Distance Education:

Access Guidelines for Students with Disabilities

August 1999

Chancellor's Office
California Community Colleges

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Students with Disabilities

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Developed By:

The High Tech Center Training Unit
In Collaboration with the
Distance Education Accessibility Workgroup

Chancellor's Office
California Community Colleges

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Preface

In March 1996, the U.S. Department of Education, Office of Civil Rights notified Chancellor Thomas J. Nussbaum that it was about to begin a statewide compliance review under Title II of the Americans with Disabilities Act of 1990. The compliance review would focus on the status of community colleges in meeting their obligation under Title II and Section 504 to provide students with visual impairments access to print and computer-based information. The review was to examine whether students with visual impairments, particularly blind students, were accorded an equal educational opportunity by California Community Colleges or whether they were being discriminated against on the basis of their disability. Specifically, OCR wished to consider whether the Chancellor's Office employed "methods of administration" which substantially impaired accomplishment of the objectives of the California Community College educational programs with respect to students with visual impairments.

As an outcome of this review, OCR offered nine suggestions for addressing areas of concern identified by the review. Among the suggestions/concerned voiced by OCR was the need for development of system-wide access guidelines for distance learning and campus Web pages. In a January 22, 1998 letter to Chancellor Nussbaum, Stefan Rosenzweig, Regional Director of OCR stated:

> *"California Community Colleges, individually and collectively as part of the California Virtual University, are rapidly developing their capacity to deliver educational programs to offsite students through technology. Little attention is being given to ensure that these distance learning programs are accessible to students with disabilities, especially students with visual impairments."*

He further added:

> *"The need for guidelines regarding distance learning has been recognized by several different entities in the California Community College system, including the Academic Senate which in Fall 1997, adopted "Guidelines for Good Practice: Technology Mediated Instruction." It is OCRs understanding that four regional distance learning centers to assist in development of program and course materials will be set-up in 1998-99. The concept of accessibility should be firmly integrated into such development."*

In responding to the Regional Director's suggestions regarding development of system-wide access guidelines for distance learning and campus Web pages, in a letter dated March 13, 1998, Chancellor Nussbaum replied:

> *"We concur with the strategies related to this issue. I will immediately direct that the Chancellor's Office Task Forces related to distance learning as well as California Virtual University have persons on them to specifically address access*

issues for persons with disabilities…To assure that the necessary guidance to colleges is available, I will specifically ask Vice Chancellor of Educational Services and Economic Development, Rita Cepeda, whose staff oversees the distance learning issues, to develop in cooperation with the DSP&S Unit and the High Tech Center Training Unit (HTCTU), guidelines for distance learning to assure it is accessible to and usable by persons with disabilities."

The guidelines which follow are the result of Chancellor Nussbaum's directive.

Legal Requirements

Both state and federal law require community colleges to operate all programs and activities in a manner which is accessible to students with disabilities. Accordingly, as the system develops its capacity for creation of technology based instructional resources and the delivery of distance learning; it must proceed with the needs of all students in mind, including the unique needs of students with disabilities.

At the federal level, requirements for access for persons with disabilities were first imposed on recipients of federal funding by Section 504 of the Rehabilitation Act of 1973, as amended (29 U.S.C. 794) and its accompanying regulations set forth at 34 C.F.R. 104. Similar requirements were later imposed on all public entities, regardless of whether or not they receive federal funding, by the Americans with Disabilities Act (42 U.S.C. Sec. 12100 et seq) and the regulations implementing Title II of the ADA which appear at 28 C.F.R. 35.

In particular, the Section 504 regulations and the regulations implementing Title II of the ADA contain nearly identical provisions stating that recipients of federal funds and public entities in providing any aid, benefit or service, may not afford a qualified individual with a disability an opportunity to participate that is not as effective as that provided to others. (See 34 C.F.R. 104.4 (b)(1) (iii) and 28 C.F.R. 35.130(b) (1) (iii)). Title II recognizes the special importance of communication, which includes access to information, in its implementing regulation at 28 C.F.R. 35.160 (a). The regulation requires that a public entity, such as a community college, take appropriate steps to ensure that communications with persons with disabilities are as effective as communications with others.

The United States Department of Education, Office for Civil Rights (OCR) is responsible for ensuring that all educational institutions comply with the requirements of all federal civil rights laws, including Section 504 and Title II of the ADA. As a result, the opinions of OCR are generally accorded considerable weight by the courts in interpreting the requirements of these laws. OCR has had occasion to issue several opinions applying the requirements of the Section 504 and ADA regulations to situations involving access to distance education and/or computer-based instruction.

In responding to a complaint by a student with a disability alleging that a university had not provided access to the Internet, OCR noted that:

[T]he issue is not whether the student with the disability is merely provided access, but the issue is rather the extent to which the communication is actually as effective as that provided to others. Title II [of the Americans with Disabilities Act of 1990] also strongly affirms the important role that computer technology is expected to play as an auxiliary aid by which communication is made effective for persons with disabilities.
(OCR Docket No. 09-95-2206, January 25, 1996)

Adding additional clarity to the meaning of "effective communication," OCR has held that the three basic components of effective communication are: "timeliness of delivery, accuracy of the translation, and provision in a manner and medium appropriate to the significance of the message and the abilities of the individual with the disability."

(OCR Docket No. 09-97-2145, January 9, 1998)

OCR also points out that the courts have held that a public entity violates its obligations under the ADA when it only responds on an ad-hoc basis to individual requests for accommodation. There is an affirmative duty to develop a comprehensive policy in advance of any request for auxiliary aids or services.

Finally, in considering the magnitude and responsibility of this task, OCR states:

[T]he magnitude of the task public entities now face in developing systems for becoming accessible to individuals with disabilities, especially with respect to making printed materials accessible to persons with visual impairments, is comparable to the task previously undertaken in developing a process by which buildings were to be brought up to specific architectural standards for access. Buildings in existence at the time the new architectural standards were promulgated are governed by "program access" standards. However, buildings erected after the enactment of the new architectural standards are strictly held to the new standards on the premise that the builder is on-notice that such standards apply. One who builds in disregard of those standards is ordinarily liable for the subsequent high cost of retrofitting.

Similarly, from the date of the enactment of Title II onwards, when making purchases and when designing its resources, a public entity is expected to take into account its legal obligation to provide communication to persons with disabilities that is "as effective as" communication provided to non-disabled persons. At a minimum, a public entity has a duty to solve barriers to information access that the public entity's purchasing choices create, particularly with regard to materials that with minimal thought and cost may be acquired in a manner facilitating provision in alternative formats. When a public institution selects software programs and/or hardware equipment that are not adaptable for access by persons with disabilities, the subsequent substantial expense of providing access is not generally regarded as an undue burden when such cost could have been significantly reduced by considering the issue of accessibility at the time of the initial selection.

(OCR Docket No. 09-97-2002, April 7, 1997)

There are also state laws and regulations which require community colleges to make their distance education offerings accessible to students with disabilities.

Government Code Section 11135 et seq. prohibits discrimination on various grounds, including mental or physical disability, by entities receiving funding from the State of California. The Board of Governors has adopted regulations at Title 5, California Code of Regulations, Section 59300 et seq. to implement these requirements with respect to funds received by community college districts from the Board of Governors or Chancellor's Office. These regulations require

community college districts and the Chancellor's Office to investigate and attempt to resolve discrimination complaints filed by students or employees.

In addition, the Board of Governors has adopted Title 5 regulations setting forth the general requirements applicable to all independent study (Sections 55300 et seq.) and those requirements specific to distance education courses (Sections 55370 et seq.). Section 55370 expressly states that the requirements of the Americans with Disabilities Act are applicable to distance education courses.

The remainder of this document sets forth guidelines developed by the Chancellor's Office to address specific issues community college districts will face in meeting their legal obligation to make distance education courses accessible to students with disabilities. These guidelines are not legally binding on districts, but the Chancellor's Office will apply these guidelines in determining whether a district has met its obligations under Title 5, Section 55370 and 59300 et seq. Districts which follow these guidelines will generally be regarded as having met those obligations. Districts which do not follow these guidelines will bear the burden of demonstrating that they have achieved compliance with their legal obligation to provide access to distance education for students with disabilities by other means.

Basic Requirements for Providing Access

The following are general principles that should be followed in ensuring that distance education courses are accessible to students with disabilities. They represent the general concepts of the ADA and its regulations but do not provide a detailed legal analysis of the ADA requirements. Persons utilizing this document who are unfamiliar with the ADA may wish to consult the campus ADA Coordinator or DSP&S Coordinator for further interpretation. In the remainder of this document, specific guidelines will be provided for resolving access issues with respect to particular delivery modes commonly used in distance education.

1. One of the primary concepts of distance education is to offer students "Learning anytime, anywhere." Therefore, all distance education resources must be designed to afford students with disabilities maximum opportunity to access distance education resources "anytime, anywhere" without the need for outside assistance (i.e. sign language interpreters, aides, etc.).

2. Distance education resources must be designed to provide "built-in" accommodation where possible (i.e. closed captioning, descriptive narration) and/or interface design/content layout which is accessible to "industry standard" assistive computer technology in common use by persons with disabilities.

3. Whenever possible, information should be provided in the alternative format preferred by the student (i.e. sign language interpreter, closed captioning, descriptive narration, Braille, audio tape, large print, electronic text). When choosing between possible alternative formats or methods of delivery, consideration should be given to the fact that methods which are adequate for short, simple or less important communications may not be equally effective or appropriate for longer, more complex, or more critical material (Example: Use of a telephone relay service may be an acceptable method for a faculty member to respond to a brief question from a deaf student during his/her office hours, but probably would not be appropriate as a means of permitting that same student to participate in a class discussions in a course conducted by teleconference.) Issues concerning accommodation should be resolved through appropriate campus procedures as defined under Title 5, Section 56027.

4. Adoption of access solutions which include assigning assistants (i.e. sign language interpreters, readers) to work with an individual student to provide access to distance education resources should only be considered as a last resort when all efforts to enhance the native accessibility of the course material have failed.

5. Access to distance education courses, resources and materials include the audio, video and text components of courses or communication delivered via satellite, Instructional Television Fixed Services (ITFS), cable, compressed video, Local Area Network/Wide Area Network (LAN/WAN networks), Internet, telephone or any other form of electronic

transmission. Access to resources and materials include the audio, video, multimedia and text components of Web sites, electronic chat rooms, e-mail, instructional software, CD-ROM, DVD, laser disc, video tape, audio tape, electronic text and print materials. Where access to Web sites not controlled by the college is required or realistically necessary to completion of a course, the college must take steps to ensure that such sites are accessible or provide the same material by another means that is accessible.

6. Distance education courses, resources and materials must be designed and delivered in such a way that the level of communication and course taking experience is the same for students with or without disabilities.

7. After the adoption date of these guidelines, any distance education courses, resources or materials purchased or leased from a third-party provider or created or substantially modified "in-house" must be accessible to students with disabilities unless doing so would fundamentally alter the nature of the instructional activity or result in undue financial and administrative burdens on the district.

8. Colleges are encouraged to review all existing distance education curriculum, materials and resources as quickly as possible and make necessary modifications to ensure access for students with disabilities. At a minimum, the Chancellor's Office will expect that the curriculum for each distance education course and its associated materials and resources will be reviewed and revised as necessary when the course undergoes curriculum review pursuant to Title 5, Sections 55002 and 55378, every six years as part of the accreditation process. In the event that a student with a disability enrolls in an existing distance education course before this review is completed, the college will be responsible for acting in a timely manner to making any requested modifications to the curriculum, materials or resources used in the course, unless doing so would fundamentally alter the nature of the instructional activity or result in undue financial and administrative burdens on the district.

9. In the event that a discrimination complaint is filed alleging that a college has selected software and/or hardware that is not accessible for persons with disabilities, the Chancellor's Office and the U.S. Department of Education , Office for Civil Rights will not generally accept a claim of undue burden based on the subsequent substantial expense of providing access, when such costs could have been significantly reduced by considering the issue of accessibility at the time of initial selection.

10. In all cases, even where the college can demonstrate that a requested accommodation would involve a fundamental alteration in the nature of the instructional activity or would impose an undue financial and administrative burden, it must nevertheless provide an alternative accommodation which is equally effective for the student if such an accommodation is available.

11. Ensuring that distance education courses, materials and resources are accessible to students with disabilities is a shared college responsibility. All college administrators, faculty and staff who are involved in the use of this instructional mode share this

obligation. The Chancellor's Office will make every effort to provide technical support and training for faculty and staff involved in the creation of accessible distance education courses, resources and materials through: campus representative(s) to the California Virtual University (CVU) Regional Distance Education Center, staff from the local Regional Distance Education Center(s), campus High Tech Center staff and High Tech Center Training Unit staff.

Access Guidelines for Specific Modes of Distance Education Instructional Delivery

1. Print Media

The use of "correspondence" has a long history in distance education and will likely continue as an element of some courses. Print-based materials are easy to handle, modify, distribute and store. Print materials allow students to work at their own pace.

Delivery Medium - Print Medium

Access Issue

Students who are blind or have low vision will be unable to read print material. Some students with severe learning disabilities may also be unable to effectively read print materials.

Remedies

Provide print material in alternate formats including: Braille, large print, audiotape, digital sound files and e-text. Whenever possible, information should be provided in the alternative format preferred by the student.

Analysis:

Braille

Braille can be produced in a variety of formats designed to accommodate specialized needs such as scientific notation and music scores. For general text production, materials should be provided in Grade 2 Braille. Grade 2 Braille is the format most commonly used by persons who are blind.

Braille can be produced "in-house" using readily available Braille translation software and specialized Braille printers or out-sourced to agencies and organizations which produce Braille documents commercially. As of 1999, colleges wishing to produce Braille documents in-house should expect to pay around $5000 for the necessary printer hardware and software. Commercial production costs average about one dollar per

Braille page with one single spaced print page equaling approximately two print Braille pages. Production time through commercial providers can vary from days to weeks.

In either case, Braille documents should be formatted to preserve critical page layout elements (i.e. columns, tabular data, etc.) and proofed for accuracy.

Large Print

Large print documents printed from electronic files should be produced using a font size of 14 point (or larger) and sans serif type faces such as Helvetica for visual clarity. Documents should be reformatted as necessary to preserve critical page layout elements. All colors should be set for maximum print contrast.

Audio Tape

Audio taped materials can be produced in-house if recording studio resources are available or outsourced to commercial providers such as Recordings for the Blind and Dyslexic. For in-house recording, readers should be familiar with the vocabulary of the source material and the taped material proofed for accuracy. These media are typically used by both visually impaired and learning disabled students.

Electronic Text

Electronic text should be available in multiple operating system formats (i.e. Windows, Macintosh), plain text, and industry standard word processing formats (i.e. Word, WordPerfect, etc.). These media are typically used by both visually impaired and learning disabled students.

Resource Material

Please see Appendix I for supplemental information about copyright issues, Braille and large print.

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2. Audio Conferencing

Telephones remain the technology of choice for simple phone calls between a teacher and a student as well as for scheduled, multi-point sessions between a teacher and students at many locations. Telephones are also used in "one-way video, two-way audio" teleconferencing/instructional delivery systems often used by community colleges for microwave delivery of courses to surrounding community sites. The telephone system is ubiquitous, reliable, easy to use and of sufficient quality for delivery of voice content.

Delivery Medium - Audio Conferencing

Access Issue

Students who are deaf or hard-of-hearing will not be able to hear conversations. Students with speech impediments will not be able to respond to conversations.

Remedies

Provide a text telephones (TTY) link in the studio or classroom, provide TRS service, provide a dedicated, electronic chat room and real-time transcription of conversations, provide on-site interpreter at the student's location.

Analysis:

Text Telephones (TTY), sometimes called a TDD or Telecommunication Devices for the Deaf, are widely used by people who are deaf or have speech impediments. A TTY is a combination telephone, keyboard and display which allows for direct, point-to-point text based communication between two people. Communication rates are only constrained by typing speed of the two users. TTYs work over ordinary phone lines and require no set-up or configuration. TTYs may be used for one-on-one telephone conversations between faculty and student.

Faculty can communicate with students who are deaf, hard of hearing, or speech-impaired using the Telecommunications Relay Service (TRS). A TRS special operator types whatever the instructor says and the words appear on the students TTY display. Student responses are typed back to the TRS operator who reads them aloud to the instructor. Toll free TRS services are available 24 hours a day, 365 days a year. Use of a TRS may be an acceptable method for a faculty member to respond to a brief question from a deaf student during his/her office hours, but probably would not be appropriate as a means of permitting that same student to participate in a class discussions in a course conducted by teleconference.

A variety of commercial and public domain Web-based "chat" software is presently available. Using these tools, the college may create a private chat room where deaf, hard-of-hearing or speech impaired students can read, and type responses to, the content of the conversation as it is input by a "real-time" transcriptionist. The instructor also views the transcribed text and shares with the telephone audience any comments typed by students using the chat room. Chat rooms may be used for one-on-one conversations between faculty and student as well as for multi-point group conversations.

In keeping with the basic requirements defined earlier, in the event that all other efforts to make the distance education resource accessible as delivered have failed, as a last resort, colleges may provide an on-site interpreter(s) at the student's location.

Please see Appendix II for supplemental information about TRS, TTY, chat, real-time transcription and interpreter services.

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3. Video Conferencing/Video Transmission (Live)

Video conferencing can include satellite broadcast, TV cable, Instructional Television Fixed Service (ITFS) or compressed video (ISDN). It may include real-time, two-way video and audio or one-way video/two-way audio. Pre recorded video transmission, described in Item 4, generally involves the rebroadcast of a course segment which has been videotaped and includes no real-time interaction between student and instructor.

Delivery Medium - Video Conferencing/Video Transmission (Live)

Access Issue

Students who are deaf or hard-of-hearing will not be able to hear conversations. Students who are blind or have low vision will not be able to see instructional materials.

Remedies

Provide real-time closed or open captioning, an on-screen interpreter or (as a last resort) an interpreter at the student's location. To facilitate communication from the student, provide a TTY link in the studio or classroom, provide TRS service or provide a dedicated, electronic chat room for real-time conversation exchange.

For blind and low vision, provide all print materials in alternative formats and include descriptive video narration as needed.

Analysis:

On August 7th, 1997, the Federal Communications Commission (FCC) unanimously approved a new law which mandates captioning on virtually all television programming in the United States. Section 305 of the Telecommunications Act of 1996 is being implemented as a new section (Section 713) of the existing Communications Act. There are a variety of existing technologies which will allow colleges transmitting via satellite Ku or C band, microwave (ITFS) or cable and with moderately sophisticated video editing and broadcast capabilities to add captioning to live broadcasts in real-time in

closed or open format. Average cost for these systems is about $10,000. Hourly rates for real-time transcriptionists average $75 to $100/hour. Real-time captioning can also be provided through outsourcing to commercial services.

Colleges may also provide access to the audio component of live broadcasts for deaf or hard-of-hearing students by including a sign language interpreter in a small video window superimposed over the main video.

To facilitate communication from the student, the college may employ:

Text Telephones (TTY), a combination telephone, keyboard and display which allows for direct, point-to-point text based communication between two people. TTYs work over ordinary phone lines and require no set-up or configuration and may be used for one-on-one telephone conversations between faculty and student. The faculty would read the student's response from the TTY to the listening audience.

Deaf, hard of hearing, or speech-impaired students can also communicate with the faculty member using the Telecommunications Relay Service (TRS). Student responses are typed back to the TRS operator who reads them aloud to the instructor. The faculty would share the student's response with the listening audience. Toll free TRS services are available 24 hours a day, 365 days a year. Use of a TRS may be an acceptable method for a faculty member to respond to a brief question from a deaf student during his/her office hours, but probably would not be appropriate as a means of permitting that same student to participate in a class discussions in a course conducted by teleconference.

A variety of commercial available and public domain Web-based "chat" software is presently available. Using these tools, the college may create a private chat room where deaf, hard-of-hearing or speech impaired students can type responses to the content of the video as presented via captioning or on-screen interpreter. The instructor monitors the chat room and shares with the audience any comments typed by students using the chat room. Chat rooms may be used by one or more students simultaneously. Colleges may also provide an on-site interpreter(s) at the student's location as an alternative to captioning, TTY, TRS or chat rooms.

Supplemental course material in print media must also be provided in alternative formats (Braille, large print, audio tape and/or electronic text) to provide access for students who are blind or have low vision. Please see the discussion of Print Media for details.

Descriptive narration on the Second Audio Programming (SAP) channel provides a mechanism through which students who are blind or have low vision can receive auditory descriptions of important visual elements of the video presentation. Real time descriptive narration requires the services of a trained narrator and the ability of the college to transmit a SAP channel. As an alternative, colleges should train faculty who teach via real-time broadcast to include descriptions of visual objects which have significant instructional content in their course dialogue.

Please see Appendix III for supplemental information about real-time captioning.

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4. Video Transmission (Pre Recorded)

Passive video transmission generally involves the rebroadcast of a course segment which has been videotaped and includes no real-time interaction between student and instructor.

Delivery Medium - Video Transmission (Pre Recorded)

Access Issue

Students who are deaf or hard-of-hearing will not be able to hear conversations. Students who are blind or have low vision will not be able to see instructional materials.

Remedies

Provide closed or open captioning, an on-screen interpreter or (as a last resort) an interpreter at the student's location.

For blind and low vision, provide all print materials in alternative formats. Provide real-time descriptive narration of significant visual elements

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Analysis:

As mentioned in Item 3, on August 7th, 1997, the FCC unanimously approved a new law which mandates captioning on virtually all television programming in the United States. Section 305 of the Telecommunications Act of 1996 is being implemented as a new section (Section 713) of the existing Communications Act. There are a variety of existing technologies which will allow colleges to provide "off-line" captioning to existing libraries of instructional video and course materials. There are a variety of technologies available for off-line addition of captioning in closed or open format. Average cost for these systems is about $10,000. Costs for keying in of captioning are comparable to clerical word-processing rates. Off-line captioning can also be provided through outsourcing to commercial services for reasonable rates.

Colleges may also provide access to the audio component of a video for deaf or hard-of-hearing students by adding a sign language interpreter in a small video window superimposed over the main video as a post-production activity.

Supplemental course material in print media must also be provided in alternative formats (Braille, large print, audio tape and/or electronic text) to provide access for students who are blind or have low vision. Please see the discussion of Print Media for details.

Descriptive narration on the Second Audio Programming (SAP) channel provides a mechanism through which students who are blind or have low vision can receive auditory descriptions of important visual elements of the video presentation. Post-production descriptive narration requires the services of a trained narrator and the ability of the college to encode a SAP channel on the videotape. Colleges should train faculty who teach via videotaped courses to include descriptions of visual objects which have significant instructional content in their course dialogue.

Please see Appendices I for supplemental information about copyright issues, Braille, large print, audiotape and electronic text and III for supplemental information about real-time captioning.

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5. World Wide Web

The Web is rapidly becoming one of the most widely used media for delivery of distance education. The relatively low cost of delivery, ease of resource development and wide availability of student access make it an ideal instructional delivery resource. Although presently constrained by bandwidth considerations, the Web is fully capable of delivering a variety of multimedia and interactive instructional resources including audio, video and real-time chat services.

Delivery Medium - World Wide Web

Access Issue

Students who are blind will be unable to access graphic images, text formatted in complex ways, Java applets and video clips. Students who are deaf or hard-of-hearing will not be able to hear the auditory content of the Web site. Some students with severe learning disabilities may be unable to process large amounts of text information without the use of assistive technologies.

In addition, documents created using Adobe Portable Document Format (PDF) are difficult, if not impossible, to read using screen readers and/or refreshable braille displays. Thus, if materials are provided on a website in PDF format, an alternative version should also be available in plain text or HTML format. Of course, this is only feasible for textual information and would not apply to materials, or portions of materials, that are inherently graphic in nature such as pictures, graphs and maps.

Remedies

A comprehensive set of guidelines for meeting the Web access needs of persons with disabilities have been developed by the Web Accessibility Initiative (WAI) (http://www.w3.org/WAI/) as a working group of the World Wide Web Consortium (W3C).

Analysis:

The intent of these guidelines is to foster the creation of Web sites which provide equal access to information when viewed using typical, industry standard assistive computer technologies in wide use today by students with disabilities. Over the past two years, the international body of the World Wide Web Consortium (W3C) has sponsored the work of the Web Accessibility Initiative (WAI) in developing a set of international access guidelines for the Web. Although the WAI guidelines remain in draft format, they satisfy the access requirements identified under Title II of the Americans with Disabilities Act (ADA). In order to resolve compliance issues raised by OCR and to comply with Title II of the ADA, these guidelines have been adopted by the California Community Colleges Chancellor's Office. They apply to use of Web based instructional resources created by the college or other Web-based resources students are required to use for course completion. They will be reviewed/modified as necessitated by future revisions of the WAI guidelines by W3C.

The WAI guidelines excerpted below fall into three priority levels:

Priority 1

This guideline must be followed by an author, or one or more groups of users will find it impossible to access information in the document. Implementing this guideline is a basic requirement for some groups to be able to use Web documents.

Provide alternative text for images, applets, and image maps.
Provide descriptions for important graphics, scripts, or applets if they are not fully described through alternative text or in the document's content.
Provide textual equivalents for audio information (captioning).
Provide verbal descriptions of moving visual information in both auditory and text form.
Ensure that text and graphics are perceivable and understandable when viewed without color.
Ensure that moving, blinking, scrolling, or auto-updating objects or pages may be paused or frozen.
Ensure that pages using newer HTML features (i.e. style sheets, forms, tables) will transform gracefully into an accessible form.
Use features that enable activation of page elements via input devices other than a pointing device (e.g., via keyboard, voice, etc.).
For frames, provide sufficient information to determine the purpose of the frames and how they relate to each other.
Ensure that tables (not used for layout) have necessary markup to be properly restructured or presented by accessible browsers and other user agents.
Only use technologies defined in a W3C specification and use them in an accessible manner. Where not possible, provide an accessible alternative page that does.

Priority 2

This guideline should be followed by an author, or one or more groups of users will find it difficult to access information in the document. Implementing this guideline will significantly improve access to Web documents.

Indicate structure with structural elements, and control presentation with presentation elements and style sheets.
Provide supplemental information needed to pronounce or interpret abbreviated or foreign text.
Elements that contain their own user interface should have accessibility built in.
Use interim accessibility solutions so that assistive technologies and older browsers will operate correctly.
Group controls, selections, and labels into semantic units.
Wherever possible, create good link phrases.

Priority 3

This guideline may be followed by an author to make it easier for one or more groups of users to access information in the document. Implementing this guideline will improve access to Web documents.

Provide mechanisms that facilitate navigation within your site.
Create a single downloadable file for documents that exist as a series of separate pages.

Complete text of the WAI accessibility guidelines as well as useful tutorials and extensive technical support can be found at: http://www.w3.org/WAI/

Additionally, a fully automated Web accessibility evaluation tool called BOBBY is available for use by California community colleges. BOBBY will evaluate a local Website incorporating the current WAI guidelines in its Website accessibility analysis and provide a detailed report of accessibility problems and recommended changes arranged by priority of importance.

It is required that all California community college instructional Web sites created or substantially modified after adoption of these guidelines be Priority 1 compliant. It is strongly recommended that all California community college instructional Web sites created or substantially modified after adoption of these guidelines be Priority 2 compliant.

BOBBY can be found at: http://www.cast.org/bobby/

Please see Appendix IV for supplemental information about development of accessible Web pages.

6. Instructional Software, Laser Video Disc, CD ROM, DVD

Courses presented through distance education may also include supplemental materials offered in a variety of electronic formats including computer assisted instruction (CAI) software, materials on video disc, CD ROM or DVD.

Delivery Medium - CAI software, video disc, CD ROM, DVD

Access Issue
Students who are blind will be unable to access graphic images, text formatted in complex ways, Java applets and video clips. Students who are deaf or hard-of-hearing will not be able to hear the auditory content of these resources. Students with physical disabilities may have difficulty using a touch screen video disc interface. Some students with severe learning disabilities may be unable to process large amounts of text information without the use of assistive technologies.

Remedies

The Trace Research & Development Center at the University of Wisconsin-Madison has designed a comprehensive set of software development guidelines which address these issues. These guidelines should be used in combination with the guidelines for multimedia access developed by the Web Accessibility Initiative.

Analysis:

The California Community Colleges Chancellor's Office gratefully acknowledges the work of Dr. Gregg C. Vanderheiden, Ph.D. and the Trace Research & Development Center at the University of Wisconsin-Madison for the development of the following software accessibility development guidelines which have been excerpted for inclusion.

In order to comply with Title II of the Americans with Disabilities Act (ADA), the Chancellor's Office strongly recommends that California community colleges abide by the guidelines excerpted below when purchasing existing software, contracting for the development of software or developing software in-house.

Excerpted from the Trace Research & Development Center Accessibility Guidelines

There are many people who need to be able to use standard software programs in their jobs, schools or homes but are unable to because of the design of the programs or their interfaces. These people, because of accident, illness, congenital condition or aging have reduced visual, hearing, physical or cognitive/language abilities. The current estimate of people with disabilities is over 40 million people - a sizable portion of our population.

Purpose of the guidelines

The purpose of these guidelines is to document what application developers can do (or need to do) in order to make their software accessible and usable by people who have disabilities or reduced abilities due to aging.

The guidelines document does this by providing information on the problems faced by people with disabilities in using current software and documenting ways in which application software can be made more accessible and usable by them.

Basic Components

Basically, making application software more accessible consists of three complementary components:

1. Designing your software so that it is as usable as possible to the greatest number of people - without requiring them to use special adaptive software or hardware. (This is referred to as Direct Accessibility).

2. Designing your software in such a way that it will work with special access features built into the operating system or attached to it by users who require them. (i.e., Compatibility with operating system or third-party access features / software / devices for those people who will not be able to use your software directly.)

3. Making sure that your documentation, training, and customer support systems are accessible.

A brief summary of the guidelines by disability area follows.

For people with physical disabilities

People with physical disabilities can have a wide range of abilities and limitations. Some people may have complete paralysis below the waist but may have no disability at all with their upper body. Others may have weakness overall. Some may have very limited range of motion, but may have very fine movement control within that range. Others may have little control of any of their limbs, or may have uncontrolled, sporadic movements which accompany their purposeful movements. Some with arthritis may find that hand and other joint movement is both physically limited and limited by pain.

A physical disability, by itself, does not usually affect a person's ability to perceive information displayed on the computer screen. Access is generally dependent on being able to manipulate the interface.

Therefore, you can increase the accessibility of your software (both direct and via access features/software and hardware):

by avoiding timed responses (less than 5-8 sec.) or allowing the response time to be changed;
by providing keyboard access to all toolbars, menus, and dialog boxes (whose functions are not also in the menu);
by not interfering with access features built into the operating system (e.g. StickyKeys, SlowKeys, Key Repeating etc.).

For people who are hard of hearing or deaf

Many users with hearing impairments need to have some method for adjusting the volume or for linking sounds more directly to their hearing aids. Both of these are hardware considerations and can be met with systems having volume controls and headphone or audio jacks. Users who have more severe hearing impairments may also use a combination of these techniques, as well as techniques for people who are deaf. Such techniques generally involve the visual display of auditory information.

Therefore, you can increase the accessibility of your software to users with hearing impairments:

by providing all auditory information in a visual form as well;
by ensuring that all visual cues are noticeable if one is not looking at the screen;
by having a mode of operation that will work in noisy environments or if sound is turned off;
by using the ShowSounds feature of the operating system of your computer, the user can specify that all sound should be accompanied by a visual event including a caption for any spoken text which is not already presented on screen.

In addition, you should make sure that product support people are reachable via Text Telephones (also called TDD's or Telecommunications Devices for the Deaf).

For people with color blindness

You can increase the compatibility of your software with access features/software:

by making color coding redundant with other means of conveying information;
by making sure that your program can operate in monochrome mode;
by using colors which differ in darkness so that they can be distinguished by this as well as color.

For people with low vision

People with low vision may have any one of a number of problems with their vision ranging from poor acuity (blurred or fogged vision) to loss of all central vision (only see with edges of

their eyes) to tunnel vision (like looking through a tube or soda straw) to loss of vision in different parts of their visual field, as well as other problems (glare, night blindness, etc.).

For people with low vision, a common way to access the information on the screen is to enlarge or otherwise enhance the current area of focus. Given this, you can increase the direct accessibility of your software:

by allowing the user to adjust the fonts, colors and cursors used in your program to make them more visible;
by using a high contrast between text and background;
by not placing text over a patterned background where the two might interfere with each other;
by using a consistent or predictable layout for screens and dialogs within the program;
by providing access to tools, etc., via menu bar;
by using recommended line width information when drawing lines (if such information is provided by the system).

In addition, you can increase the compatibility of your software with low vision access features/software by using the system pointers wherever possible, as well as the system caret or insertion bar if one is available.

If you use your own highlight/focus indicator, drag the system cursor with you even if it is invisible. This makes tracking the focus much easier for screen enlargement or "pan and zoom" features. If the operating system has a High Contrast setting, support it.

<u>For people who are blind</u>

Many people who are legally blind have some residual vision. This may vary from just an ability to perceive light to an ability to view things that are magnified. The best design is for this group is therefore one that doesn't assume any vision but allows a person to make use of whatever residual vision they may have.

Access by people who are blind is usually accomplished using special screen reading software to access and read the contents of the screen, which is then sent to a voice synthesizer or dynamic Braille display.

On computers which use a graphic user interface this is a bit tricky, but there are a number of things that application software developers can do to make it possible for people using screen readers to detect and figure out what is on the screen. These include:

using the system tools wherever you can to; 1) draw and erase all text on the screen; 2) display all cursors and pointers;
using the system standard controls whenever possible;
drawing tools in tool bars, palettes and menus that are separate items (rather than one big graphic of toolbar) as this makes it possible for screen readers to identify the number, location and shape of the individual tools so that they can be identified and named.

You can also increase the compatibility of your software with screen readers using the following considerations:

if text is embedded in a graphic image, using a special technique to make the text known to screen reading software (see detailed notes);
if you use your own highlight or focus techniques, dragging system cursors with you (even if invisible);
using consistent or predictable screen and dialog layouts;
not using popup help balloons that disappear if the focus changes unless there is a way to lock them in place so that the focus (e.g., cursor) can be moved there to read them;
using single column text whenever possible;
giving controls logical names, even if the name is not visible on screen (screen readers can access this information and use it to describe the type and function of the control on the screen);
providing keyboard access to all tools, menus, and dialog boxes.

Since screen readers can only read text (or give names to separately identifiable icons or tools) it is a good idea to:

avoid unlabeled "hot spots" on pictures as a control scheme (unless redundant with menu selection);
avoid non-text menu items when possible or incorporate cues (visible or invisible) (screen readers can ‘see’ text that is written to screen in an invisible color);
avoid non-redundant graphic tool bars if possible.

Finally, you can make your documentation and training materials more accessible:

by designing all documentation and on line help so that it can be understood by reading the text only (e.g. information presented in pictures and graphics is also presented with a description in text);
by providing synchronized running audio descriptions for all information presented as an animated graphic or movie (descriptive narration).

<u>For people with language or cognitive disabilities</u>

This is perhaps one of the most difficult areas to address. Part of the difficulty lies in the tremendous diversity that this category of persons with disabilities represents. It includes individuals with general processing difficulties (developmental disabilities, brain injury, etc.), people with very specific types of deficits (short term memory, inability to remember proper names, etc.), learning disabilities, language delays, and more. In addition, the range of impairment within each of the categories can (like all disabilities) vary from minimal to severe, with all points in between. In general, software that is designed to be very user friendly can facilitate access to people with language or cognitive impairments.

Somewhat more specifically, you can increase the accessibility of your software without reducing academic rigor:

by making sure that all messages and alerts stay on screen until they are dismissed;
by making language as straightforward as possible, both on screen and in the documentation;
by using simple and consistent screen layouts.

In addition, because print disabilities are more common among people with language and cognitive impairments, you can increase the accessibility of your software by ensuring that it is compatible with screen reading software.

For people with disabilities in general

Finally, you can increase the overall accessibility of your software without reducing academic rigor:

by making sure that your documentation is available in electronic form (that can be accessed by screen reading software) so that it is available to people who cannot handle or read your printed manuals;
by making sure that your product support people are aware of disability access issues and are aware that people with disabilities routinely use your products;
by having particular product support people identified who specialize in handling any incompatibility associated with the use of your product with disability access products (all support people should be able to handle regular product use questions of people who have disabilities, but it is usually helpful to focus incompatibility problems to a few people who can become more familiar with the issues and work arounds);
by forwarding any access or compatibility problems identified by product support people to product designers (and setting lower trigger levels for incidence vs. priority for fixing).

The complete text of these guidelines can be found at: http://www.trace.wisc.edu/docs/software_guidelines/toc.htm

Please see Appendix V for supplemental information about development of accessible software.

Appendix I

Copyright Issues

Copyright Law Amendment, 1996:
PL 104-197
December 1996

Background

The free national library program of reading materials for visually handicapped adults administered by the National Library Service for the Blind and Physically Handicapped (NLS), Library of Congress, was established by an act of Congress in 1931. The program was expanded in 1952 to include blind children, in 1962 to include music materials, and in 1966 to include individuals with physical impairments that prevent the reading of standard print.

From the beginning, this program was dependent upon the cooperation of authors and publishers who granted NLS permission to select and reproduce in special formats copyrighted works without royalty. Although many factors influence the length of time it takes to make a print book accessible in a specialized format, the period required to obtain permission from the copyright holder has sometimes been significant.

Public Law 104-197

Under the Legislative Branch Appropriations Bill, H.R. 3754, Congress approved a measure, introduced by Senator John H. Chafee (R-R.I.) on July 29, 1996, that provides for an exemption affecting the NLS program. On September 16, 1996, the bill was signed into law by President Clinton.

The Chafee amendment to chapter 1 of title 17, United States Code, adds section 121, establishing a limitation on the exclusive rights in copyrighted works. The amendment allows authorized entities to reproduce or distribute copies or phonorecords of previously published nondramatic literary works in specialized formats exclusively for use by blind or other persons with disabilities.

The act making appropriations for the Legislative Branch for the fiscal year ending September 30, 1997, sets forth the Chafee amendment as follows:

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, that .
. . and for other purposes, namely:

(a) IN GENERAL—Chapter 1 of title 17, United States Code, is amended by adding after section 120 the following new section:

"SEC.121. Limitations on exclusive rights: reproduction for blind or other people with disabilities

"(a) Notwithstanding the provisions of sections 106 and 710, it is not an infringement of copyright for an authorized entity to reproduce or to distribute copies or phonorecords of a previously published, nondramatic literary work if such copies or phonorecords are reproduced or distributed in specialized formats exclusively for use by blind or other persons with disabilities.

"(b)

(1) Copies or phonorecords to which this section applies shall—

"(A) not be reproduced or distributed in a format other than a specialized format exclusively for use by blind or other persons with disabilities;

"(B) bear a notice that any further reproduction or distribution in a format other than a specialized format is an infringement; and

"(C) include a copyright notice identifying the copyright owner and the date of the original publication.

"(2) The provisions of this subsection shall not apply to standardized, secure, or norm-referenced tests and related testing material, or to computer programs, except the portions thereof that are in conventional human language (including descriptions of pictorial works) and displayed to users in the ordinary course of using the computer programs.

"(c) For purposes of this section, the term—

"(1) ‘authorized entity’ means a nonprofit organization or a governmental agency that has a primary mission to provide specialized services relating to training, education, or adaptive reading or information access needs of blind or other persons with disabilities;

"(2) ‘blind or other persons with disabilities’ means individuals who are eligible or who may qualify in accordance with the Act entitled ‘An Act to provide books for the adult blind,’ approved March 3, 1931 (2 U.S.C. 35a; 46 Stat. 1487) to receive books and other publications produced in specialized formats; and

"(3) ‘specialized formats’ means Braille, audio, or digital text which is exclusively for use by blind or other persons with disabilities."

(b) TECHNICAL AND CONFORMING AMENDMENT—The table of sections for chapter 1 of title 17, United States Code, is amended by adding after the item relating to section 120 the following:

"121. Limitations on exclusive rights: reproduction for blind or other people with disabilities."

Braille

Braille is a system of reading and writing for blind individuals. The basic unit of Braille is the Braille cell. It is composed of six dots: the upper left dot is dot 1, the middle left dot is dot 2, the lower left dot is dot 3, the upper right dot is dot 4, the middle right dot is dot 5, and the lower right dot is dot 6. From these six dots you can get 64 possible combinations.

dot 1 ** dot 4
dot 2 ** dot 5
dot 3 ** dot 6

There are many more inkprint symbols than the 64 Braille symbols. For example, most computer systems handle about 96 different inkprint symbols. Braille can show a wide number of different inkprint symbols by using one or more Braille cells for each inkprint symbol.

Braille only has one set of letters. By itself, a Braille letter is assumed to be in lower case. To show an uppercase letter, put the capitalization indicator (dot 6) in front of a Braille letter. To show an uppercase word, you put two capitalization indicators in front of the word. The number sign (used to indicate a number) is dots 3-4-5-6. This symbol comes just before the number.

An important thing to realize about Braille is that you cannot write the dot patterns smaller or larger. An 11-1/2 by 11 inch piece of Braille paper contains about 900 Braille cells. The Braille Planets cause Braille volumes to be much bulkier than inkprint.

To reduce the bulkiness of Braille there is a system of Braille contractions, or abbreviations. A Braille contraction is a combination of one or more cells used to shorten the length of a word. For example, to write the word “mother”, you would use a two-cell contraction rather than spelling out the word “mother”. Just because a contraction can be used does not mean it should be used. The word “chemotherapy” contains the sequence “mother”. Some Braille translation programs are smart enough to know not to use the contraction for “mother” in “chemotherapy” (most of the Braille rules are based on pronunciation; you do use the “mother” contraction in “smother”, since this is pronounced like “mother”).

In Braille, if you have the letter “d” with a space or punctuation on either side, the “d” stands for the word “do”. To show you really mean the isolated letter “d”, precede it with a Braille cell called the letter sign, dots 5-6. This alerts the Braille reader to the fact that the next letter is to be read as a letter of the alphabet rather than an abbreviation.

Decoding Braille by comparing inkprint and Braille sequences can be tricky. The words “to”, “into”, and “by” are jammed up against the next word in Braille. The words “a”, “the”, “for”, “of”, and, “and” within Braille are single cells which can be jammed up against each other. For example, “with” is a single cell with spaces on either side, but “withthe” comes out as two cells

jammed together. Numbers use the number sign followed by the letters a-j (312 comes out as #cab). One Braille cell means “dis” if it shows up in the beginning of a word, means “dd” if it shows up in the middle of a word, and is used for the period punctuation symbol if it shows up at the end of a word.

There are several grades of Braille. Grade I Braille does not contain any contractions (abbreviations), but it does represent capitalization, numbers, and punctuation with the correct Braille symbols. Grade I Braille is used only for specialized applications where the Braille contractions might be confusing, such as in spelling lists. Grade II Braille is the most commonly used in North America. It not only represents capitalization, numbers, and punctuation marks with the proper symbols, but it uses the various contractions.

Braille Format

Another component of Braille is format. When material is laid out on paper for the sighted reader, it is done so for visual effect. The reader is attracted to what is pleasing to the eye. However, in Braille the object is maximization of space. Due to the bulkiness of Braille volumes, you want to put as much material as possible on the page, while at the same time maintaining readability.

According to the Library of Congress, which oversees standards and trains Braille transcribers for Braille production, there are certain criteria for the output page. A page of Braille contains a maximum of about 40 characters per line and 25 lines per page. For normal literary format (style sheet LITERARY) the Braille page number appears at the upper right-hand corner of each page. However, you may need to change these values according to the specifications of your Brailler.

Because of the physical (rather than visual) nature of Braille, format standards are especially important. Small differences in where text is placed on the page can tell the Braille reader a lot about what they are reading. In any Braille format, with or without a Braille translation program, certain elements are especially crucial components of page layout. These include treatment of indent and runover, Braille page numbers, inkprint page indicators, and running heads.

One of the major differences between Braille and print format pertains to paragraphs. Rather than having an indent of five spaces, Braille paragraphs have a two cell indent. The first character of the paragraph begins in cell three. There are no blank lines between paragraphs. Except in special circumstances, you do not put two or more spaces in a row in Braille. Thus only one space is used between sentences.

When material is underlined or emphasized in print, there are different ways of indicating it. In Braille there are italics marks which indicate something is being emphasized. A special symbol of dots 4-6 is placed before each word to be emphasized if there are three or fewer words in a row. If four or more words are emphasized, a double italics sign (dots 4-6, dots 4-6) is placed before the first word. A single italics sign (dots 4-6) is placed in front of the last emphasized word. Please note that you do not show all uses of inkprint emphasis in Braille. Emphasis is only used in headings when it is necessary to preserve the distinctions shown in inkprint.

Indent and Runover

Instructions for Braille transcribing often say indent to cell #. The farthest left position in which a cell may appear is cell 1. The farthest right position ranges from cell 30 to cell 40, depending on the carriage width of your Brailler.

The placement of the first cell in a paragraph is called the indent. When transcribing instructions say, Indent to cell 3, put the first cell of that segment in cell 3, regardless of where the preceding line began. The position at which all subsequent lines of the same segment begin is the runover. When instructions say, Runover to cell 1, begin all subsequent lines of that segment in cell 1. If instructions say, Indent to cell 7, runover to cell 5, begin the first line of that segment of text in cell 7, and all subsequent lines in cell 5.

Sometimes, the indent is a smaller number than the runover, as in, Indent to cell 1, runover to cell 5. In print, this is called outdenting, or a hanging indent. In Braille, the position of the first cell of a segment of text is always called the indent, regardless of whether it is to the left or the right of the remaining text.

Another common Braille instruction is block, as in, Block to cell 5. This simply means that the indent and the runover are equal to each other. It is the same as saying, Indent to cell 5, runover to cell 5.

Headings

There are three kinds of headings in Braille: major headings, minor headings, and paragraph headings.

A major heading is centered, with a blank line before the heading, and a blank line after it. Some Braille groups do not put a blank line after a major heading. Technically, this is a violation of the rules for Braille.

A minor heading is blocked to cell five. This means that the heading starts on the fifth cell of the line. Any runover also starts on the fifth cell of the line. Usually, there is a skipped line before a minor heading, but not after a minor heading.

A paragraph heading is a line or phrase in italics (or some other emphasis) that labels a paragraph and is immediately followed by text on the same line. If this is done in inkprint, do the same in Braille, using italics.

Braille rules require that there be at least one line of body text after a heading or headings on the same page. If there is not enough room on the page for the heading(s) and a line of body text, then the heading(s) need to be postponed to the top of the next Braille page.

Before you start a Braille project, you need to structure the document. You need to analyze how many levels of headings there are. You need to decide which of these should be done as a major heading, and which should be done as a minor heading.

Braille Page Numbers

As in print, each physical page in a Braille volume is given a sequential page number. This Braille page number merely orders the pages in the book. It does not provide the reader with any information about the pagination of the inkprint original. The Braille page numbers appear in different spots in different formats.

Print Page Indicators

Many Braille formats consider the Braille reader's need to know where each inkprint page begins. When required, inkprint page indicators appear in addition to the sequential Braille page numbers. Textbooks are one instance where this information is essential. With it, the Braille reader can follow class discussion, locate homework assignments, and generally keep up with the users of the inkprint original.

A single print page usually occupies several Braille pages. For example, if inkprint page 87 is found on three Braille pages, then these are marked with inkprint page indicators 87, a87, and b87.

Inkprint page indicators are also extremely useful when transcribing anything that has a table of contents or an index. When inkprint page indicators are not included on the Braille page, indexes and such must be completely rewritten to refer to the Braille page numbers. When inkprint page indicators are included, then page numbers may be transcribed exactly as they appear in print.

Running Heads

Many Braille formats require that the title of the work being transcribed appear on the first line of every page, with an appropriate page number. When the title is too long to fit on one line, it is abbreviated. The running head never uses more than one line.

Literary vs. Textbook Format

Whenever you begin a new transcribing project, with or without a Braille translation program, there is some planning to do before you start data entry. There are a number of things to look for in the first scan through the book: Check to see if there are a large number of foreign words, a table of contents or index, and graphs or pictures in the book.

