

## **About Adaptations for Learning Disabilities**

Approximately three percent of any given population experiences mild visual, auditory or tactile-kinesthetic processing deficits of a neurological origin. Within the context of the K-12 and post-secondary educational environments, the subtle and complex effects of these deficits on a student's ability to acquire, integrate, and express information are referred to as learning disabilities. Although this disabling condition has presumably been a consistently occurring part of our population, it is only in recent years that sophisticated testing methodologies have been developed which accurately identify the range and scope of these deficits and their impact on the learning process. Adapted computer technology can be strikingly effective for individuals with learning disabilities.

A visual processing deficit frequently manifests itself as a chronic, intermittent inability to receive and/or express written information in an organized and sequential manner. For a student in post-secondary education or an employee in a text oriented occupation (i.e., word processing) setting, the effects of this disability can be devastating. Using a combination of adaptations including smart word processors, real-time spell checkers, screen reading systems and advanced speech synthesizers, an adapted writing environment can be created which is multisensory rather than visually oriented. In this environment, spelling can be checked and corrected continuously and automatically, "smart" word processors suggest likely word or phrase choices and the user can hear what he/she has written. The process of identifying and correcting errors in grammar and sentence structure can proceed unobstructed by the effects of the visual processing disability.

Individuals with auditory processing deficits experience a significant, intermittent, inability to receive, discriminate, retrieve, retain, sequence, and/or associate relevant auditory information. The visually oriented nature of a computer display allows such individuals to utilize computer assisted instruction (CAI) as a powerful adjunct to speech based classroom lecture formats.

Tactile and kinesthetic processing deficits often involve a significant inability in one or more of the following areas: fine and/or gross motor tasks, rhythmical movement and/or orientation to time and space. The effects of such deficits are often seen as an inability to write legibly or place text accurately along a ruled line. