former graduate students now head technology programs in Michigan school districts.

The Lab enjoys a high profile, in part because of a journal published there, *Communication Outlook*, which keeps the Lab in touch with major companies in the field that develop products and new applications. Eulenberg teaches in five university departments—linguistics, audiology and speech science, computer science, African languages and telecommunications. He is often called as an expert witness on litigation matters dealing with assistive technology. He has influenced state law; the legislature now makes $500,000 in matching funds available for assistive technology.

The AL Lab contracts with school districts to evaluate students with disabilities for assistive devices. Lab staff have trained teachers and developed curricula; and conducted in-service workshops, held conferences and developed new devices for students with disabilities. Today, former staff members and graduate students work in school district programs. Eulenberg and Lab staff have held large grants to work with residential and mainstreamed students with disabilities.

Because of early successes with augmentive communication, Eulenberg approached the Civil Service Commission in Washington, D.C., and secured a grant to introduce the first talking terminal systems and computer networks for blind employees. The project, implemented with blind IRS employees, was a Joint venture of MSU and Arkansas Enterprises for the Blind.

Eulenberg's Lab is a pioneer in developing speech products with a strong multilingual flavor. Over the years, speech systems have been developed or are being developed for American English, black English dialects, Chinese, Hebrew, Arabic and languages of India and Africa.

Funding

The university provides space for the Lab as well as Eulenberg's salary for teaching duties and responsibilities as AL Lab director. Grants, contracts and fees for service provide for the Lab's essential support. Eulenberg began work in assistive technology for people with disabilities by piggybacking applications for them onto other grants designed to implement technology among MSU students in general.

These included grants from the National Science Foundation and the Ford Foundation. Another early grant to MSU from the National Institute on Handicapped Research (now NIDRR) dealt with supporting communication aids for the speech impaired in the United States, the United Kingdom, Canada and

Sweden. Eulenberg was the university delegate responsible for implementing voice technologies at these sites.

The AL Lab had grants to implement technology in several school districts, including Wayne County Intermediate School District, which includes Detroit and 26 other communities, and Northville, where there is a large institutional population of people with cerebral palsy and mental retardation.

A group of American Jews in Pittsburgh sponsored a project to develop a Hebrew speech synthesizer for a young man with cerebral palsy who was about to make his Bar Mitzvah. The project's objectives were to help the young man read prayers and write Hebrew on a portable computer. This led to the Hebrew Voice Project, a larger Hebrew-language project developed by Eulenberg and a team of Israeli speech scientists.

Starting an Assistive Technology Program

Tips from Dr. John Eulenberg

• Newcomers should attend conferences in the field and meet other people in the world of delivering assistive devices. Learn who the players are to become one. Stage conferences and seminars, speak at them, publish in the field.

• Build teams. There is usually not an absence of talent on a college or university campus; each institution has certain strengths. Look to linguists, computer scientists and departments of mechanical and electrical engineering for help.

• The university's major commitment is space. It is the director's obligation to identify and bring in other resources.

• A new unit requires administrative support. Identify someone high up in the university structure who can make things happen. These administrative supporters must see your work as part of the university's ultimate mission.

• Look for small grants with the university to get started. Most offer some kind of seed money to get started and gain leverage needed to secure larger grants. usually from the federal government.

• Build a group that will meet regularly to keep abreast of opportunities within and outside the university.

Chapter 7
High-Tech Training Center
California Community Colleges, Cupertino

The High-Tech Training Center program was designed from the beginning ultimately to reach all 107 campuses (50,000 students with disabilities) in California's community college system. A modest High-Tech Center was established in 1984 by Carl Brown at Monterey Peninsula Community College to serve six to eight students. In 1991, High-Tech Centers on 51 community college campuses offered technological support services to more than 12,000 students. On any given day throughout the state, 5,000 to 6,000 students use High-Tech facilities. High-Tech Centers are expected to be on all 107 campuses within five years. Other Centers have been established on California State University campuses, on University of California campuses, in Regional Occupational Centers and in K-12 schools. Today, the program is a $1.4 million effort with permanent funding from the state legislature through the California Community Colleges Chancellor's Office. A request is pending for another $1.4 million.

Carl Brown is a former Buddhist monk, a crisis intervention counselor and author of practical computer books. Though he has a disability and uses a wheelchair, his work in the disability field began in 1984 when he was invited to work with computers and students with disabilities at Monterey Peninsula Community College (MPCC).

The MPCC Center began with Brown as a half-time faculty member and $25,000 in equipment. This High-Tech Center immediately cross-pollinated other campus units such as the Learning Resource Center and the English Department.

The Center was seen as a training resource for students, who were encouraged to use their assistive technology aids to mainstream to regular campus computer resources. Electronic tools assumed to be learning aids for students with disabilities—spelling and grammar checkers, dictionaries, organizational software and thesauruses—turned out to be excellent learning aids for students without disabilities.

Criteria developed early in the Center's formation determined that assistive technology should be based on software rather than hardware; should work transparently with such standard computer applications as Lotus, WordPerfect, dBase and SPSS; and should consist of tools that work in regular campus settings. They had to be easy to use and cost no more than $500.

The numbers of students using the MPCC Center grew, as did interest in the field. An increasing number of visitors came to see the program, which

influenced the formation of similar Centers. To disseminate information about the High-Tech Center model and systematically respond to inquiries, Brown secured a two-year, $160,000 grant from the Department of Education's Fund for the Improvement of Postsecondary Education, which paid to develop a practical two-volume book designed to advance the model. About 30,000 copies of *Computer Access and Higher Education for Persons with Disabilities* have been distributed.

Soon, the Chancellor's Office of the California Community Colleges asked Brown to set up a central High-Tech resource in Sacramento for the entire community college system, and individual High-Tech Centers on individual campuses. And the California State Department of Rehabilitation, which wanted the program in Sacramento to support its clients, provided a 2.5-year, $3.5 million (matching) Establishment Grant to stimulate development of the Centers at community colleges throughout the state.

Individual colleges responded to a request for proposal, and successful bidders were awarded staff positions and a predetermined package of hardware and software. The package, to help students with disabilities of all kinds, emphasized tools for students with learning disabilities and acquired brain injuries.

Eventually, the program moved to its current base at DeAnza Community College in Cupertino, the heart of Silicon Valley and home to Apple Computer. A 3,000-square-foot building houses a High-Tech Training Center, a Career Development Education Center and an on-site High-Tech Center for DeAnza students. Faculty are required to hold at least a master's degree in special education or related field, but no computer experience is necessary.

The Center offers 35 training courses throughout the year, and new courses are added to respond to new technologies. The Center trains its own and community college faculty. An 800 line answers questions from the field from 7:30 a.m. to 5 p.m. Today, 15 other states use the High-Tech Centers model. Colorado followed the Establishment Grant mechanism in developing its Centers.

The Centers are set up to serve the entire community; outreach is an established part of its mission. One community college has a mobile van to serve a rural community. Another, in a mountain community, works closely with high school students.

A Study of the Characteristics of Students with Disabilities in the California Community Colleges High-Tech Centers for the Disabled (Chancellor's Office, California Community Colleges, August 1989) offers a wealth of data on such variables as disability by ethnicity.

Funding

Brown began at MPCC as a half-time faculty member. With the move to Sacramento, the Department of Rehabilitation awarded a $3.5 million, 2.5-year Establishment Grant. The Chancellor's Office provided three permanent

positions, space and equipment worth up to $50,000. Funding to the colleges paid for staffing and equipment. The understanding was that when the Establishment Grants expired, the colleges would institutionalize the positions.

Now based at DeAnza Community College, the High-Tech Training Center has a funding base of $580,000, legislatively authorized as a line item in the Governor's budget.

Also in the Governor's budget is $800,000 in permanent funding for the High-Tech Center sites across the state. Brown is working on a request for another $1.4 million to finish placing High-Tech Centers in each state community college.

Starting an Assistive Technology Program

Tips from Carl Brown

• We have been successful because we consider the computer an appliance, like a toaster. You don't have to know how a toaster works to make good toast.

• Use as little technology as possible so the faculty and students don't become overwhelmed. Start small. It's better to have a couple of computers in a computer lab and some software that is being used than a fancy lab that is not being used. Start with the minimum amount needed to make a student functional, then let student feedback determine where to go next.

• Faculty training is an essential component of success. Those from non-technical backgrounds make the best trainers because they can communicate with students who have non-technical backgrounds.

• Things work best when the colleges provide faculty from the beginning under institutional funding, and requested equipment under a grant.

• Any college wanting to get started must have a deep commitment to training.

• High-Tech Centers should be a resource to the entire community. Colleges should work with corporations and community agencies that serve people with disabilities.

• Help dissolve artificial distinctions between technology for people with disabilities and useful technology. Spelling and grammar checkers help everybody. They are not unique to people with disabilities.

Chapter 8

Assistive Technology Center

University of Minnesota, Minneapolis

The University of Minnesota Assistive Technology Center (ATC) began as a centralized model under the Office for Students with Disabilities (OSD) but became a distributed model under the Microcomputer and Workstation Networks Center, which offers campus-wide computer support to all students. ATC is coordinated by Curt Griesel, a former UM computer science student. Another project on campus that deals with deaf and learning-disabled students is directed by Dr. Terrence Collins, professor and head of the Arts, Communications and Philosophy Division of UM's General College. Technological services for students with disabilities began in the early 1980s. The OSD centralized services and equipment but, realizing the need for technical support, they donated the equipment to the Microcomputer and Workstation Networks Center (Microcomputer Center), which agreed to distribute the equipment according to need, maintain the equipment and support students through technical consultation and training. This organizational change was realized in 1987, when UM was preparing to build a new Computer Research Center. To ensure the new Center could serve students with disabilities, informational access was added to the list of general accessibility concerns. About the same time, some adaptive devices were purchased with funds from an IBM grant, and a curriculum in the use of adaptive technology was proposed.

Curt Griesel was a UM senior in computer science, with an interest in adaptive technology, when this change occurred. He set up the equipment under the IBM grant. Upon graduation, he applied for a grant under Minnesota's STAR Program (funded by NIDRR under the Technology-Related Assistance Act), seeking a UM staff position.

STAR didn't fund the position, but in 1990 Griesel joined the Microcomputer Center team anyway after the UM vice president approved a new Coordinator position for the Assistive Technology Laboratory (ATL). With original equipment from OSD and the IBM grant as a base, the Adaptive Technology Center is 100 percent university-funded. Institutional support includes space, one staff position and equipment, and adaptive devices and software as a part of the Microcomputer Center equipment and supply budget.

The UM main campus in Minneapolis has 43,000 students, about 1,600 with disabilities. Twenty-five computer labs are scattered across campus. They tend to have Macintosh and IBM capability, with some Sun, Apollo and NeXT

workstations. A pool of adaptive equipment and Griesel's services are available to university students, faculty and staff with disabilities.

Some equipment is left permanently in heavy-traffic areas such as the university's three major libraries. Students may have devices installed as needed in other university public labs and in labs associated with academic departments such as physics or accounting. Griesel has access to a range of technical knowledge through others in the Microcomputer Center.

The OSD is a primary referral source. OSD counselors, supported by printed material, encourage students to use the Assistive Technology Laboratory (ATL). Griesel relies on OSD for recommendations on academic issues such as testing. Brochures are available on campus, and Griesel meets regularly with a campus organization for students with disabilities. The Microcomputer Center refers inquiries about adaptive technology to Griesel's office. Other referrals come from the Department of Communicative Disorders Speech Clinic.

The distributed model has been operational for 12 months. Demand for assistance and general computer use have increased, along with the use of adaptive technology for writing projects such as term papers. Consumer feedback is positive. Hard data on student progress is unavailable, but anecdotal evidence shows that working with adaptive technology to use or improve writing skills is one of the greatest benefits of such services.

The ATL serves as an information gathering and dispersal point. Griesel fields frequent phone and personal inquiries about equipment, and meets with counselors from State Services for the Blind, which supports blind and visually impaired students at the university with its own technology center. Griesel works with counselors to prescribe and recommend technology. He also works with the Division of Rehabilitation Services, which has a mandate from the state to offer clients technological support.

Another campus project that deals with deaf and learning-disabled students is directed by Dr. Terrence Collins, a professor and head of the Arts, Communications and Philosophy Division of UM's General College. As an English instructor for undergraduates, Collins pursued the problem of failure among students with learning disabilities.

In 1985, he obtained a three-year grant for a Learning-Disabled Writers Project from the Department of Education, Office of Special Education and Rehabilitation Services (OSERS). At the same time, UM was opening its Computer Research Center and Collins joined OSD director Sue Krueger to provide access consultation on adjusting workstation height for wheelchair-users.

Between 1985 and 1988, Collins published 30 papers, distributed information to 720 people, and consulted with colleges and universities that had set up similar programs for students with learning disabilities. Because learning-disabled (LD) students benefitted from Collins' writing project, such

students were allowed to register early for computer-based writing classes so they could have first-day access to this resource.

Research conducted during the grant period showed that LD students completed writing courses and achieved at the same rate (grade point average) as non-LD students. Collins also helped set up a project using a local area network to teach conversational English to deaf university students.

Funding

The ATL is funded entirely by the university. It began with a donation of equipment from the OSD and a grant from IBM, but the university's major resources are directed at students with disabilities.

Collins' project, which started with a $260,000 Department of Education OSERS grant, ended in 1988. Today, three classrooms that were equipped under an Annenberg Foundation/Corporation for Public Broadcasting Local Area Network grant are available to students with learning disabilities and to deaf students. One faculty member performs research in this area, and the curriculum is still used.

Starting an Assistive Technology Program

Tips from Carl Griesel and Dr. Terrence Collins

- Work with someone high up in the administration, and show the university how much money such a program can save.
- Become part of the computing center team as soon as possible. Advance the point of view that your program is part of the university's mission, not a special interest.
- New programs should make use of existing programs and avoid duplicating efforts.
- Invite the computing staff to sit in on program meetings.
- The quality of staff is vital. The person who coordinates access services should be a technical person who can tie in to other resources on campus, such as the Office for Students with Disabilities.
- Jump in. Someone has to believe this effort is important.
- Novices should learn how to use a CD Rom search protocol. Learn what others have done and build on it. Build proposals and work plans on what others have already reported. Tie your work plan to the campus mission. Use graduate students to help carry out your work.
- Make a good-faith effort to use whatever equipment is available. Only ask for what you don't have.
- Don't go it alone if you can set up a consortium of interests. Students, alumni and computer resource people all can help. Enlist the help of the math and English departments, the library and others.

• Tie technology to what the students need to do. Build structures to deal with student needs in a way that's valuable to the institution. Meet needs that are visible to the administration.

• Working in isolation can be lonely and frustrating. Attend conferences where people share information. Plug into national information databases such as SpecialNet and bulletin board services. Start early convincing people that your work is of national importance. Ask for money in your grants to go to national conferences.

• Don't buy equipment that will soon be outdated. Consult widely. Try to anticipate two years in advance.

Chapter 9
Disabled Computing Program
University of California, Los Angeles

The UCLA Disabled Computing Program (DCP) is part of the university's Office of Academic Computing. Dr. Danny Hilton-Chalfen first got involved in 1984 when he was working for Social Science Computing as a graduate student, setting up campus microcomputer labs. When the issue of on-campus access for people with disabilities was raised, Hilton-Chalfen was asked to analyze the situation. His recommendations led to the establishment of a Disability and Computing Demonstration Lab as part of the Microcomputer Information Center. Today, Hilton-Chalfen renders technical assistance in the Lab and across campus for users with disabilities. As coordinator, he considers himself a campus advocate of people with disabilities and for technology access issues. He chairs EDUCOM's EASI (Equal Access for Software Instruction), a special interest group that deals with disability issues.

The DCP seeks to create and maintain an accessible campus computing environment, and provide computing tools needed to help those with disabilities be independent and successful in their course work, research and employment.

The DCP established a demonstration Lab in the Office of Academic Computing, with prototype workstations for demonstrations and public access. This is one of three demonstration Labs. Another deals with Apple and IBM advanced workstations, the third is a Network Demonstration Lab.

DCP cooperates with other university disability interests, including the Section 504 Office, the Office for Students with Disabilities (OSD), the Chancellor's Advisory Committee on the Disabled, the university's Personnel Office and the (student) Union for Students with Disabilities.

In the School of Law, Humanities Computing, the Office of Academic Computing and the Microcomputer Support Office, 504 walkthroughs of microcomputer labs and classrooms identified access concerns and contributed to long-range planning. Jointly, DCP and the 504 Office published an access guide that has been requested by organizations nationwide. DCP helps direct incoming students to OSD, recommends computer access strategies, and provides extensive support in brailling class notes for visually impaired students. DCP also provides custom support for foreign language brailling, and brailles OSD publications.

DCP markets its services through campus presentations, articles in the *Daily Bruin* student newspaper, and newsletters and bulletins of the Office of

Academic Computing, including *UCLA Microcomputing* and *Perspectives.* Technology services are marketed through OSD publications, and OSD distributes DCP publications. Note takers and students with disabilities can check out laptop computers from DCP. Hilton-Chalfen makes presentations to the OSD staff.

The computing support coordinators of various campus labs meet regularly to discuss common issues, and Hilton-Chalfen uses this forum to educate them on accessibility issues and specific technologies. He is also committed to introducing technologies within the new Disability and Technology Demonstration Lab.

These include using the Macintosh portable computer for evaluating software for students with learning disabilities, Toshiba laptops for note taking, the Kurzweil Personal Reader, DragonDictate voice recognition, the AST 386 computer for running DragonDictate, TSI's "Navigator" (a tactile-braille computer screen display) NEC Multisynch VGA display for people with low vision, and a variety of new software including PRD+ abbreviation expansion, GrandView outline program, Duxbury English and Nemeth braille translation, and Flipper voice synthesizer site license.

UCLA is part of a network of higher education campuses in southern California, including Santa Monica Community College, California State University, Northridge, and the University of California, Irvine. Hilton-Chalfen consults with campuses in and out of the area on implementing adaptive technology accessibility.

He also chairs the EASI project, a unit of EDUCOM, the national professional association for computing in higher education. EASI's mission is to provide information and guidance about adaptive technology issues in higher education to other campuses, promote exemplary programs and help fledgling programs.

Funding

DCP began in 1984 when Hilton-Chalfen, a graduate student, gave 10 hours of his time in Social Sciences Computing to adaptive computing issues. Some peripherals were purchased and two workstations were designated as access stations.

In 1986, the University of California Chancellor's Office approved a one-year pilot project on accessibility, took Hilton-Chalfen's time up to 20 hours per week and awarded $20,000 for equipment. At year end Hilton-Chalfen proposed making the program a permanent entity.

The Chancellor appointed a Task Force with members from Social Sciences, Academic Computing and OSD to define the program and determine where to house the program.

Today, DCP is in the third year of a four-year plan that took Hilton-Chalfen's Coordinator position to full time, added a full-time technical assistant, gave DCP an equipment budget ($25,000 for each of the first three

years, $30,000 in the fourth year), set up the Demonstration Lab, provided space and supplies, and gave the unit the support of the campus at large.

Starting an Assistive Technology Program

Tips from Dr. Danny Hilton-Chalfen

• A novice to such a program should examine resources on campus that pertain to disability: committees, departments and people involved in access issues.

• Identify the basic organizational structure of campus computing and encourage the players to get together. The players should develop adaptive technology support and bring it to the attention of the highest possible level of administration.

• Encourage establishing a Task Force to address accessibility and develop an action plan. The group will need supporting documentation of activities on other campuses and legislation that influences such a program.

• Find an environment that will help the technology program flourish and involve that department's management in your work.

• As soon as possible, request staffing for a person whose sole responsibility is support of this program. This should probably be a technical person if the program is housed in Academic Computing. Beware of having a person with split responsibilities in other areas of computing or within the Office of Students with Disabilities.

• Build relationships within the university. Go campus-wide from the beginning. Become part of the larger computing picture.

Chapter 10

Desktop Computing Services

University of Washington, Seattle

Sheryl Burgstahler is manager of Desktop Computing Services (DCS) in the University of Washington Academic Computing facility. Responsibilities include running student computer labs, coordinating a consulting group, conducting computer fairs, working with user groups and negotiating campus software licenses. Within this framework, she sought to incorporate access services for students with disabilities. When the program began eight years ago, Burgstahler delivered technical services to students with disabilities. Today, one of eight consultants under her administration deals with computing access for students with disabilities. Burgstahler feels access is best carried out in cooperation with the campus Disabled Student Services Office (DSSO). With that director, Burgstahler and her consultant identify and resolve access issues. Burgstahler also has budget control over various campus computing labs, permitting her to buy and place adaptive equipment in appropriate settings. Most adaptive equipment is centralized in the Student Union HUB Micro Lab, which houses 48 computer stations. The HUB is a physically accessible, central location, with technical assistance (student help) available during Lab hours. The DCS access-issues consultant is called in as needed.

At some campus locations there are showrooms to demonstrate computing equipment, at others there are computer labs. Other departments may purchase and place adaptive equipment in their own labs instead of in the HUB. When two blind students enrolled in the Law School, for example, Burgstahler, DSSO, representatives from State Services for the Blind and the Law School met to consider accessibility to on-line legal information services. A system was configured, the Law School purchased equipment, and students accessed information from host computers in the Law School.

A group of students with disabilities formed a user group, *Computer Curb Cuts*, which anyone from on- or off-campus can attend. Burgstahler meets with the group six times a year. About 200 people in the Seattle area receive meeting announcements, and recent meetings have featured vendors such as Dragon and Kurzweil.

Working with the DSSO director, Burgstahler obtained a grant from Seattle's Library for the Blind for greater accessibility on campus. A blind student can identify printed information of interest to visually impaired students, and that material will be brailled and put in a large-print format.

Information comes from such areas as food services, library information services, computer labs and admissions. Another joint DCS-DSSO project addresses training a trainer—a blind student—who will give computing support to other blind students on campus under tutelage from DCS consultants.

The DCS access-issues consultant deals mainly one-on-one with students who have disabilities. It is not unusual for the consultant and a blind student to sit side-by-side to evaluate the effects of new software on the accuracy of braille output. Most questions from other departments about computer access come to Burgstahler.

Computer-access services are marketed through joint efforts of the Academic Computing Center and DSSO. There are mailboxes for students in the DSSO office, and an active electronic-mail network on campus with individual electronic mailboxes and bulletin boards. Notices about services and special meetings are distributed electronically and in hard copy. Large-print and brailled notices go into boxes of blind and visually impaired students. Other marketing efforts include articles in staff newsletters, the student newspaper and internal computing newsletters about services.

The Academic Computing Office conducts an annual Computer Fair. Statements about general physical accessibility go into literature promoting the event. Promotional brochures are available in braille and large print. At least one conference session deals with accessibility for people with disabilities.

Burgstahler's office is a community resource. Individual therapists and representatives from community colleges, hospitals and the State Department of Rehabilitation visit the campus for equipment demonstrations or to seek client evaluation referrals. She also works with the university library on improved access. With library information now available via networks, Burgstahler wants to see easy access from the host computers within the library and from networked computers elsewhere on campus.

Funding

Except for a modest grant from the Library for the Blind, DCS is 100 percent university-funded. The university's commitment includes equipment and software, space, staffing and supplies. As the person with budget control, Burgstahler can add to the inventory of adaptive equipment and special software as needed. When upgrading a campus computer lab, for example, she can add adaptive equipment. One problem is in anticipating what equipment students will need in the future.

Starting an Assistive Technology Program
Tips from Sheryl Burgstahler

• An ideal task force to help develop an assistive computing program would consist of directors of the Disabled Student Services Office and Academic Computing, key representatives from a student organization representing people with disabilities, and representatives from the library, affirmative action and admissions.

• Develop a strong working relationship between the Disabled Student Services Office and Academic Computing so the person from Academic Computing can financially support technology services and make changes as needed.

• Identify needs, chip away at the problem, and ask what the program can reasonably do to make a difference for students with disabilities.

• Important information can inexpensively be brailled or put into large print, and sometimes at no cost by off-campus, private or government agencies serving the blind. A user group on access issues also costs nothing. More interest than expertise is needed to get started. Group members learn quickly from each other.

• If the program has no equipment in the beginning, contact vendors and ask them to come in and demonstrate equipment for the group.

• The biggest problem is managing equipment—keeping it up and running and ready to be demonstrated.

• Network with peers in other colleges and universities to avoid isolation. Contact groups such as EASI and AHSSPPE to stay on top of issues in the field.

Chapter 11

The Office of Services for Students with Disabilities

University of Nebraska, Lincoln

After seeing a demonstration of technology for students with disabilities at a 1985 meeting conducted by Budd and Dolores Hagen, organizers of the Closing the Gap technology conference, Christy Horn wrote a three-year grant proposal to the Department of Education, Office of Special Education and Rehabilitation Services (OSERS) for computers and staffing. At the University of Nebraska, students with disabilities felt their lives were being controlled by others, and to some extent that was true. Technology was an independence issue. The OSERS grant provided technological support services to students, primarily those with physical disabilities. On this project's Advisory Board was the state director of Vocational Rehabilitation (VR) Services. Working with the university, VR provided funding to many students for personal computers and assistive devices. Tracking computer time and comparing this with grade point averages, Horn showed that students' grade point averages jumped from 1.99 to 2.92 in two years. The 2.92 GPA put students with disabilities right where other students were, and they reported greater feelings of independence.

In 1985, the University of Nebraska served about 25 students with disabilities through its Office of Affirmative Action. Today, the Office of Services to Students with Disabilities (OSSD) serves 500 students. Computer services contributed to this growth, as did several other factors, including an article in *Time* magazine.

An April 3, 1989, cover story on student athletes highlighted a University of Nebraska basketball player, Carl Hayes, who had trouble reading. Hayes, referred to OSSD, was diagnosed as having a learning disability. The article described educational support services he received as a legally handicapped person, including tape-recorded texts, and reading and note taking services.

Afterward, flooded with students, OSSD began getting Athletic Department referrals of students with diagnosed or undiagnosed learning disabilities. The office also got calls from other states about its support of athletes. It developed intake instruments on technological assessments and the kinds of accommodations students would need.

Dr. David Beukelman, a professor of Special Education and Communication Disorders, joined Horn's advisory board. So did the heads of other organizations such as Nebraska's State Services for the Visually Impaired. The university and VR spent $1 million to make campus residence

halls more accessible. A local hospital provides attendant care. Lincoln has a city transportation system for people with disabilities. Beukelman oversees technology assessments. VR assesses most learning disabilities.

Horn secured more funds—an 18-month, $132,000 Research and Development grant from the Department of Education's Technology and Media Division. InfoNet networked an IBM system with CD-Rom drivers that was field-tested at the university and with high school and elementary students with disabilities. Voice output allowed people with print disabilities to access information without having to do heavy reading. When the grants ended, the university's chancellor approved formation of the OSSD and Horn, who had been the technology trainer, was appointed coordinator.

The OSSD has the most sophisticated computer lab on campus. The Computer Resource Center donated two Macintosh computers, and the OSSD has some access technology in the residence halls. Many students have their own access devices.

New students are connected with VR right away so they can get their own equipment. VR works more directly with students with physical disabilities. OSSD refers blind and visually impaired students to State Services for the Visually Impaired, where they typically receive training and equipment loans. When a new student contacts OSSD, Horn handles straightforward recommendations for technology. She uses Buekelman (an augmentive communication expert), VR, or local hospitals for specialized assessment. VR often purchases equipment for individual clients within two weeks after recommendations are made.

Nebraska is a rural state, so the university serves many rural students with and without disabilities. OSSD also has a special program to serve minority students who are university athletes. These are primarily students with learning disabilities that went undiagnosed until they got to the university. VR helps market university services to students with disabilities using brochures that have information about OSSD.

Horn is active in the field through several professional associations. She chairs the Technical Advisory Group for Nebraska's Technology-Related Assistance Act, funded by NIDRR. In AHSSPPE she chairs the Computer Special Interest Group. Horn arranged a hands-on technology demonstration at the 1991 AHSSPPE conference in Minneapolis. She has attended the CSUN conference, presented a half-day workshop on Computer Access at the October 1991 Closing the Gap conference, and is active in the EDUCOM EASI Special Interest Group on Disability.

Funding

Two federal grants initiated the university's technology services and were the chief motivation for forming OSSD. When the grants ended, the university picked up Horn's salary as coordinator and paid for some student assistants, $35,000 for interpreters and other service providers, and some equipment.

The university Foundation has awarded small grants for equipment. Graduate assistants come from educational psychology, speech pathology and special education. Space is an important factor. OSSD is located in a prime, centrally located spot near the bookstore, the University Student Union and the residence halls.

Starting an Assistive Technology Program

Tips from Christy Horn

• One of the biggest mistakes is to get $100,000 worth of computer equipment and no staff. A good staff consists of someone full time in charge of the computer lab, and someone who is good at training students on the equipment. Graduate students are a good resource.

• Get students up on computers as soon as possible to take tests. Keep labor-intensive activities down. Tell students very early that they are going to have to take tests on computers.

• Follow the new technologies. Voice input is an exciting new technology. Do your homework—don't spend money on something you haven't seen. Get to conferences and haunt the exhibit halls. Take a piece of software with you. Make them demonstrate that new technologies work with your equipment.

• Connect into campus and community resources. VR is a critical community contact. On campus, use computer science people. Seniors often have to do projects, computer science majors can help write manuals for software or set up batch files, others can do research on new equipment, special education majors can do volunteer work, and all students can work as tutors.

• If you get started on federal money, don't wait for funding to end to connect into the university system, and connect early while the student population is low. If you don't have outside funding, go to the University Foundation for equipment to get started. It's not so hard to get money for equipment. It's tougher to get money for staffing support and training.

Chapter 12
Adaptive Computing Technology Center
University of Missouri, Columbia

Columbia, Missouri, is home to the world-famous Rusk Rehabilitation Center, which deals with spinal cord injuries. Because it has a relatively high number of wheelchair users, Columbia has been a leader in physical access. It was one of the first cities to cut curbs. Federal grants predating Section 504 of the 1973 Rehabilitation Act provided for physical renovations on campus. In 1985, year-end funds in the university Equal Opportunity Office were designated for physical access projects. Because this $10,000 wasn't enough to fund a significant physical renovation project, the Computing Center was asked if it could use the money to give students with disabilities access to computers. A committee formed to consider campus-wide computer access for students with disabilities, leading to the immediate purchase of a few adaptive devices and salary for a half-time graduate assistant. A white paper detailed how the university could make computer access part of its mission. Since then, the university has taken a leadership role in providing computer access to students with disabilities.

As microcomputer labs were established at the University of Missouri's Columbia campus in the early 1980s, students with disabilities and others began raising access issues. Not much was done until 1985, when the university's Equal Opportunity Office encouraged Campus Computing to consider electronic access as a way to spend year-end money designated for physical access.

A group was formed that consisted of representatives from the university Access Office, the Rehabilitation Counseling Program, the Rusk Center and a medical pediatrics faculty member. They recommended that a Total Talk PC be purchased and a half-time graduate assistant assigned to help students with disabilities.

William Mitchell, director of advanced projects for the Computing Center, said the group continued to work on a model of access. The Computing Center supported a half-time staff person, then increased the position to full-time. The Adaptive Computing Technology (ACT) Center now has two full-time staff members and graduate assistant support.

Early in its history, to attract vendors and university support, ACT made presentations at national conferences. When EDUCOM formed its Special Interest Group on Disability and sought a campus to act as its first home base, the Center volunteered to coordinate activities. ACT continued its

coalition-building efforts, bringing together university administrators, Rusk Center and University of Missouri Medical Center teaching faculty, Vocational Rehabilitation, State Services for the Blind, major manufacturers such as IBM and Apple and a host of smaller vendors.

The Computing Center increased ACT staffing and space and allocated up to $40,000 a year for equipment. IBM and Apple donated equipment, and other vendors donated or loaned equipment. Vocational Rehabilitation (VR) and Services for the Blind supported purchases of equipment for their clients.

ACT works cooperatively with VR and Services for the Blind by performing student technology assessments, followed by written recommendations for the purchase of equipment. The average system costs about $5,000; some have cost $10,000. VR funds an estimated $40,000 in equipment per year, and has for three years. At VR's request, ACT evaluates clients who are not university students on a fee-for-service basis.

ACT Center services are marketed in several ways. An all-university publication, *A Student Guide to Computing*, goes to all freshmen. ACT services are emphasized in this guide. The Access Office tells all students with disabilities about ACT, and Campus Computing distributes information. The ACT Center publishes a newsletter. ACT's testing and training room is in the Arts and Sciences Lab, the hub of computing, open 24 hours a day, in a central campus location. The ACT Center routinely consults with state colleges, which send representatives to examine the ACT program.

The Center receives inquiries from within and outside the state. ACT Center staff cooperated with IBM to write the WordPerfect profile for IBM's ScreenReader. This has now become an IBM standard and is distributed along with the ScreenReader.

The Access Office recently sponsored a program on the Impact of the Americans with Disabilities Act and ACT contributed a segment on adaptive equipment. Center staff demonstrate adaptive technology at state conferences, including two sponsored recently by VR. ACT also has placed equipment at the Rusk Rehabilitation Center, which offers training and technical support.

Funding

The university Computing Center completely funds ACT. All students pay a $2-per-credit fee to partially support campus computing efforts, generating $1.2 million per year. This supports ACT staff and provides up to $30,000 per year for devices for students with disabilities. The fund also provides a half-time graduate assistant and other student help.

ACT formed a critical alliance with VR and Services for the Blind to provide equipment for individual students. The university has no grants, but is in the process of applying for grants to provide services to a broader clientele outside the university. The ACT Center's work with VR clients who are not university students is in its early stages. The Center performs assessments and makes recommendations to VR at a $45-per-hour fee for service.

Starting an Assistive Technology Program
Tips from William Mitchell

• It is important for an Adaptive Computing Model to have goals—direction, priorities, philosophy.

• A university that is already in the computer support business, with labs on campus, has a leg up. Secure access to the machines to give priority to students with disabilities. Usually such labs are already staffed, often with graduate students. Find a graduate student who is computer literate and interested in access for students with disabilities, and try to get him or her assigned to supporting the hardware.

• Talk to other players on campus. Build a coalition of supporters from the Access Office, the Learning Center, and faculty or staff with disabilities.

• To get started, use existing equipment and people. A lot can be done that costs very little. Use a trackball instead of a mouse, or special software that allows single-finger input. Do inexpensive things first; find students with disabilities who need support and start serving them.

• Program developers should talk to vendors. All universities work with vendors, many of whom will provide adaptive equipment on loan.

• Access is legislatively mandated, but don't push that too hard. Be positive. Have references handy to show you are meeting a legal mandate.

• Steer the program where you can have maximum impact. If you have more blind than learning-disabled students, go in that direction.

• Form links with the campus Access Office, which can schedule tests and help support test proctoring of students with disabilities through the use of computers; with the campus Learning Center, which can provide tutoring; and with the library.

Chapter 13
Training and Resource Center for the Blind
University of New Orleans, Louisiana

Oliver St. Pe, with a background in political science and public administration, joined the University of New Orleans (UNO) in 1984. He was to conduct programs in continuing professional education for public administrators under UNO's Public Service Training Program, an outreach program for enhancing quality of life throughout Louisiana. Blind himself, St. Pe used a computer in his work and personal life. In 1985, his department approved $5,000 in computer support for St. Pe. Seeing how it helped him, he proposed an adaptive computing program to the Louisiana Department of Health and Hospitals (DHH) to train blind employees. DHH gave St. Pe a memorandum of understanding and UNO supported a $15,000 loan, which was paid back over three semesters from tuition fees. Nearly 1,900 DHH employees have been trained under a $500,000 contract between DHH and TRCB—the Training and Resource Center for the Blind (and Other Handicapped). Blind and visually impaired matriculated UNO students enrolled in the second series of courses. TRCB now serves students, teachers and rehabilitation counselors, and blind and visually impaired community members throughout Louisiana.

Based on his own experience as a blind person profiting from technology, St. Pe developed a program to serve Louisiana state employees with contracts from the Departments of Vocational Rehabilitation, Transportation and Development, and Health and Hospitals, as well as UNO students with disabilities. He established the TRCB as an advisory, information/technical, evaluation and training center to make knowledge and information accessible through the use of technology to those with impaired vision and other disabilities.

A program development and planning team was formed. Eight of 10 members were visually impaired. St. Pe and his group finally arrived at a curriculum of 150 contact hours that covered screen access, DOS, word processing and exposure to Lotus 1-2-3.

The initial course was offered to blind and visually impaired students who were sponsored by Vocational Rehabilitation (VR), the Veterans Administration (VA) and the Greater New Orleans Council for the Blind. The only criteria were a high school diploma and minimal typing skills. UNO students were added with the second course offering and, later, service was extended to blind and visually impaired community members. The Center now

offers courses in data management and medical transcription, word processing, DOS, Lotus 1-2-3 and other programs.

TRCB predated and influenced the formation and development of the university's Office of Handicapped Student Services (OHSS). TRCB helps students take tests, offering equipment and consultation in conjunction with the Learning Lab and OHSS. TRCB does materials production (large print, braille) and test duplicating for students and professors and is a resource as well to off-campus, non-traditional students taking no-credit courses.

TRCB works closely with OHSS, which identifies students and encourages them to take advantage of the Center's technology services. TRCB has brochures and flyers, and participates in most state conferences and conventions. The Center conducts tours for high school teachers, who let their students know what to expect when they come to UNO. TRCB also works with the VA and other federal agencies.

TRCB has encouraged the university to make its campus physically accessible and learning accessible to all students. In 1989, TRCB gave $10,000 in rehabilitation funds to improve accessibility in campus buildings by installing automatic doors, building ramps and improving accessibility to bathrooms and drinking fountains. The university offers a course to all students, Computer Science 1000, Introduction to Computer Literacy. St. Pe teaches a section of this course in adaptive microcomputing for students with disabilities.

In addition to teaching continuing education courses, TRCB serves as a resource to Louisiana's VR by teaching, evaluating clients, maintaining a demonstration lab, performing research on blindness and other disabilities, and helping with case management files.

All policy manuals are now electronically accessible; a blind or visually impaired rehabilitation counselor can access this information through large print, braille or speech synthesis. All counselors with disabilities in Louisiana have adapted computers on their desks. TRCB developed a software system that helps Rehabilitation Services maintain the state-mandated Louisiana Blind Registry, a list of state residents who are legally blind.

Under another contract, TRCB assessed the size of the state's deaf-blind population. A resulting report included demographic, education and training information on this population. A nine-month grant allowed TRCB to provide creative and practical technological and other strategies as a supplement to classroom instruction for 20 visually impaired young people, aged 14-22.

The Center serves as consultant to the Harris-Lanier computer manufacturing company, installing medical transcription systems designed to accommodate those who are blind. Staff members have helped install systems in Louisiana, Maryland, South Carolina and Oklahoma. The Center has completed modifications and supplemental training for Chevron, the VA, the U.S. Navy, the New Orleans City Attorney's Office, Watters Petroleum and others.

Funding

TRCB began with a university loan for $15,000. Six months later the Center received a $200,000 equipment grant from the Department of Rehabilitation.

Today, the program's $250,000 annual budget includes training counselors, carrying out research, developing access standards, holding workshops on blindness, and offering information on the Americans with Disabilities Act.

The Center also manages training for the state's Randolph Sheppard Program. Under a VR contract TRCB trains staff and vendors. Marketing plans and strategies are developed. The Center has plans for a $3 million rehabilitation center to house its programs.

The Department of Vocational Rehabilitation has spent $250,000 for engineering and architectural studies. A bill authorizing $2.5 million to complete the facility is pending in the legislature, and a 30,000-square-foot building (attached to a residential facility) is planned for 1994. The institutional commitment includes space, and the university will fund new operations. St. Pe's salary and that of 17 staff members is generated by program income.

The Center has no federal grants, although St. Pe would like to secure federal grants for long-term research and development on topics such as the correlation between assessment information and the effectiveness of a student upon completion of training.

TRBC staff have worked with different departments on campus to secure grants for special equipment for students with disabilities. Equipment purchased for the Computer Research Center, the library, and the Media and Learning Centers include closed-circuit television systems, desktop microcomputers with voice synthesizers and large print software, a camera projection system for large print images, a reading machine and a braille printer.

Starting an Assistive Technology Program

Tips from William Mitchell

• Take help where you find it. Build coalitions but don't form committees. Instead, share your experiences with others. Seek out those who share your interests in the English and math departments, the library, the bookstore, and Special Education, where people with disabilities seek help.

• Join associations like EASI or AHSSPPE. Go to conferences, find out what the rest of the world is doing. Ask questions: How did you finance your work? What did your administration think about it? What is your relationship with Vocational Rehabilitation? As you get up on the learning curve, pray for inspiration and figure it out yourself.

Chapter 14
Vocational Rehabilitation Programs
El Centro College, Dallas

El Centro College is a comprehensive community college, an urban institution whose mission is to serve the widest possible array of students. Serving students with disabilities always has been part of that mission. Since 1976, El Centro has offered, in conjunction with the Texas Rehabilitation Commission (TRC), a Career Training Program funded by TRC. The program offers basic math and developmental reading skills. Another program, Computer Programmer Training (CPT) for the Physically Challenged, began in 1985 to prepare students with disabilities to perform management information services work in major Dallas/Fort Worth corporations. In 1987, an Office Systems Training (OST) Program for the Disabled was developed as a middle ground to meet the needs of students in between the Career Training Program and CPT. The Career Training Program now serves as a feeder program for OST. El Centro president Dr. Wright Lassiter, Jr., sees the OST program as a natural part of a comprehensive program for people with disabilities. Technological resources also are offered El Centro students with disabilities who are not enrolled in the Career Training Program, the CPT or the OST. Under Special Services Office (SSO) Director Jim Handy, assistive devices for students with disabilities have been placed in El Centro's Computer Lab.

El Centro's Career Training Program is one of the largest Vocational Rehabilitation (VR) community college programs in the southwest. IBM and El Centro's Business Advisory Committee (BAC) played a large role in starting the Computer Programmer Training Program for the Physically Challenged. The BAC, composed of representatives from the Dallas/Fort Worth business community, ensures instruction is current, monitors teaching quality, and helps evaluate the program. They have become advocates for the program.

CPT began with the vision of Hal Heitz of IBM, who took a six-month sabbatical to plan the program. He also sought support from other companies that could donate state-of-the-art equipment and hire graduates when they completed training. Heitz involved the Dallas Mayor's Committee on Employment of People with Disabilities and built an initial Computer Training Program BAC of 50 members.

Students who enter Computer Programmer Training must be physically challenged, must have a high school diploma, above-average intelligence, and a 12th grade reading level and must pass a Computer Battery Test with a minimum score at the 50th percentile. Over the first five years, 20 students

entered the program. The number recently dropped to between 12 and 15 eligible students. But rather than loosen admission criteria, El Centro stepped up its marketing program. VR Program Director Gloria Rosenberg says CPT has relied on rehabilitation counselors for referral so far, but is making contact with insurance companies, hospitals and back pain clinics to reach a group of people who do not usually seek vocational rehabilitation.

In Computer Programmer Training's second year, the staff began to discover many motivated students with disabilities who did not meet program criteria, and the Office Systems Training program was conceived. The TRC provided $98,000 in support, and a second BAC was formed.

El Centro considers job placement its greatest indicator of success. Most Computer Programmer graduates, 89 in all, are placed in BAC companies. The CPT placed 100 percent of graduates for the first four years, then 12 of 15, then 10 of 12. An eight-month training program is followed by a two-month internship, usually in a BAC company. OST has a 76 percent placement record.

The CPT curriculum, more stringent than one offered through regular El Centro courses, is handled as non-credit courses under the college's Continuing Education Program. A BAC Curriculum Committee helps the program keep up with this rapidly changing field. Finding qualified instructors and maintaining them is the program's key to success. CPT graduates are finding jobs in the community at salaries between $21,000 and $30,000, with an average of $26,000. CPT staff meets with supervisors before a new employee is placed. They discuss what to expect and how to accommodate the employee.

CPT students are largely male, white and middle-aged. In six years, eight women, two blacks, one Hispanic and one Asian student have completed the program. In early classes there were more people with congenital disabilities. This has shifted to those who have more recently experienced a disability. The OST program more accurately reflects El Centro's ethnic makeup. OST is 50-50 male-female and 50 percent minority. The average starting pay for an OST graduate is $14,000 to $18,000 per year.

Students with disabilities take other courses at El Centro, and the SSO provides interpreters, readers, tutors and note takers. All students, including those with disabilities, use equipment in the college Computer Lab, which offers devices such as large print, braille printers and speech synthesizers.

Funding

The college supports the VR programs with space and by covering administrative overhead. The facility is located in generous, attractive space in El Centro's downtown Dallas facility, formerly a department store.

Initial 1985 funding of $72,000 for the CPT came from the Job Training Partnership Act (JTPA), a combination of city and county funds. TRC added $50,000. JTPA also supported the OST Program. TRC and the Texas Commission for the Blind have supported El Centro programs.

Before 1985, the rehabilitation organizations supported the Career Training Program and the OST program, and supported the purchase of personal computers and adaptive devices for students enrolled in the CPT program.

Starting an Assistive Technology Program

Tips from Dr. Wright Lassiter, Jr., and Gloria Rosenberg

• Have one Business Advisory Committee instead of two, with a strong Public Relations Subcommittee.

• It is critical to keep all partners and partnerships up to date. They can include the college administration, program staff and all other supporting organizations. The chain of communication has to keep flowing.

• There was initial concern about the tough eligibility criteria for the Computer Programmer Training Program, but it has proved itself and is now a showcase program. The students view it as a tough program, like boot camp. But the Business Advisory Committee sees the students as well qualified, more qualified, often, than graduates of other area programs.

Chapter 15
Adaptive Technology Laboratory
Southern Connecticut State University

By spring of 1988, many professors at Southern Connecticut State University (SCSU) required students to use computers for writing, accounting, information management, research and statistics, simulations, computer programming and computer-aided design. While computer laboratories were available at several points on campus, students with learning, visual and physical disabilities had no access to the hardware or software. A committee was formed to address these needs and propose solutions through an Adaptive Technology Laboratory (ATL). The ATL was conceived as a unit that would insure equal access to computers for SCSU students and staff, support university teacher education departments, and become a community resource serving non-university teachers, professionals and people with disabilities. ATL administrators visited California's High-Tech Training Center for two days of intensive training, and Center Director Carl Brown visited SCSU to help the fledgling Lab. A major contribution of the ATL is its Start-Up Kit, a compilation of intake, evaluation and service forms; a list of resources; self-directed training modules for adaptive devices; word processing curricula; and a student survey (feedback) form. A disk is included that has information about starting a lab in a postsecondary institution.

Motivated by Sections 504 and 508 of the Rehabilitation Act, and in response to requests for assistance from several blind students, a cross-departmental committee of university faculty, staff and administrators concluded that access was a university responsibility. An Adaptive Technology Laboratory (ATL) was formed and a grant was prepared that ultimately brought $25,000 worth of equipment to the ATL, which is based in the library.

The Lab, in operation for 2.5 years, is a centralized operation whose influence spreads across campus in several ways. Students with learning disabilities have learned that the university's Macintosh Lab has five trackballs, making the Mac Lab computers accessible.

The ATL has helped other campus computer labs make physical accommodations for wheelchair users. The ATL helped the Institute for Classroom Computing write a proposal to IBM that secured adaptive equipment for use there. Students can borrow software to take to other labs, and laptop computers are available on loan.

Under a small grant from the Office of the Vice President of Academic Affairs, Lab staff conducted training workshops for SCSU faculty. One Art

Department faculty member held a class competition to design an ATL logo. A Communications class fulfilled a class requirement by producing a videotape on the ATL.

A new 1991 course addresses Adaptive Technology and Augmentive Communication. In the Special Education courses, students are offered the option of carrying out a class assignment in the ATL. One option calls for students to do a case study on a particular student with a disability and recommend appropriate adaptive devices. Computer Science seniors and graduate students in Social Work do internships in the ATL.

Students with disabilities who use the ATL may take a formal word processing course over five to 10 weeks. Students may seek individual solutions to problems and use the Lab as a resource to support their course work. About 40 students with disabilities per semester use the Lab.

The university offers a non-credit course in remedial English for those who have insufficient background for the required Freshman Composition course. One section is for students with learning disabilities, and the ATL will support that class with a Writing Lab. The state Bureau of Rehabilitation has purchased computer systems for about 25 students with disabilities. The Board of Education and Services for the Blind may buy computer systems for blind or visually impaired students as they seek employment.

The Lab markets its services through the Disabled Student Services (DSS) office and through a newsletter, *Writing Without Worry*, that encourages students to learn word processing skills. The ATL also publishes a brochure that describes its services and lists a schedule of classes. The Lab has been the subject of articles in the *New York Times* and the *Hartford Courant*, and it recently won national recognition from the American Association of State Colleges and Universities.

The ATL is a community resource. The Bureau of Rehabilitation Services and the Board of Education and Services for the Blind refer clients for evaluation and training under a small contract. The ATL holds a monthly open house for community members, and holds training sessions for rehabilitation counselors and community members. Parents and teachers from local high schools visit the Lab.

During registration, it is recommended that students with learning disabilities take a word processing course in the ATL. These are offered on a non-credit basis and can be tailored to individual needs. In preparation for a presentation on Establishing an Adaptive Technology Lab in a Postsecondary Institution at a 1991 conference on technology and people with disabilities, Barbara Heinich, Amy Rubin, Jan Hecht and DeWitt Luze began compiling forms they felt would be helpful to new programs.

Assembling the materials, they realized the information's value. The presentation evolved into a Start-up Kit—a compilation of forms, a list of resources, self-directed teaching modules for six adaptive devices, word processing curricula, a student feedback form and a disk with more

information. The Lab sells the kit for $149 as an information packet and a way to raise funds for the program. As the kit is updated, buyers receive new information. After purchase, the ATL offers telephone support, even visits in some cases to help people in the start-up phase. ATL staff have spoken in five states.

Funding

The ATL is staffed by a half-time professor of Special Education and two half-time professionals. They receive some student assistant help. A consultant, paid with state funds, was available five to 10 hours a week. He worked with difficult students and trained ATL staff members.

Today, the ATL pays for his services with other funds. The initial equipment grant from state funds in 1988 was $17,000. This was supplemented by a $25,000 equipment grant from the Academic Computing Department.

Another revenue source is from their work (at $45 per hour) with the Bureau of Rehabilitation Services for clients who are not SCSU students. The Start-up Kit generates funds, and there are donations from service clubs such as Lions and Rotary.

Starting an Assistive Technology Program

Tips from Amy Rubin

• Go for a broad-based committee. Get people in a lot of different areas involved. Don't tuck your Lab where others can't be exposed to it.

• The Start-up Kit is a conscious effort to share information with new programs to help them get started. It is a valuable resource.

Chapter 16
Center for the Vocationally Challenged
Grossmont Community College, El Cajon

Scott Barr, director of the Center for the Vocationally Challenged (CVC), has raised $4.4 million for this program since 1986. CVC offers Computer Programmer Training, PC Specialist Training and Local Area Network Specialist Training for the Physically Challenged. Sparked by a meeting at the 1986 conference, Technology and Persons With Disabilities, and an initial course in Computer Programmer Training for orthopedically challenged individuals, CVC has broadened its course offerings, added an Adaptive Technology Lab for all students with disabilities and expanded its audience to include people who are blind and visually impaired, deaf and hearing impaired, learning disabled, orthopedically disabled, spinal cord injured, and recovering from drug and alcohol abuse. New programs—PC Specialist and Local Area Network Support Specialist—have helped increase the number of participants.

In 1986, a computer science instructor from Grossmont Community College attended the Technology and Persons with Disabilities conference, participating in a session conducted by an IBM representative from Maryland who discussed IBM-sponsored computer programmer courses for physically challenged people. Later, she attended an Association of Rehabilitation Programs in Data Processing meeting in Florida to learn more.

She and Scott Barr, then on staff at a nearby college, co-wrote a proposal that followed the IBM model. This was funded by the Chancellor's Office of the California Community Colleges for a year at $315,000, and Barr was hired to direct the program.

Barr and a newly established Business Advisory Committee looked at the needs of San Diego businesses and designed a computer programmer training program to meet local needs. Students who participate in the computer programmer training program must have an IQ of 110 or above, financial means to support themselves while in training for almost a year, and academic skills and physical stamina to maintain 24 units (versus 12 for the average Grossmont student).

Realizing these criteria excluded many with disabilities, Barr and his staff designed other programs to broaden the group's range of employment possibilities. The PC Specialist Program was initiated to teach people a spectrum of off-the-shelf business software applications. Within this program were subcourses in office procedures and speed typing.

Placement rates are high. All 16 students in the first computer programmer class were placed. The overall placement rate is 87 percent. Graduating classes in the PC Specialist Program have comparable placement rates and their salaries nearly equal those of the computer programmers. By adding courses, the program moved from serving 22 trainees per year to 130.

A new program, Local Area Network Support Specialist, was added in January 1992 to teach participants to install, support and configure local area networks. Dozens of colleges have installed training programs based on the CVC model for people with disabilities and for others.

IBM, which initially supported only computer programmer training programs with grants of equipment, now supports PC Specialist training programs. Because of the increasing numbers of participating Grossmont students, the local Department of Rehabilitation (DR) added two full-time counselors.

The number of students with disabilities—some enrolled in CVC, some enrolled in other college courses—has grown considerably. The Chair of Grossmont's Computer Science Department sits on the BAC curriculum committee and uses CVC's BAC as an Advisory Board to the Department of Computer Science.

Barr formed a new campus group, the Committee for the Disabled, to share information and coordinate resources. Membership has grown from eight to 21 members, and the group meets regularly to consider a range of academic and support services to students with disabilities.

CVC was nominated as one of nine exemplary programs for special populations by the Chancellor's Office of the California Community Colleges. Barr uses that position to advocate the development of similar programs, including such courses as microcomputer repair and computer-aided design training. He also leads a new state group, Innovators in Rehabilitation.

A key part of CVC is that, from the beginning, students rub shoulders with employers. The BAC meets with them regularly and they serve as interns in many companies. During training, students dress as data processing professionals and are called trainees, not students. If ill, students are expected to call in by 8 a.m. If they expect to be late, they call and let someone know. They work in teams as they will on the job, and their skills are evaluated every two months.

The San Diego Community College District sent representatives to Grossmont to consider replicating the CVC programs. Other visitors have included representatives from Hawaii and England.

Funding

The Computer Programmer Training Program began with a one-year, $315,000 grant from the Chancellor's Office of the California Community Colleges. CVC's contribution back to the District is the generation of average daily attendance (ADA).

The District receives state reimbursement for students served. As CVC attracted more students, the state increased ADA payments to the District. CVC now produces $350,000 per year in ADA funds for the District and is nearly self-supporting.

In the second year, the California Department of Rehabilitation became a permanent partner with a grant of $115,897. Its 1991-92 contribution is $333,000. As programs and services grew to include vocational evaluation and guidance and job placement for non-students, these became fee-for-service programs with funding coming from such sources as individuals and private insurance companies.

CVC also receives support from IBM; the San Diego Community Foundation; Greater Avenues for Independence, Department of Social Services; and others.

Starting an Assistive Technology Program

Tips from Scott Barr

• The first step is to determine need. Start with anecdotal data, talk to students. What do they need? You can do formal research later. The key is to conduct business the way successful businesses conduct business. A part of that is, never lower your standards.

• The problem is not raising money to initiate the program; that's easier than you think. The real problem is securing funding year after year to sustain the program.

• New program managers should understand differences in philosophy between the education and business systems. Business Advisory Committee (BAC) members are enthusiastic about training computer programmers, but the secretarial training program also will result in jobs for many people with disabilities.

• Keep the BAC active and working. CVC conducts an annual self-evaluation, then the BAC does a separate evaluation and compares it to the staff-generated one. The BAC is structured by this document each year—each BAC committee sets its own goals, objectives and time lines.

• Barr advocates a talent-search-approach to selecting candidates for training rather than a screening-out process. Programs should accept responsibility for bringing prospective candidates up to program standards rather than dilute program criteria.

• Identify local needs and design programs to meet these needs.

• Use a single BAC for all programs.

• Design the program from entrance to exit—so students will be employed. Everyone in the CVC accepts responsibility for helping the students find jobs.

Chapter 17
The Technology Group
California State University, Northridge (CSUN)

In October 1985, CSUN's Office of Disabled Student Services conducted an on-campus conference, Technology and Persons with Disabilities. Expecting 200 local participants, CSUN opened its doors to more than 600, some from foreign countries. This conference grew into a larger meeting that draws 2,000 people to Los Angeles each March. It involves more than 220 speakers and 100 exhibitors. It is the model for similar conferences in Australia, New Zealand and Europe. In partnership with Pacific Telesis Foundation, CSUN offers conference scholarships (registration fee waivers) to parents and people with disabilities. The Foundation has granted $90,000 over four years, and CSUN has added $140,000. About 600 scholarships have been offered to date. CSUN then secured grants to develop a Computer Access Lab for students; a multistate training project for rehabilitation counselors, rehabilitation facility personnel and employers; and an engineering project, the Universal Access System. Other grants were secured to develop SoundProof, a screen-reading program for people with learning disabilities, a project to evaluate technologies for people with learning disabilities and a conference on Virtual Reality and Persons with Disabilities.

Dr. Harry Murphy is director of CSUN's Office of Disabled Student Services (ODSS). For the last 20 years he has written and administered dozens of grants totaling tens of millions of dollars. He conducted many seminars and workshops over 15 years before establishing CSUN's Technology and Persons with Disabilities conference.

From 1972 to 1979, Murphy was assistant director of CSUN's National Center on Deafness. Between 1979 and 1983, as a consultant to the national training firm, the Grantsmanship Center of Los Angeles, he trained 2,000 people in 39 states in 100 week-long workshops on grant writing and grants administration.

Murphy returned to CSUN in 1983 to head ODSS, which is charged with carrying out mandated educational support services—including note taking, tutoring and reading—for 800 students with disabilities. Another CSUN campus office, the National Center on Deafness, provides interpreting and other services for another 220 deaf students.

These services are mandated under Section 504 of the Rehabilitation Act and by directives of the Chancellor's Office of the California State University

(CSU) system, a network of 20 campuses offering bachelor's and master's degrees.

About 365,000 students are enrolled on 20 CSU campuses; 8,000 have disabilities. CSUN, a campus of 30,000 in Los Angeles's northern suburbs, serves 1,000 of the 8,000 students with disabilities. CSUN has had an impact on adaptive technology because of the grants it has secured to conduct innovative technology projects, and because of its Technology and Persons with Disabilities conference.

CSUN's major contribution in 1985 was to create a forum for sharing information about adaptive technology. The Technology and Persons with Disabilities conference is primarily supported through exhibit and registration fees. The Pacific Telesis Foundation awarded $90,000 in grants over four years for conference scholarships for parents and people with disabilities.

The conference has more than matched that amount, waiving another $140,000 in registration fees to award scholarships to more than 600 persons. At the end of each conference, a Proceedings is published and distributed. Authors retain a copyright to their work and can publish their papers elsewhere. Professional groups of all kinds are urged to use the conference as a place to hold their own meetings. The conference provides a room at no charge for such national, regional or local groups.

Those who associated CSUN with technology as a result of the conference assumed CSUN was also a leader in the use of assistive devices for students with disabilities. This motivated the ODSS leadership to seek external funding for a Computer Access Lab (CAL), where students with disabilities could experiment with assistive devices and equipment, receive training, and gain access to equipment that would help them with their university studies and prepare them for employment.

At that time, the ODSS was supported by state funds and charged under Section 504 of the Rehabilitation Act of 1973 with providing mandated educational support services. ODSS saw technology and computer access as 504 issues and an effective means of carrying out the university's responsibility to this population.

It was clear from the start that CSUN could be a powerful advocate for technology use by combining the visibility and credibility of its conference with high visibility and credibility of a Computer Access Lab and other programs.

The conference has a growing international influence. In 1991, representatives from 19 countries attended. Murphy has consulted in Australia, New Zealand and Europe, where similar conferences are now modeled after the CSUN meeting. He serves each year on the Program Committee of the European Conference on Computers and the Handicapped (Vienna, Austria) and has twice keynoted the National Conference of New Zealand on Technology and Disability.

In 1991 he keynoted the statewide conference of Tasmania, Australia, and the national conference on blindness in Prague. CSUN also recently joined

the University of Karlsruhe in Germany to help the Technical Institute of Prague under a grant to Eastern European universities by the European Economic Community. The Technical Institute will establish technological support services to blind students and sponsor the first national conference of Czechoslovakia on Technology and Blindness.

Funding

In 1987, CSUN received an equipment grant from Apple Computer to initiate its Computer Access Lab (CAL). Soon after, the California Department of Rehabilitation awarded the Lab a two-year grant for equipment and staffing. Over the next three years, CAL received equipment grants from Apple, IBM, Hewlett-Packard and other manufacturers and distributors, eventually making it a $300,000 investment.

In 1988, CSUN received a three-year grant from the Department of Education Rehabilitation Services Administration (RSA) to conduct training in technology among rehabilitation counselors, rehabilitation facility personnel and employers in California, Arizona, Nevada, Hawaii, Guam, Saipan and American Samoa.

The same year, CSUN received a three-year grant from the Department of Education Fund for the Improvement of Postsecondary Education (FIPSE) for the Universal Access System, an engineering project to make all computers accessible to people with disabilities. This takes place through a two-way, infrared link. This project won a national award from the American Association of State Colleges and Universities.

Also in 1988, CSUN secured $33,000 in contracts from NASA for conferences designed to increase the number of qualified employees with disabilities in the areas of computer science, engineering and business. Representatives from California community colleges and universities joined Department of Rehabilitation personnel and Affirmative Action recruiters from NASA in two conferences in Los Angeles.

In 1989, CSUN was awarded another Establishment Grant from the California State Department of Rehabilitation for $11,000, to develop and evaluate a speech synthesis device, SoundProof, a creation of Dr. Marshall Raskind and Neil Scott that is now manufactured by PulseData of Christ Church, New Zealand, and distributed by HumanWare of Sacramento, California.

In late 1989, the ODSS adopted the name The Technology Group to describe a critical mass of technology programs and personnel. This group includes technological support services to students with disabilities through the Computer Access Lab, the annual conference, the RSA Training Project and the FIPSE-sponsored project.

A second FIPSE grant, $220,000 over three years, was awarded in August 1991 for Learning Disabilities and Technology, a best-use study of three devices of benefit to this population: Optical Character Recognition

(OCR), voice recognition and speech synthesis, including CSUN's product, SoundProof.

A third FIPSE grant, awarded in summer 1991, for $5,000 under the Lecture Programs Division, was for a conference-within-a-conference on Virtual Reality and Persons with Disabilities at CSUN's Seventh Annual International Conference in Los Angeles in March 1992. In September 1991, ODSS received a second three-year, $250,000 RSA grant to conduct regional seminars in Experimental and Innovative Training in Learning Disabilities, which included a simulation experience developed by CSUN's Learning Disabilities team.

Between 1985 and 1991, ODSS secured $2 million in grants. The number of students with disabilities increased from 435 to 800. A Learning Disability Program was added and the number of these students increased from 55 to 285. Recognizing this growth, the university moved ODSS once, then again to a 7,000-square-foot facility to house the support-service operation and the Computer Access Lab.

Starting an Assistive Technology Program

Tips from Dr. Harry Murphy

• Consider the *distributed-access* model under Academic Computing as a first choice. Put equipment in as many locations as possible, open as many hours as possible.

• Try to get institutional support from the beginning. Computer access is recognized as a university responsibility; argue 504 and ADA issues.

• Getting the right staff is critical. Have an engineer on staff along with service providers to get a good balance. Accept responsibility from the beginning to develop and advance new technologies *and* to provide services with present technologies.

• Create forums that bring people together. Every program can create meetings of 10, 20 or 100 people. Use technology as a way to share information.

• Visit as many existing programs as possible, but keep in mind that every program is different, serving different populations in different environments. What will work in one place won't work in another. Be deeply rooted in local needs.

APPENDICES

A. Sites and People Interviewed

1. Electronic Networks for Interaction, Gallaudet University, Washington, D.C. Dr. Trent Batson, Director.

2. The Computer Center for the Visually Impaired, Baruch College, N.Y. Dr. Karen Luxton, Director.

3. Instructional Technology Division, University of Michigan, Ann Arbor. Dr. James Knox, Director.

4. Disabled Student Services, University of Wyoming, Laramie. Chris Primus, Director.

5. Artificial Language Laboratory, Michigan State University, East Lansing. Dr. John Eulenberg, Director.

6. High-Tech Training Center, California Community Colleges, Cupertino, California. Carl Brown, Director.

7. Assistive Technology Center, University of Minnesota, Minneapolis. Curt Griesel, Coordinator.

8. Disabled Computing Program, University of California, Los Angeles. Dr. Danny Hilton-Chalfen, Director.

9. Desktop Computing Services, University of Washington, Seattle. Sheryl Burgstahler, Manager.

10. Services for Students with Disabilities, University of Nebraska, Lincoln. Christy Horn, Director.

11. Adaptive Computing Technology Center, University of Missouri, Columbia. William Mitchell, Advanced Projects Director, and Susan Phillips, Program Development Specialist.

12. Training and Resource Center for the Blind, University of New Orleans, Louisiana. Oliver St. Pe, Director, Public Service Training.

13. Vocational Rehabilitation Programs, El Centro College, Dallas, Texas. Gloria Rosenberg, Director.

14. Adaptive Technology Laboratory, Southern Connecticut State University. Amy Rubin, Director.

15. Center for the Vocationally Challenged, Grossmont Community College, El Cajon, California. Scott Barr, Director.

16. The Technology Group, California State University, Northridge. Dr. Harry Murphy, Director.

B. National Council Member and Staff Biographies

National Council Members

Sandra Swift Parrino

As National Council chairperson, Sandra Swift Parrino played an active role on key issues affecting the lives of people with disabilities. Nominated by President Reagan in 1982, appointed chair by the President in 1983 and reappointed by President Bush, Parrino has supported the rights of people with disabilities before Congress, in the media, and before groups nationwide. Under her leadership, the National Council is a driving force with respect to creating public policies that affect the nation's people with disabilities.

During Parrino's tenure as chair, the National Council has worked toward creating and enacting legislation for people with disabilities; participated with President Bush in signing the Americans with Disabilities Act; issued a policy statement, *National Policy for Persons with Disabilities;* convened hearings nationwide to solicit comments and recommendations from people with disabilities about discrimination; issued a major report, *Toward Independence,* which outlined key components of a comprehensive civil rights law protecting people with disabilities; initiated the first national survey of attitudes and experiences of Americans with disabilities in conjunction with Louis Harris and Associates, Inc.; issued *On the Threshold of Independence,* a report outlining specifics of the Americans With Disabilities Act; and conducted the first national conference on preventing primary and secondary disabilities.

Before becoming National Council chair, Parrino founded and directed the Office for the Disabled, Towns of Ossining and Briarcliff Manor, New York, where she created a regional program for public and private organizations that focused on facilities and programs for people with disabilities. She has more than 25 years' experience on boards, councils, commissions, committees and task forces at the federal, regional, state and local levels, and as an expert witness, community leader, organizer and lobbyist.

Parrino has represented the U.S. government on disability issues in many countries. She was invited by the Department of State to represent the United States in the Meeting of Experts on Alternative Ways to Mark the End of the United Nations Decade of Disabled Persons. She was an American representative to the U.N. and UNICEF (the U.N. International Children's Emergency Fund) for the International Year of Disabled Persons. In 1991, Parrino was invited by the Department of State to be a delegate at the Third Committee on Social Development of the United Nations. In 1991, Parrino was invited by the People's Republic of China to review their efforts to help people with disabilities. At the request of the government of Czechoslovakia, she and the National Council were invited to conduct the Eastern European Conference on Disabilities for participants from Czechoslovakia, Poland and Hungary.

Parrino graduated from Briarcliff College with a B.A. in history, and completed courses at Bennett College, GuildHall School of Drama in London, and the Yale School of Languages. She is married and has three children, two with disabilities. She was born in New Haven, Connecticut, and lives in Briarcliff Manor, New York.

Kent Waldrep Jr.

Kent Waldrep has been involved with disability issues on a local, state and national level since suffering a spinal cord injury in 1974 while playing football for Texas Christian University. Since 1981, Waldrep has served on the National Council by presidential appointment. He is National Council vice chair and chairman of the Research and Prevention Committee. He has been instrumental in formulating the National Council initiative on preventing primary and secondary disabilities.

Waldrep, one of 15 original ADA drafters, gave the legislation its name. He has lectured nationwide on subjects ranging from national disability policy to medical research targeted at

curing paralysis. He founded the American Paralysis Association and the Kent Waldrep National Paralysis Foundation. He has appeared on *Good Morning America*, the *Today* Show, the *NBC Nightly News* and *CNN*, and been featured in *People* and *Look* magazines, *USA Today* and others.

He was selected by the U.S. Jaycees as one of 1985's 10 Outstanding Young Men in America, and received a special award from the Texas Sports Hall of Fame and a Sports/Fitness Award from the President's Council on Physical Fitness. Kent Waldrep Days are celebrated in four Texas cities and Birmingham, Alabama. He serves on many boards, including the Texas Rehabilitation Commission. He is past chairman of the Texas Governor's Committee for Disabled Persons and now chairs the Dallas Rehabilitation Institute. He also is chairman of Turbo-Resins Inc., a family-owned and -operated aviation-repair business. He lives in Plano, Texas, with his wife Lynn and two sons, Trey and Charles Cavenaugh.

Linda Wickett Allison

Linda Allison of Dallas, Texas, is a long-time advocate of people with disabilities. She is a board member of the National Paralysis Foundation and a trustee for the International Spinal Research Trust. Allison, who grew up in Fort Worth, has three children. Her daughter Marcy was paralyzed from the waist down in a 1979 automobile accident. Marcy graduated from the University of Texas School of Law in 1986, and practices law in Austin. Allison's late husband, James N. Allison Jr., owned the *Midland Reporter Telegram* and other newspapers in Texas and Colorado, and was former deputy chair of the Republican National Committee.

Larry Brown Jr.

Since 1981, Larry Brown of Potomac, Maryland, has been the Xerox business and community relations manager for the Mid-Atlantic Region, Coastal Operations, Custom Systems Division. In 1991 he became Government and Community Relations Manager with Integrated Systems Operations.

Brown was a running back for the Washington Redskins for eight years. During that time he received many awards, including Most Valuable Player in the National Football League for 1972, and was recently inducted into the Washington, D.C., Touchdown Hall of Fame.

After retiring from football in 1977, he worked at E.F. Hutton as a personal financial management adviser. He has been special assistant to the director, Office of Minority Business Enterprise, Department of Commerce. He is involved with youth, people with disabilities and senior citizens. Brown has spoken at schools, colleges and universities on topics such as motivation, discipline and camaraderie. He works with many organizations, including the Friends of the National Institute on Deafness and Other Communication Disorders, the Deafness Research Foundation and the Vincent Lombardi Foundation.

Mary Ann Mobley Collins

A former Miss America who lives in Beverly Hills, California, Mary Ann Collins has a career in film, television and on Broadway. She has co-hosted the National March of Dimes Telethons with husband, Emmy-award winning actor Gary Collins, and serves as National Chair of the Mother's March Against Birth Defects. She is a member of SHARE, a Los Angeles-based women's organization that has raised more than $6 million for the Exceptional Children's Foundation for the Mentally Retarded. She serves on the National Board of the Crohns and Colitis Foundation.

Collins helped raise funds for the Willwood Foundation in her native Mississippi, which provides homes for young adults with mental and physical learning disabilities. She has received many awards and honors, including the 1990 International Humanitarian Award from the Institute for Human Understanding, Woman of Distinction 1990 from the National Foundation for Ileitis and Colitis, and the HELP Humanitarian Award of 1985 from HELP for

Handicapped Children. She has filmed documentaries in Cambodia, Ethiopia, Mozambique, Somalia, Kenya, Sudan and Bolivia on the plight of starving children and people with disabilities.

Anthony H. Flack

Anthony Flack of Norwalk, Connecticut, is president of Anthony H. Flack & Associates. He has been a member of the board of Families and Children's Aid of Greater Norwalk, and has worked with the Child Guidance Center of Greater Bridgeport, the Youth Shelter in Greenwich, Hall Neighborhood House in Bridgeport, and the Urban League of Greater Bridgeport. Flack is a member of the Allocations and Admissions Committee, United Way of Norwalk, and received the Bell Award for outstanding service in the field of mental health at the Bridgeport Chapter, Connecticut Association of Mental Health.

John A. Gannon

John Gannon of Cleveland, Ohio, and Washington, D.C., founded John A. Gannon and Associates. His firm has offices in Columbus and Cleveland, Ohio, and Denver, Colorado, and Washington, D.C. A fire fighter for more than 30 years, Gannon was an active leader of the International Association of Fire Fighters (IAFF) Local 93. Starting as a member of the local IAFF committee, he eventually became president, a position he held for 10 years before being elected to national office.

In September 1988, Gannon was elected IAFF President Emeritus. He had served as president of the 170,000-member organization since 1980. Under his leadership, the IAFF expanded its role in occupational safety and health.

Concerned about hazards of his profession, he guided and directed a series of programs to promote greater safety and health protection. One program sponsored research on safer garments and equipment for fire fighters. Gannon also fostered development of the IAFF Burn Foundation, which raises funds for research on the care of burn victims. In 1985, the Metropolitan General Hospital in Gannon's hometown, Cleveland, dedicated a John Gannon Burn and Trauma Center in recognition of his support for the hospital.

Gannon was elected vice president of the AFL-CIO, with which the IAFF is affiliated. Within the AFL-CIO he is vice president of the Public Employee Department. On the Executive Council, he is a member of several committees. He serves on the board of the National Joint Council of Fire Service Organizations, and in 1982 served as its chairman. He is a member of the board of the Muscular Dystrophy Association. Gannon attended Miami University in Ohio and Glasgow University in Scotland, and studied at Baldwin-Wallace College and Cleveland State University.

Margaret Chase Hager

Margaret Hager's husband contracted poliomyelitis from the oral Sabin polio vaccine in August 1973. Helping him with rehabilitation, she became interested and involved in the disability field. Since 1985, Hager has been a member of the Mayor's Commission for the Disabled, which she chairs, in Richmond, Va. She is a member of the Executive Committee of Richmond's Office of Human Services Advocacy. She has served as the city's Festival Coordinator and Consultant for ABLEFEST, a disability-awareness festival showcasing abilities in sports, recreation, cultural arts and entertainment.

Hager holds executive positions in local and national organizations that promote better quality of life for people with disabilities: Very Special Arts, Virginia (an affiliate of Very Special Arts of the Kennedy Center, Washington, D.C.); and the Employment Committee of the Commonwealth of Virginia, Board of the Rights of the Disabled. She is a member of the Executive Committee of the Japan-Virginia Society and the Virginia Committee of the Jefferson Poplar Forest Foundation. She received a B.A. from Wheaton College in 1963. Her avocation is

accessible residential design for people with disabilities. Her article on this subject was published in the September 1987 issue of *Builder Architect* magazine. She is a consultant and speaker on architectural accessibility and disability awareness.

John Leopold

John Leopold of Pasadena, Maryland, has 18 years experience in elected state office. He was elected to the Hawaii State House of Representatives in 1968 and re-elected in 1972. In 1974, Leopold was elected to the Hawaii State Senate. In 1982, he became the first Republican in Maryland history elected from District 31 in Anne Arundel County to the Maryland House of Delegates, where he served until 1991.

An advocate of people with disabilities, Leopold is a member of the Learning Disabilities Association of Anne Arundel County, the Anne Arundel County Committee on Employment of People with Disabilities, and the University of Maryland Hospital Infant Study Center Planning Advisory Board. He has served in other appointed and elected positions, including the Hawaii State Board of Education in 1968, the National Advisory Council for the Education of Disadvantaged Children in 1977, and the Maryland State Accountability Task Force for Public Education in 1974.

Leopold has written and produced cable television commercials in Maryland, written a weekly interview column for a local publication, and hosted and produced a weekly radio public affairs program. He graduated from Hamilton College in Clinton, New York, with a B.A. in English.

Robert S. Muller

Robert Muller of Grandville, Michigan, began his career with Steelcase Inc. in 1966 and is now an administrator. He is an adjunct associate professor in the Department of Psychology at Aquinas College and in the Department of Education at Calvin College in Grand Rapids. He serves on the board of trustees for Hope Network and Foundation in Grand Rapids, which serves 1,700 adults with disabilities. In April 1981, he received an honorary degree in educational psychology from the Free University in Amsterdam, the Netherlands.

Muller holds a B.S. in business administration from Aquinas College and in 1978 was voted Outstanding Alumnus of the Year. He has lectured at colleges and universities nationally and internationally. He is a board member for several national, state and local organizations.

In May 1987, Muller and his wife hosted a first-time event at the White House with the Vice President. The Celebration of Disabled Americans at Work was co-sponsored by several major corporations. He now serves as president of the National Roundtable on Corporate Development for Americans with Disabilities. In 1985, Muller received the Liberty Bell Award from the Grand Rapids Bar Association. In 1988, he was national co-chair of the Disabled Americans for President Bush Campaign.

George H. Oberle, PED

George Oberle of Stillwater, Oklahoma, has more than 35 years' experience in the field of health, physical education and recreation. He began his career as a high school teacher and coach, and has been a professor and director of the School of Health, Physical Education and Leisure at Oklahoma State University since 1974. Oberle is a consultant to many organizations in the area of administration and adaptive physical education. In 1988, he worked with the Kennedy Foundation to organize and direct a new program of unified sports for the Special Olympics.

Oberle chaired the College and University Administrator's Council (1980-82); he was president of the Association for Research, Administration, Professional Councils and Societies (1984-87); and served as a board member of the American Association of Health, Physical Education, Recreation and Dance (1985-89). Awards include the 1985 Centennial Award from

the American Association of Health, Physical Education, Recreation and Dance; and Meritorious Service Awards from Indiana and Oklahoma.

He was selected for *Men of Achievement* in 1975 and recognized in *Who's Who of the Southwest* in 1977. Oberle received his doctorate from Indiana University in administration and adapted physical education, and has written many books and articles. He lectures extensively about wellness promotion, adapted physical activity, sports and recreation for people with disabilities.

Mary Matthews Raether

Mary Raether of McLean, Virginia, is associated with St. John's Child Development Center, a non-profit organization providing instruction, employment training and independent and group home living skills for people with severe mental disabilities, especially those with autism. Raether has been an officer and trustee of St. John's since 1985, and has chaired the public relations committee and participated on the executive, nominating, investment and development committees.

Raether has been active in civic, educational and religious organizations in the Washington metropolitan area. While community vice president of the Junior League of Washington, she developed emergency grant procedures and fund-raising information services for small and emerging non-profit organizations. Raether has 10 years experience as legislative assistant to Reps. George Bush and Barber Conable. She specialized in tax, social security, medicare/medicaid and trade issues. She considers her efforts in clarifying the tax status of lobbying by non-profit organizations an outstanding career accomplishment. She received a B.A. from the University of Texas at Austin in 1962. She is married and has two children.

Michael B. Unhjem

Michael Unhjem of Fargo, North Dakota, is president of Blue Cross/Blue Shield of North Dakota. The youngest member in state history elected to the North Dakota House of Representatives, Unhjem is a member of the National Conference of Commissioners on Uniform State Laws. In 1988, he served as president of the National Mental Health Association.

He has been involved in local and national organizations, including the Advisory Mental Health Council of the U.S. Department of Health and Human Services; the Governor's Commission on Mental Health Services; the National Alliance for Research on Schizophrenia and Depression; and the National Mental Health Leadership Forum. Awards include the 1989 Special Presidential Commendation from the American Psychiatric Association, the 1988 Distinguished Leadership Award from the North Dakota Psychological Association, and the National Excellence in Leadership Award from North Dakota.

He was recognized by *Who's Who in American Politics* and *Who's Who in North Dakota*. Unhjem graduated *magna cum laude* with a B.A. in history and political science from Jamestown College in North Dakota in 1975. In 1978, he earned a J.D. with distinction from the University of North Dakota School of Law in Grand Forks. He is married and has two children.

Helen Wilshire Walsh

Helen Walsh of Greenwich, Connecticut, is a board member of the Rehabilitation Institute of Chicago, the largest U.S. rehabilitation center. She has been involved in disability advocacy for many years and has been associated with the Institute of Rehabilitation Medicine at the New York Medical Center, where she served as associate trustee. She has served as vice president, president and chairman of the board of Rehabilitation International USA.

Walsh has been a member of the President's Committee on the Employment of People with Disabilities, and was appointed by the President to serve as a member of the National

Advisory Council of Vocational Rehabilitation. In 1976, Walsh received the Henry J. Kessler Award for outstanding service in the rehabilitation field. She has received the Rehabilitation International Award for Women and the Anwar Sadat Award for outstanding work in the field of rehabilitation.

National Council Staff

Ethel D. Briggs

Ethel Briggs is executive director of the National Council on Disability. In seven years at the National Council, Briggs served as the acting executive director, deputy executive director, and director of Adult Services. Briggs is former chief of the Office of Staff Development and Training for the Washington, D.C., Rehabilitation Services Administration. Prior experience includes employment as a rehabilitation counselor supervisor, vocational rehabilitation counselor and part-time college instructor at George Washington University. Briggs, a long-time advocate of people with disabilities, graduated from North Carolina Central University and holds a master's degree in counseling from the University of North Carolina at Chapel Hill. She was recognized by *Dollar & Sense Magazine* as one of the Top 100 African American Business and Professional Women of 1989. Briggs also was recognized in *Outstanding Women in America* in 1976 and by *Who's Who in American Colleges and Universities* in 1971.

Dr. Harold W. Snider

Harold Snider, selected as deputy executive director in June 1990, was previously the first director of outreach for people with disabilities at the Republican National Committee. He served as executive director of the American Impact Foundation, and was president of Access for the Handicapped Inc. Snider holds a B.S. in international studies from Georgetown University, a master's degree in history from the University of London, and a doctorate in history from Oxford University in England. He is the author of two books on disability, *The United States Welcomes Handicapped Visitors*, and *Museums and Handicapped Students: Guidelines for Education*.

Mark S. Quigley

Mark Quigley joined the staff as a public affairs specialist in May 1990. He previously served as a consultant to the U.S. National Commission on Drug-free Schools. He is a former program coordinator at the U.S. Interagency Council on the Homeless, and former director of communications at the White House Conference on Small Business. Quigley graduated *magna cum laude* in 1979 from Northern Virginia Community College in Annandale, Virginia, with an A.A. in general studies. He received a B.A. in government and politics in 1983, and an MPA in public administration in 1990 from George Mason University in Fairfax, Virginia.

Katherine Seelman, Ph.D.

Katherine Seelman joined the National Council staff in 1989 as a research specialist. She is former director of Public Education, Research and Technological Services at the Massachusetts Commission for the Deaf and Hard of Hearing. She was a research scholar at Gallaudet University in Washington, D.C., and a consultant to the American Association of Retired Persons.

Seelman received a doctorate in public policy and a master's degree in political science from New York University, and a B.A. in political science from Hunter College in New York. She is the author of many published articles, including "Communication Accessibility: A Technology Agenda for Deaf and Hard-of-Hearing People," *International Journal of Technology and Aging*; "Communication Accessibility for Deaf and Hard-of-Hearing People: An Expanded

Concept of Access," *Journal of Disability Policy Studies*; and "A Comparison of Federal Laws Toward Disabled and Racial Ethnic Groups in the USA," *Disability, Handicap and Society*.

Brenda Bratton

Brenda Bratton, executive secretary for the National Council, was formerly employed as a secretary at the National Transportation Safety Board. Bratton graduated from Farmville Central High School and the Washington School for Secretaries.

Stacey S. Brown

Stacey Brown is staff assistant to the Chairperson and has been employed by the National Council since 1986. Prior experience includes employment as a receptionist and clerk with the Board for International Broadcasting, and with the Compliance and Enforcement Unit of the Architectural and Transportation Barriers Compliance Board, where he was a student assistant. Brown is a graduate of Howard University in Washington, D.C., where he earned a B.A. in political science in 1987.

Lorraine Williams

Lorraine Williams, a National Council student assistant, was previously employed as a clerk typist with the District of Columbia Public Schools. She attends the University of the District of Columbia, where she is a third-year student majoring in computer information systems science.

Consultant

Harry J. Murphy

Dr. Harry Murphy is director of the Office of Disabled Student Services, California State University, Northridge (CSUN). He is project director for six technology and disability grants. He founded and directs the annual conference, Technology and Persons with Disabilities, held each March in Los Angeles.

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This publication was printed at the UNICOR Print Plant,
Federal Correctional Institution, Ray Brook, NY