One of the first things you must decide is whether to use textbook or literary format. Sometimes, the agency that assigns the transcribing job makes this decision for you. Here are some guidelines for when you have to decide yourself. Textbook format uses inkprint page indicators; literary format does not. When there is any possibility that the Braille reader needs inkprint page

indicators, use textbook format. Both formats may be used with or without running heads. Textbook and literary formats are also different from each other in the way they handle preliminary pages, indexes, and certain special cases such as tables and graphs.

In general, literary format allows the transcriber a certain amount of latitude. The overriding concern of textbook format is to represent things in Braille EXACTLY as they appear in print. Anything added or omitted in the transcribing process must be explained in a transcriber's note.

Literary Format

In literary format without a running head, text appears on every line of the Braille page. The Braille page number appears in the rightmost cells of the first line, with at least three blank cells before the number. Text on the first line must break to allow room for this.

Literary format with a running head has text on lines 2 through 25. Line 1 begins with at least three blank cells, followed by the running head, at least three more blank cells, and the Braille page number.

Textbook Format

The major difference between textbook and literary formats in the main body of text is inkprint page indicators. Textbook format has them; literary format doesn't. For textbook format with no running head, text appears on every line. On line 1, the inkprint page indicator appears in the rightmost cells with at least three blank cells before it. The Braille page number appears in the rightmost cells of the last line on the page. Again, at least three blank cells are placed before the Braille page number.

Textbook format with a running head has text on lines 2 through 25. Line 1 begins with at least three blank cells, followed by the running head, at least three more blank cells, and the inkprint page indicator. Line 25 breaks the text to allow room for three blank cells and the Braille page number at the end of the line.

The California Community Colleges Chancellor's Office gratefully acknowledges the work of Braille Planet in creating this excellent overview of Braille.

Braille Production Facilities

Dozens of commercial Braille production companies are available to colleges wishing to outsource. The majority of these resources have Web addresses and accept electronic submission of materials to be Brailled. Prices, production times and quality vary. Three of the largest are:

National Braille Press

88 St. Stephen Street
Boston, MA 02115
Phone: (617) 266-6160
Toll-free: (800) 548-7323
Fax: (617) 437-0456
http://www.nbp.org/

The American Printing House for the Blind, Inc.
1839 Frankfort Avenue
Mailing Address: P.O. Box 6085
Louisville, Kentucky 40206-0085
U.S.A.
Phone: 502-895-2405
Toll Free Customer Service: 800-223-1839 (U.S. and Canada)
Fax: 502-899-2274
http://www.aph.org/contact.htm

Braille Institute
741 N. Vermont Avenue
Los Angeles, CA 90029
(323) 663-1111
FAX: (323) 663-0867
http://www.brailleinstitute.org/Press.html

Other Braille Transcriber Services

Braille Transcribers
http://www.spedex.com/directories/braille.htm

Braille Jymico Inc.
http://www.braillejymico.qc.ca/products.htm

NMSU List of Braille Transcription Resources
http://www.nmsu.edu/Resources_References/access/public_html/trans.html

Quik-Scrybe
http://www.quikscrybe.com/

BRAILLE INSTITUTE
EDUCATION AND AWARENESS

A Guide To Large Print For People With Low Vision
Many people with visual impairments beyond those correctable by prescription lenses still read, often with the assistance of special aids such as lighting or magnification

devices. People with reduced sight often find that conventional print appears blurred, dim and very difficult, if not impossible, to read. Central damage to the retina, for example, prevents some people from seeing small print clearly and reduces their ability to move their eyes in the ways needed for reading. Text can be made more legible for some of these readers through the use of large print. There are many factors to consider when producing large-print material, and it is important to note that the variety of visual impairment and subsequent impact on the ability to read is extensive.

CONTRAST: Text should be printed with the highest possible contrast. Use of boldface type generally provides greater legibility, as the letters are darker and thicker. Black or dark blue inks are preferable to lighter colors. Color backgrounds generally should be avoided, although some studies suggest that black ink on a bright yellow background is easy to read. Buff, cream or light yellow backgrounds usually are acceptable, but not dark or bright color backgrounds. Some visually impaired people are unable to distinguish type at all with black ink on a dark red background.

REVERSE type—"white" type on a dark background-improves readability for some. Reverse type often is an available option with some computers and special closed-circuit cameras used for reading, and might be good for some signs or other items with limited text. Backgrounds should be solid.

SIZE: Type often is measured in points and should be as large as practical. Text should be 14 points or larger, preferably 18 points. Headlines should be at least 24 points, larger if possible.

LEADING: The spacing between lines of text, called leading, should be greater than that traditionally used in regular text. Many people with Iow vision have difficulty finding the beginning of the next line when reading if the lines of type are too close together. A ratio of 150 percent (12-point type receives 18-point leading) is a good guideline for text.

STYLE: An ordinary typeface, such as this one (Helvetica), a sans-serif font (one without the fine lines projecting from the main strokes of letters found on some fonts, such as Palatino or Times, usually is the best choice for large print. Other styles of type frequently used in regular print are not easily read by people with Iow vision. These include ALL CAPS, SMALL CAPS, *italics* and `ornate, decorative fonts like this`. Text should be in Upper and Lower Case, with wider spacing between lines, for maximum readability.

LETTER SPACING: The spacing (track) between individual letters on each line should be wider than usual whenever possible. Text with close letter spacing is particularly difficult for partially sighted readers who have central visual field defects.

MARGINS: Extra-wide binding margins are very helpful in large-print books and other bound material because they make the volumes easier to hold flat. Many visual aids, such as stand and video magnifiers, are easier to use on a flat surface.

PAPER: Paper with a glossy finish can interfere with legibility because it tends to catch and reflect the glare of lights in a room. Glare is a common problem for many readers who are partially sighted. Print on paper with a matte (dull) finish whenever possible. Those wishing to use recycled paper will find a good selection of paper stock. Ink type—petroleum-based versus soy-based—is not a factor.

ALIGNMENT of text, hyphenation of words and other factors can slow a reader who is visually impaired and are worth considering when producing materials for this audience. Text created "flush left" is easiest to read. Paragraphs indented too far (.125 inches is a suggested maximum) might be replaced by paragraphs with extra space between them.

Text that is centered is harder to follow because
the reader must search for the start of each line.
Text created "flush right" also is a potential problem.

Text that is "justified" appears to create no special problems, although many computer programs typically compact some type when this alignment is used, which can reduce the readability. Justified type also uses a lot of hyphenation, which can slow the reading process for someone who is visually impaired to a greater degree than it does for sighted readers.

When producing large-print materials for people with reduced sight, keep the above principles in mind and your readers will be able to make full use of their remaining vision.

Los Angeles Sight Center (213) 663-1111•Desert Center (760) 321-1111
San Diego Center (619) 452-1111•Santa Barbara Center (805) 682-6222
Orange County Center (714) 821-5000•Youth Center (213) 851-5695
www. brailleinstitute.org

Appendix II

Telephone Relay Services

Telephone Relay Services (TRS) link people using a standard (voice) telephone with people using a device called either a Text Telephone (TTY) or Telecommunications Device for the Deaf (TDD). This device generally consists of a keyboard and display screen. Calls are routed through a communications operator who has both sets of equipment and who acts as the intermediary between callers. Such services eliminate communications barriers between people with and without hearing/speech impairments, and between the different telephone equipment they typically use. Tip: Relay service calls take longer due to the communications operator's "translation" to/from voice and text. It helps to organize your thoughts and any material you will need, beforehand.

Dialing Instructions:

TTY/TDD Origin

Dial the TTY/TDD number of the relay services.
The communications operator will answer by typing his/her personal ID number. (relay call conventions will be explained if you have not used them before).
Type the voice number you wish to call. The operator will connect you.

Voice Origin

Dial the voice number of the relay service.
The communications operator will answer by speaking his/her personal ID number. (relay call conventions will be explained if you have not used them before).
Speak the TTY/TDD number you wish to call. The operator will connect you.

Nationwide Long Distance Relay Services

AT&T
800-855-2880 (TTY/TDD)
800-855-2881 (Voice)
800-855-2882 (Computer)
800-855-2883 (Telebraille)
800-855-2884 (Spanish-TTY/TDD)
800-855-2885 (Spanish-Voice)
800-855-855-2886 (Spanish-Computer)
MCI
800-688-4889 (TTY/TDD)
800-947-8642 (Voice)
Sprint
800-877-8973 (Voice & TTY/TDD)

Real-Time Transcription

On-Site Classroom Captioning

Rapidtext is a leading provider of qualified classroom captioning or interpreting. Transcribers attend class and write the spoken word on a steno machine. This process instantly creates English text so that one or more hearing impaired students may not only see what is being said, but non-oral students can utilize the keyboard to ask questions. These questions are usually read aloud by the Rapidtext captionist. At the end of the class session, the hearing impaired students can have a diskette or hard copy of the class notes. This solution is unparalleled for even the most technical classes and graduate studies. This meets ADA requirements for the hearing impaired and is extremely effective for learning disabled and English as a Second Language (ESL) students.

Remote Captioning

The benefits are identical to the Classroom Captioning description except that the captionist/steno interpreter is located remote to the class setting. The captionist can be located in another building, another city, or in our office. The captionist hears what is being said via a telephone line, and sends back the captions to a computer in the classroom or to the Rapidtext Infosign for the instant display of the spoken work. This can work very simply by using a speakerphone in the classroom or a lapel microphone on the teacher. Also, the class notes are available at the end of the class session. This solution meets ADA requirements for the hearing impaired and can be very easy to staff for the erratic class schedule by dealing only with Rapidtext.

Captioning for Public Events, Seminars, Meetings

Rapidtext can provide either on-site or remote captioning/interpreting for any event. Captions can be displayed on one or more computer monitors, video monitors, projection televisions, or Rapidtext Infosigns. Even special interfaces can be developed for sports arena scoreboards or special display devices. Rapidtext has captioned events of all sizes, including our president's speech, and that was outdoors. Transcripts can be provided of the events or seminars. Ensure that you meet ADA requirements for your next event.

RapidText
http://www.rapidtext.com/

Interpreter Services

What is Interpreting?

Interpreting, simply stated, is receiving a message in one language and delivering it in another. Not as simple as it sounds, interpreting is a complex process that requires a high degree of linguistic, cognitive and technical skills.

Professional sign language interpreters develop interpreting skills through extensive training and practice over a long period of time. Interpreters continue to actively improve their skills, knowledge, and professionalism through membership in RID. An increasing number of interpreters have completed college or university interpreter education programs, earning associates, bachelors, and/or masters degrees in interpreting. Some interpreters have also obtained advanced degrees in related fields such as linguistics or cultural studies.

Sign language interpreting is a highly specialized field; simply knowing both sign language and English does not qualify a person as an interpreter. The professional sign language interpreter is able to adjust to a broad range of deaf consumer preferences and/or needs for interpretation. Some deaf individuals use American Sign Language, a natural language with its own grammar and structure that is distinct from English. Others prefer a form of signing that more closely follows the grammar and structure of spoken English. The professional interpreter is expected to work comfortably along this wide spectrum. Sometimes it is necessary to have two or more interpreters working simultaneously in order to satisfy the preferences and needs of a varied audience. On occasion, one of the interpreters may be a deaf individual or a person fluent in a language other than English or American Sign Language. Interpreters should be aware of and sensitive to ethnic/cultural and linguistic concerns.

Where professional interpreters work

Interpreters work in a variety of settings and situations. Many interpreters work in private practice; they are self-employed. From scheduling assignments to handling billing, the interpreter is responsible for all business aspects. The private practice interpreter may also receive assignments through interpreter service agencies. Other interpreters are salaried staff of an agency, institution, or corporation. Still others interpret in educational settings from pre-school to graduate school and any level in between. Interpreters work in settings as intimate as a private therapy session or as public as a televised address at a national political convention. The interpreter must be a versatile, flexible, skilled professional.

Interpreter Ethics

The Registry of Interpreters for the Deaf, Inc. has set forth the following principles of ethical behavior to protect and guide interpreters and transliterators and hearing and deaf consumers. Underlying these principles is the desire to insure for all the right to communicate.

This Code of Ethics applies to all members of the Registry of Interpreters for the Deaf, Inc. and to all certified non-members.

Interpreters/transliterators shall keep all assignment-related information strictly confidential.
Interpreters/transliterators shall render the message faithfully, always conveying the content and spirit of the speaker using language most readily understood by the person(s) whom they serve.
Interpreters/transliterators shall not counsel, advise or interject personal opinions.
Interpreters/transliterators shall accept assignments using discretion with regard to skill, setting, and the consumers involved.

Interpreters/transliterators shall request compensation for services in a professional and judicious manner.
Interpreters/transliterators shall function in a manner appropriate to the situation.
Interpreters/transliterators shall strive to further knowledge and skills through participation in workshops, professional meetings, interaction with professional colleagues, and reading of current literature in the field.
Interpreters/transliterators, by virtue of membership or certification by the RID, Inc., shall strive to maintain high professional standards in compliance with the Code of Ethics.

Interpreting Credentials

In the field of interpreting, as in other professions, appropriate credentials are an important indicator of an interpreter's qualifications. The Registry of Interpreters for the Deaf (RID) awards certification to interpreters who successfully pass national tests. The tests assess not only language knowledge and communication skills, but also knowledge and judgment on issues of ethics, culture and professionalism. An interpreter may hold one or more certifications. Information on certifications is available from RID.

Some common sign language interpreting certifications are:

CI—Certificate of Interpretation
CT—Certificate of Transliteration
CSC—Comprehensive Skills Certificate
SC:L—Specialist Certificate: Legal
IC—Interpretation Certificate
TC—Transliteration Certificate
CDI—Certified Deaf Interpreter

Appendix III

Captioning

FEDERAL COMMUNICATIONS COMMISSION ADOPTS RULES FOR VIDEO CLOSED CAPTIONING
(MM DOCKET 95-176)

The Commission has adopted an order (FCC 97-279) establishing rules to implement the closed captioning requirements of the Telecommunications Act of 1996. The 1996 Act required the Commission to adopt, by August 8, 1997, rules and implementation schedules for captioning of video programming ensuring access to video programming by persons with hearing disabilities. This order implements Section 305 of the 1996 Act which added a new Section 713, Video Programming Accessibility, to the Communications Act. These rules will increase the amount of closed captioned video programming available to the more than 22 million Americans with hearing disabilities.

Congress generally required that video programming be closed captioned, regardless of distribution technology, to ensure access to persons with hearing disabilities. Congress also recognized that in some situations requiring that programming be closed captioned might prove to be an undue burden on video programming providers or owners and authorized the Commission to exempt classes of programs or services for which provision of video programming would be economically burdensome.

Some of the key elements in the order adopted today include:

Video programming distributors will be responsible for compliance with captioning requirements. This is the most efficient and focused way to ensure compliance.

Video programming distributors include all entities who provide video programming directly to customers' homes, regardless of distribution technology used (i.e., broadcasters, cable operators, MVPDs and other).

That new programming (video programming first published or exhibited on or after January 1, 1998) is made "fully accessible," as required by Section 713. The rules establish an 8 year transition period and define full accessibility as the closed captioning of 95% of nonexempt new programming. Compliance will be measured on a channel-by-channel basis for MVPDs and will be measured over each calendar quarter. Three benchmarks are established during the transition period. These benchmarks are based on average amounts of required captioning of approximately 5 hours per day after 2 years, 10 hours per day after 4 years and 15 hours per day after 6 years. During this transition period if these closed captioning requirements exceed the number of hours of nonexempt new programming on a channel during the calendar quarter, 95% of the nonexempt new programming on a channel must contain captions. The Commission will also require video programming providers to continue to provide closed captioning at a level

substantially the same as the average level of captioning that they provided during the first six months off 1997, even if the amount of captioned programming exceeds that required under the benchmarks.

That the accessibility of pre-rule programming (video programming first published or exhibited before January 1, 1998) is "maximized" through the provision of closed captions, as required by Section 713. With respect to pre-rule programming that does not meet any of our criteria for exemption, at least 75% of such programming must contain closed captions at the end of a ten year transition period. Compliance will be measured on a per-channel, quarterly basis. The Commission expects that the amount of captioning of such programming will increase incrementally over the transition period and does not set specific benchmarks for pre-rule programming. During the transition period the Commission will monitor distributor's efforts to increase the amount of captioning to determine whether channels are progressing toward the 75% requirement. The Commission also will reevaluate its decision to determine whether specific benchmarks are necessary to increase captioning and whether the 75% threshold for maximizing the accessibility of pre-rule programming is the appropriate amount to meet the goals of the statute.

Exemptions based on economic burden:

The rules exempt from our closed captioning requirements several specific classes of programming for which such requirements would be economically burdensome. These include: non-English language programming, primarily textual programming, programming distributed late at night, interstitial announcements, promotional programming and public service announcements, certain locally-produced and distributed programming, non-vocal musical programming, ITFS programming and programming from new networks.

The rules further exempt any video programming provider from closed captioning requirements where the provider has annual gross revenues of less than three million dollars. Advertisements of less than 5 minutes are not included in the definition of covered programming here. The rules also permit some smaller video programming providers to caption less than the specified benchmark amounts of their programming by permitting them to cap their spending on closed captioning based on their gross revenues.

Exemptions based on existing contracts:

The rules will exempt any programming subject to a contract in effect on February 8, 1996, for which compliance with the closed captioning requirements would constitute a breach of contract.

Exemptions based on undue burden:

The Commission will consider petitions for exemption from the closed captioning rules if the requirements would impose an undue burden based on statutory criteria.

Standards for quality and accuracy:

Video programming distributors will be required to deliver intact the closed captioning they receive as part of the programming they distribute to viewers, where the captions do not require reformatting. Video programming distributors must maintain and monitor their equipment to ensure the technical quality of the closed captioning they transmit. The Commission will not adopt standards for the non-technical aspects of quality at this time.

Enforcement process:

The rules will be enforced through a complaint process. Complaints alleging violation of the closed captioning rules must first be directed in writing to the video programming distributor responsible for distribution of the programming. If a video programming distributor fails to respond to a complaint or a dispute remains following this initial procedure, a complaint may then be filed with the Commission.

Action by the Commission August 7, 1997, by Order (FCC 97-279). Chairman Hundt, Commissioners Quello, Ness and Chong, with Chairman Hundt and Commissioner Chong issuing separate statements.

Basic Captioning Terms

If you are unfamiliar with the process of captioning, this glossary can help you understand the most basic terms:

Off-line captioning:

Captioning that is produced after a video segment has been recorded. A captioner watches the video recording and creates captions, paying attention to the timing and screen placement of each caption. The captions are usually then recorded on videotape with the program picture and sound before the program is broadcast or distributed. Most captioned programming is produced off-line.

Realtime captioning:

Captions which are simultaneously created and transmitted during a video program or conference. This type of captioning is most frequently used for live programs, including news shows and sporting events. A trained stenotypist, acting in much the same way as a courtroom reporter, enters the spoken content by typing phonetic codes on a special keyboard that permits high-speed transcription. A computer, using custom software, then very quickly translates the phonetic codes into proper words. In order to display the words as quickly as possible after they are spoken, most realtime captioning is shown in a scrolling style.

Closed captions:

Captions that appear only when special equipment called a decoder is used. Closed captioning is typically used for broadcast television and for videocassettes of movies which are widely distributed. Closed captioning allows caption users (people who are deaf or hard of hearing) to enjoy the same broadcast and pre-recorded video materials that other television viewers enjoy.

Open captions:

Captions that are visible without using a decoder. When a video is open captioned, the captions are permanently part of the picture. Open captions are advised for any situation where a decoder may be difficult to obtain or operate (for example, in a hotel, convention center, or museum). For this reason, open captioning is recommended for training and promotional videos.

Closed caption decoder:

Equipment that decodes the captioning signal and causes captions to appear on the screen. In the 1980s and early 1990s, closed caption decoders were usually separate appliances that connected to the television set, VCR, and/or cable converter box. Since July 1, 1993, all television receivers with screens 13 inches or larger manufactured for sale in the United States must have built-in closed caption decoders, and the additional appliance will not be needed for these sets.

Roll-up and Pop-On captions:

These are the two main styles in which captions may appear. Roll-up captions scroll onto and off the screen in a continuous motion. Pop-on captions do not scroll; the words display and erase entirely together. Pop-on captions are used for most off-line captioning. Roll-up captions are used for most realtime captioning.

<u>Captioning Service Providers</u>

These are links to captioning and subtitling service providers. There are no licensing requirements or tests a captioner must meet in order to call themselves a captioning service provider.

The National Association of the Deaf in cooperation with the Department of Education operates a Captioned Films/Videos program; and the NADCFV has a list of vendors evaluated by the

NAD and approved by the U. S. Department of Education for CFV captioning. In order to be listed, a captioning vendor must submit samples to the NAD for approval. Some of the vendors on the NAD/DOE list are represented here:

©Captionmax, Inc.
530 N. 3rd St.
Minneapolis, MN 55401
http://www.captionmax.com/

Caption Perfect
P.O. Box 12454
Research Triangle Park, NC 27709-2454
919-942-0693 (v)
919-942-0435 (fax)
http://members.aol.com/captioning/index.html

Henninger Digital Captioning
2601-A Wilson Boulevard
Arlington, Virginia 22201
phone 703-243-3444
fax 703-243-5697
http://www.henninger.com/hcap.html

National Captioning Institute
NCI California Office
303 North Glenoaks Boulevard, Suite 200
Burbank, CA 91502
V/TTY (818) 238-0068
http://www.ncicap.org/

VITAC
4450 Lakeside Drive, Suite 250
Burbank, California 91505
(888) 528-4822
(818) 295-2490
(818) 295-2494 Fax
http://www.vitac.com/

Appendix IV

WAI Guidelines for Accessible Web Site Design
(http://www.w3.org/WAI/)

A. Transform Gracefully

Make sure pages transform gracefully across users, techniques, and situations.

To "transform gracefully" means that a page remains usable despite user, technological, or situational constraints. In order to use the page at all, some users may need to "turn off" features specified by the author (font size, color combinations, etc.). For example, a person with low vision might need to display all text in 36-point font, so any formatting based on an author-determined font size will fall apart.

To create documents that transform gracefully, authors should:

Ensure that all the information on the page may be perceived entirely visually and entirely through auditory means, and that all information is also available in text.
Always separate the content on your site (what you say), and the way you choose to structure that content (how you organize it), from the way the content and structure are presented (how you want people to "see" it).
Ensure that pages will be operable on various types of hardware, including devices without mice, with small, low resolution, or black and white screens, with only voice or text output, without screens, etc.

Guidelines A.1—A.12 address these issues.

A.1. Provide alternative text for all images, applets, and image maps [Priority 1]

This includes images used as submit buttons, bullets in lists, and all of the links within an image map as well as invisible images used to layout a page. Alternative text does not describe the visual appearance of an image, applet, or image map. Rather, it is used to represent the function that the image, applet, or image map performs whether it be decorative, informative, or for purposes of layout. If alternative text is not provided, users who are blind, have low vision, or any user who cannot or has chosen not to view graphics will not know the purpose of the visual components on the page. Since "bare" ASCII art (characters that form images) does not allow alt-text, it must be marked up especially for this purpose.

Techniques:

For all images (IMG) provide alt-text (via the "alt" attribute).[Priority 1]. Note: This includes images used as image maps, spacers, bullets in lists, and links.

For all applets (APPLET) provide alt-text (via the "alt" attribute) and content [Priority 1].
For all image map links (AREA) Provide alt-text (via the "alt" attribute) [Priority 1]. Also provide redundant links [Priority 2].
If server-side image maps must be used, provide text links for each hotspot in the image map [Priority 1].
For all graphical buttons (INPUT type="image"), 1. Provide alt-text (via the "alt" attribute) [Priority 1], 2. Do not use an image map to create a set of buttons in a form. Instead, use separate buttons or images (accompanied by alt-text) [Priority 2].
Replace ASCII art with an image and alt-text [Priority 1 or 2 depending on the importance of the information (e.g., an important chart)]. Note: If the description of (important) ASCII art is long, provide a description in addition to alt-text (see A.2).
If OBJECT is used to incorporate an image, applet, or script into a page, use any of the many ways to convey that information in cases where the OBJECT cannot be perceived (e.g., with "title" or within the body of the OBJECT element) [Priority 1].

A.2. Provide descriptions for important graphics, scripts, or applets if they are not fully described through alternative text or in the document's content [Priority 1]

Otherwise, important information presented graphically (charts, billboards, diagrams) will not be perceivable to people with blindness, some people with low vision, and users who have chosen not to view graphics, scripts, or applets or whose browser does not support scripts or applets.

Techniques:

Provide a long description of all graphics that convey important information. To do so: Use "longdesc" [Priority 1]. Until most browsers support "longdesc", also use a d-link (or invisible d-link) [Priority 1].
If OBJECT is used to incorporate an image, applet, or script into a page, and it presents important information, use any of the many ways to provide a long description of the information in cases where the OBJECT cannot be perceived (e.g., within the body of the OBJECT element) [Priority 1].

A.3. Provide textual equivalents (captions) for all audio information [Priority 1]

If the audio is associated with a visual presentation (movie or animation), synchronize the textual equivalents with the visual presentation. Otherwise, users who are deaf, or hard of hearing, or any user who cannot or has chosen not to hear sound cannot perceive the information presented through speech, sound effects, music, etc.

Techniques:

For stand-alone audio files provide a textual transcript of all words spoken or sung as well as all significant sounds [Priority 1].
For audio associated with video, provide a textual transcript (of dialog and sounds) synchronized with the video (e.g., captions) [Priority 1].

Where sounds are played automatically, provide visual notification and transcripts [Priority 1 or 2 depending on the importance of the sound].

A.4. Provide verbal descriptions of moving visual information in both auditory and text form (for movies, animations, etc.) [Priority 1]

If the visual presentation is associated with an auditory presentation (e.g., for a movie), synchronize the audio version of the descriptions with the existing auditory presentation and collate the text version of the descriptions with the text transcript (captions) of the primary audio track. Otherwise, if actions, body language, or other visual cues present information that is not expressed through auditory means as well (through dialogue, sound effects, etc.), users who cannot see (or look at) the page will not be able to perceive it. The collated text version allows access to the information by devices that do not play movies and by people who are deaf-blind.

Techniques:

For short animations such as animated "gifs" images, provide alt-text (see A.1) and a long description (see A.2) if needed [Priority 1].
For movies, provide auditory descriptions that are synchronized with the original audio [Priority 1].
Provide a text version of the auditory description that is collated with the text transcript (captions) of the primary audio track [Priority 2].

A.5. Ensure that text and graphics are perceivable and understandable when viewed without color [Priority 1]

Otherwise, if color is used to convey information, users who cannot differentiate between certain colors (and users with devices that have non-color or non-visual displays) will not receive the information. When foreground and background colors are too close to the same hue, they may not provide sufficient contrast when viewed using monochrome displays or by people with different types of color blindness.

Techniques:

Don’t use color to convey information unless the information is also clear from the markup and/or text [Priority 1].
Use foreground and background color combinations that provide sufficient contrast when viewed by someone with color blindness or when viewed on a black and white screen [Priority 1].

A.6. Indicate structure with structural elements, and control presentation with presentation elements and style sheets [Priority 2]

When structural elements and attributes are used to create presentation effects, user agents that allow users to navigate through the structure will be unable to do so properly. Such practices also make it difficult to render the page on other media and devices. For instance, don’t use H1 to create large, bold face text unless that text is actually a top-level heading.

Techniques:

Nest headings properly (H1—H6) [Priority 2].
Encode list structure and list items properly (UL, OL, DL, LI) [Priority 2].
Mark up quotations with the Q and BLOCKQUOTE elements. Do not use them for formatting effects such as indentation [Priority 2].
Use style sheets to control layout and presentation wherever possible as soon as a majority of browsers in use support them well (see A.9). Until then, simple tables (to control layout) and bitmap text with alt-text (for special text effects) may be used, with alternative pages used as necessary to ensure that the information on the page is accessible [Priority 2].
Use relative sizing and positioning (e.g., percent) rather than absolute (e.g., pixels or point) [Priority 2].

A.7. Ensure that moving, blinking, scrolling, or auto-updating objects or pages may be paused or frozen [Priority 1]

This is particularly important for objects that contain text and does not apply to instant redirection. Some people with cognitive limitations or visual disabilities are unable to read moving text quickly enough or at all. Movement can also cause such a distraction that the rest of the page becomes unreadable for people with cognitive disabilities. Screen readers are unable to read moving text. People with physical disabilities might not be able to move quickly or accurately enough to interact with moving objects. People with photosensitive epilepsy can have seizures triggered by flickering or flashing in the 4 to 59 flashes per second (Hertz) range with a peak sensitivity at 20 flashes per second.

Techniques:

Movement should be avoided when possible, but if it must be used, provide a mechanism to allow users to freeze motion or updates in applets and scripts or use style sheets and scripting to create movement (see also A.10) [Priority 2].
For auto-refreshing or timed response pages, provide a second copy of the page where refresh only happens after a link has been selected (until user agents provide this ability themselves) [Priority 1].
Avoid any blinking or updating of the screen that causes flicker [Priority 1].

A.8. Provide supplemental information needed to pronounce or interpret abbreviated or foreign text [Priority 2]

Unless changes between multiple languages on the same page are identified, and expansions for abbreviations and acronyms are provided, they may be indecipherable when spoken or Brailled.

Techniques:

Use the "lang" attribute to clearly identify changes in the language of text [Priority 2].

For abbreviations and acronyms use either ABBR or ACRONYM with the "title" attribute to specify the expansion [Priority 2].

A.9. Ensure that pages using newer W3C features (technologies) will transform gracefully into an accessible form if the feature is not supported or is turned off [Priority 1]

Some more recent features that are not completely backwards compatible include frames, scripts, style sheets, and applets. Each release of HTML has included new language features. For example, HTML 4.0 added the ability to attach style sheets to a page and to embed scripts and applets into a page. Older browsers ignore new features and some users configure their browser not to make use of new features. These users often see nothing more than a blank page or an unusable page when new features do not transform gracefully. For example, if you specify an image as the source of a frame (via the "src" attribute), then there is no simple way to attach alt-text (see A.1) to that image.

Techniques:

Frames: 1. Provide a fallback page for pages that contain frames (e.g., by using NOFRAME) [Priority 1], 2. Ensure that the source of each frame is an HTML file [Priority 1].
For scripts that present critical information or functions, provide an alternative, equivalent presentation or mechanism (e.g., by using NOSCRIPT) [Priority 1].
For pages that use style sheets, ensure that the contents of each page are ordered and structured so that they read appropriately without the style sheet [Priority 1].
Applets: (embedded using OBJECT or APPLET). At a minimum, provide alternative text for applets (see also A.1.2) [Priority 1] where needed, provide a description [Priority 1]. If possible, provide an alternative function or presentation in a format other than an applet. For example, a canned "mpeg" movie of a physics simulation (written in Java) or a single frame of the animation saved as a "gif" image [Priority 2].

A.10. Elements that contain their own user interface should have accessibility built in [Priority 2]

The accessibility of objects with their own interface is independent of the accessibility of the user agent. Accessibility must therefore be built into the objects or an alternative must be provided (see A.11.4).

Technique:

Where possible make applets directly accessible (see also A.9.4) [Priority 1 if information or functionality is important, and not presented elsewhere, otherwise Priority 2].

A.11. Use features that enable activation of page elements via input devices other than a pointing device (e.g., via keyboard, voice, etc.) [Priority 1]

Someone who is using the page without sight, with voice input, or with a keyboard (or input device other than a pointing device, e.g., a mouse or Braille display) will have a difficult time navigating a page if operation requires a pointing device. If a page is usable via a keyboard, it is

more likely that it should also be operable via speech input, or a command line interface. Access to image maps is impossible for these users if alternatives are not provided.

Techniques:

For image maps, provide alternative text for links (see also A.1) [Priority 1].
If possible, ensure that all elements that have their own interface are keyboard operable (see also A.11) [Priority 2].
Create a logical tab order through links, form controls, and objects (via the "tabindex" attribute or through logical page design) [Priority 3].
Provide keyboard shortcuts (via the "accesskey" attribute) to links (including those in client-side image maps), form controls, and groups of form controls) [Priority 3].

A.12. Use interim accessibility solutions so that assistive technologies and older browsers will operate correctly [Priority 2]

Older browsers are unable to "Tab" to edit boxes, text areas and lists of consecutive links, making it difficult to impossible for users to access them. Users not operating in a graphical environment are disoriented by being transferred to a new window without warning.

Techniques:

Until most users are able to secure newer technologies that address these issues:

Include default, place-holding characters in edit boxes and text areas [Priority 3].
Include non-link, printable characters (surrounded by spaces) between links that occur consecutively [Priority 3].
Do not use pop-up windows, new windows, or change active window unless the user is aware that this is happening [Priority 2].
For all form controls with labels, ensure that the label that is either: immediately following its control on the same line (allowing more than one control/label per line) [Priority 2] or on the line before the control (with only one label and one control per line) [Priority 2].
Until user agents and screen readers are able to handle text presented side-by-side, all tables that lay out text in parallel, word-wrapped columns require a linear text alternative (on the current page or some other) [Priority 2].

B. Context and Orientation

Provide context and orientation information for complex pages or elements.

To provide context and orientation information means that additional information is provided to help users gain an understanding of the "big picture" presented by a page, table, frame, or form. Oftentimes users are limited to viewing only a portion of a page, either because they are accessing the page one word at a time (speech synthesis or Braille display), or one section at a time (small display, or a magnified display).

To create documents that provide context and orientation information, authors should:

Structure and group information.
Clearly label the structure and groups.

Guidelines B.1—B.3 address these issues.

B.1. For frames, provide sufficient information to determine the purpose of the frames and how they relate to each other [Priority 1]

Users with blindness and low vision often access the screen with "tunnel vision" and are unable to get an overview understanding of the page. Complex relationships between frames may also be difficult for people with cognitive disabilities to use.

Techniques:

Provide titles for frames (via the "title" attribute on FRAME) so that users can keep track of frames by name [Priority 1].
Use "longdesc" (where needed) to associate a more complete description (than is provided by the title) directly with the frame. Until "longdesc" is widely supported, also use a d-link or invisible d-link [Priority 2].

B.2. Group controls, selections, and labels into semantic units [Priority 2]

This provides contextual information about the relationship between controls, which is useful for all users.

Techniques:

Group form controls (using the FIELDSET and LEGEND elements) [Priority 2 for radio buttons and checkboxes, Priority 3 for other controls].
Associate labels to their controls (using LABEL and its "for" attribute) [Priority 2].
Create a hierarchy of long lists of choices (with OPTGROUP) [Priority 2].

B.3. Ensure that tables (not used for layout) have necessary markup to be properly restructured or presented by accessible browsers and other user agents [Priority 1]

Many user agents restructure tables to present them. Without appropriate markup, the tables will not make sense when restructured. Tables also present special problems to users of screen readers.

These guidelines benefit users that are accessing the table through auditory means (e.g., an Automobile PC which operates by speech input and output) or viewing only a portion of the page at a time (e.g., users with blindness or low vision using speech or a Braille display, or other users of devices with small displays, etc.).

Techniques:

Provide summaries for tables (via the "summary" attribute on TABLE) [Priority 3].
Identify headers for rows and columns (TD and TH) [Priority 2].
Where tables have structural divisions beyond those implicit in the rows and columns, use appropriate markup to identify those divisions (THEAD, TFOOT, TBODY, COLGROUP, the "axis" and "scope" attributes, etc.) [Priority 2].
Provide abbreviations for header labels (via the "abbr" attribute on TH) [Priority 3].

B.4. Wherever possible, create "good" link phrases [Priority 2]

"Good" link phrases:

do not repeat on a page,
are meaningful when read out of context,
are terse

"Auditory users," people who are blind, have difficulty seeing, or who are using devices with small or no displays are unable to scan the page quickly with their eyes and often use a list of links to get an overview of a page or to quickly find a link. When links are not descriptive enough, do not make sense when read out of context, or are not unique, the auditory user must stop to read the text surrounding each link to identify it.

Wherever possible:

If more than one link shares the same textual phrase, all those links should point to the same resource [Priority 2].
Avoid phrases that are not meaningful on their own such as "click here" [Priority 2].
Avoid creating link phrases that contain full sentences [Priority 2].

Appendix V

Microsoft's Checklist of Accessibility Design Guidelines
(Reprinted with permission from Microsoft Corporation)

Basic Principles

You should follow these basic principles when designing an accessible application:

Flexibility. Provide a flexible, customizable user interface for your application that can accommodate the user's needs and preferences. For example, you should allow the user to choose font sizes, reduce visual complexity, and customize the arrangement of menus.

Choice of input methods. Support the user's choice of input methods by providing keyboard access to all features and by providing access to common tasks using simple mouse operations.

Choice of output modalities. Support the user's choice of output methods through the use of sound and visuals and of visual text and graphics. You should combine these output methods redundantly or allow the user to choose his or her preferred output method.

Compatibility with accessibility aids. Use programming techniques and user-interface elements that are compatible with accessibility aids, such as blind access, screen magnification, and voice input utilities.

Consistency. Make your application's behavior consistent with other Windows-based applications and with system standards. For example, you should support Control Panel settings for colors and sizes and use standard keyboard behavior.

Keyboard Access

Providing a good keyboard user interface is key to designing an accessible application.

Provide keyboard access to all features.

Fully document your keyboard user interface.

When possible, model your keyboard interface on a familiar application or control.

Provide underlined access keys for all menu items and controls.

Use logical keyboard navigation order.

If you normally hide some keyboard user interface elements, display them when the Keyboard Preference flag is set.

Allow the user to select text with the keyboard.

Avoid using the GetAsynchKeyState function.

If possible, provide customizable keyboard shortcuts.

Exposing the Keyboard Focus

Many accessibility aids need to know where the user is working.

Expose the location of the keyboard focus within a window, either by moving the system caret or by using ActiveAccessibility.

Exposing Screen Elements

Many accessibility aids need to identify or manipulate the objects on the screen.

Allow other software to identify and manipulate all screen elements that the user interacts with, using Microsoft Active Accessibility (which is already supported by standard window classes and controls).

Ensure that every object, window, and graphic is properly named. Define correct text labels for all controls, and give every window a user-friendly caption, even if the text is not visible on the screen.

Support the WM_GETDLGCODE message in all custom controls that have their own window, to identify your control type and keyboard interface.

Provide an alternative to any owner-drawn menus.

Display text using appropriate read-write edit, read-only edit, status, static, or HTML controls.

Make sure that dialog boxes define the correct tab order.

Uniquely identify every type of window.

Expose names or descriptions for all images and bitmapped text.

Give objects labels that are unique within their context and are unambiguous when taken out of context.

If screen contents are not exposed in other ways, support standard drawing techniques that can be monitored and recorded. Provide alternatives to operations that directly manipulate bitmap or screen pixels.

Color

Color should be used to enhance, emphasize, or reiterate information.

The application must respond properly when the High Contrast option is True.

Use only colors that the user can customize, ideally through Control Panel.

Use colors in their proper foreground/background combinations.

Omit background images drawn behind text.

Where possible, allow the use to customize all colors through Control Panel or through its own user interface.

When screen elements correspond with standard elements, use the appropriate system colors chosen in control Panel.

Always use colors in their proper foreground/background combinations.

If possible, be prepared to draw monochrome images that contrast with the background color.

Avoid conveying important information by color alone, or make it optional.

Draw graphic objects to contrast with the current background color.

Provide an option to omit complex or shaded backgrounds drawn behind text.

Size

The size of text and graphics affects usability as well as accessibility.

The application must be compatible with system settings for sizes and fonts. (Logo Requirement).

Avoid hard coding any font sizes smaller than 10 points.

If you draw lines, determine the proper width rather than using a fixed value.

Allow the user to select font and font sizes for displayed information.

Allow the user to adjust the size of non-document elements such as toolbars.

Make sure the application is compatible with changes to the system font size and the number of pixels per logical inch.

If feasible, provide a draft mode, zoom, and wrap to window features.

Stretch, shrink, pad, or crop images appropriately when their space changes.

Avoid tuning your application too tightly to a single font.

Sound

Do not convey important information by sound alone, or if you do, provide an option to convey this information by visual means.

Display important information visually when the ShowSounds option is True.

Provide closed captions for all audio content rendered through DirectPlay.

Define many custom sound events, even if they are silent in the default sound scheme.

Trigger standard sound events when carrying out equivalent actions.

If you generate sounds, provide a way to turn them off.

Timings

Allow the user to customize all user interface timings.

Allow the user to avoid having messages time out.

Allow slowing down or disabling any rapid screen updates or flashing.

Unexpected Side Effects

Moving the mouse should not trigger unexpected side effects.

Navigating with the keyboard should not trigger unexpected side effects.

Mouse Input

Applications must be compatible with specified system settings for mouse input.

Provide mouse shortcuts for commonly used features.

Make toolbars customizable.

Emphasize simple mouse operations that require only single clicks.

Customizable User Interface

If possible, allow the user to administrator to customize the application to meet specific needs.

Layout

Visual design and layout can make an application more usable and more accessible for people with cognitive or visual impairments.

Make it easy to recognize the label for each control or object.

Place a text label immediately to the left of or above its control.

Do not separate a control and its label by too great a distance.

Do not place unlabeled controls both to the left of and beneath a label.

All text labels should end with colons, and static text controls that do not label other controls should not end in colons.

Follow conventions for labeling icons, with text below or to the right of the icon, or displayed as a tooltip.

Try to position related objects near each other.

Verifying Accessibility

Test the application against this guidelines checklist.

Test with the High Contrast option and high contrast appearance schemes.

Test compatibility with extra-large appearance schemes.

Verify that all features can be used without a mouse.

Verify that all keyboard user interface methods are documented.

Test with the Inspect Objects tool to verify that all screen elements are exposed and properly labeled.

Test with the Microsoft Magnifier to verify that the keyboard focus location is properly exposed during navigation and editing.

Test with commercial accessibility aids.

Test with changes to the system font size and number of pixels per logical inch.

Include people with disabilities and accessibility software vendors in your beta tests.

Include people with disabilities in your usability tests.

Conduct surveys of your users who have disabilities.

Distribute free evaluation copies of your product to individuals with disabilities, disability organizations, and accessibility software vendors.

Documentation

Provide documentation in accessible format, such as ASCII text or HTML.

Accessible documentation should contain descriptions of illustrations and tables.

Do not convey important information by color or graphics alone. Use color and graphics redundantly to the text.

Maintain high contrast between the text and its background.

Do not use text smaller than 10 points in size.

If possible, bind printed documentation to lie flat.

Software Design Guidelines (TRACE Research Center)

General Design Guidelines

There are a few general themes that you'll notice occurring repeatedly in the specific guidelines in the next section. They are worth noting since they provide the rationale for many of the specific guidelines and can be used to help make decisions when options exist for a given design.

Use system tools whenever possible.
Maintain consistent, predictable layout & behavior and adhere to system standards/style guides.
Provide keyboard access to all dialogs, menus, and tools.
Design software to minimize the skills and abilities needed to operate it.
Be sure software cooperates with (or at the least, does not break) special access features in the OS and third party access software.
Use an open systems approach.

1. Use system tools whenever possible

Many software based access programs provide their alternate input and display capabilities by tapping into the system software. These access systems depend on the application program using

the system tools provided for input and output. Application programs which do not use the system tools may not be accessible to people using special access software or features in the operating system.

For example, alternate input software may take Morse code in and convert it into alternate or "counterfeit" keystrokes which it then puts into the input cue or buffer just as if they came from the keyboard. Application software that takes its keystrokes from the input buffer will find these alternate keystrokes and treat them just like regular keystrokes. If your application program bypasses the input buffer and takes its keystrokes directly from the input hardware, then the alternate keystrokes will not be seen and the person will not be able to use it.

Similarly, screen reading software for people who are blind works by watching the activity of the text drawing routines in the operating system. By watching commands sent to the operating system telling it to draw text on the screen, the screen reading software can keep track of everything that is written to the screen. If application software writes text directly to the screen, then the screen reading software will not know that it is there.

Alternate mouse or pointer routines would also depend on the ability to make system and application software think that a person was moving the mouse when in fact they were operating a mouse simulation program.

2. Maintain consistent, predictable layout & behavior and adhere to system standards/style guides

Wherever possible, follow system standards and style guides. For people with cognitive disabilities it makes it easier to predict and understand how things should operate and what they mean. For people who are blind and use screen readers to find out what is on the screen, predictable layouts and controls are easier to figure out. Also, adaptive software manufactures can build techniques into their software to handle the standard objects and appearances, but not unique or one of a kind implementations. If you do something different, be sure it is accessible (see "Product Testing and Developer Support" at the end of Guidelines—Part I.)

3. Provide keyboard access to all dialogs, menus, and tools

Application programs which provide the ability to access all of the menus by using the keyboard greatly facilitate access by individuals who cannot use the standard mouse. It also makes access easier (or possible) for people with poor eye hand coordination or those who are blind. This access may be provided either by use of the arrow keys to move around through the menu structure, or through use of keyboard equivalents for ALL menu items.

4. Design software to minimize the skills and abilities needed to operate it

The best way to view people who have disabilities is to think of them simply as individuals with reduced abilities rather than as people without an ability. The reduction in their abilities may vary from slight to severe. The more you can reduce the sensory, physical, or cognitive skills necessary to operate the program, the more people will be able to directly use the program. It also makes it easier for everyone else to use the program. Some examples: using a slightly larger or clearer type, using menus which can be scanned rather than commands which must be memorized, keeping menus short and dialog boxes uncluttered, reducing or eliminating the need for fine motor control.

It is also helpful to provide multiple ways of accomplishing functions in order to adapt to different needs or weaknesses. For example, having pull-down menus reduces the cognitive load and makes it easier to operate computers. While providing hot keys reduces the motor load and makes it easier and faster for individuals with physical disabilities to use computers, providing both addresses the needs of both groups and gives all users more options to meet their preferences. A second example would be the ability to use either the scroll bar or the keyboard to select position within a document.

The third general strategy is to provide layering to reduce visual and cognitive complexity. One example of this are programs which provide both short and long forms of their menus. The use of option buttons in dialog boxes or other techniques for nesting complexity would be a second example of this.

5. Be sure software cooperates with (or at the least, does not break) special access features in the OS and third party access software

Using system tools and conventions/standards

As mentioned above, the most important and easiest mechanism for ensuring greater compatibility with access software is to use the tools and conventions which have been established for the operating system. Most access software works through modifications to the system tools, or bases its operation on assumptions that the standard conventions for the system will be followed. As long as application software programs use the system tools and conventions, there is generally little problem.

Provide software access to commands

When commands are all executed through the menus, access software has very little trouble in both accessing listings of the available commands and activating the commands. Program commands which are issued in other fashions—such as tool bars, special palettes, etc.—present problems. It is difficult to get a listing of all of the commands (for example, to present to somebody who is blind). It is also difficult to directly activate the various commands (for example, by an alternate access routine for someone with a severe physical disability). Where all of the palette and tool bar commands are available via the standard menus, this is not a problem. When these commands, however, are not otherwise available, it is important that access somehow be achieved.

Access to commands in a program consists of four parts. Fortunately, the movement toward inter-application control is making the commands in a program more accessible electronically. Features like balloon help are also useful for providing descriptions of the commands and buttons on the screen. Eventually, it would be nice to be able to:

Obtain a listing of all of the possible commands
Obtain help text for each of the commands
Be able to execute all of the commands from an external program
Be able to read the status of user-settable parameters (and be able to set all such parameters) from an external program

When these capabilities are all available in a standardized format, it will make the process of developing access programs much simpler and more complete. In the meantime, programs which have most of their commands available for inter-program control may consider making the rest of the program commands available as well.

6. Use an open systems approach

Providing access to people who have disabilities is in many ways just a natural extension of the open systems approach to software design. Support of the open systems through GOSIP, POSIX, and the applications portability profile facilitates compatibility with special access software and hardware within these environments. With the rapid advance of technologies and operating systems, software that is based upon open systems concepts and which retains a stable or similar interface format across platforms greatly facilitates the efforts of third-party accessibility developers in keeping up and adapting their products.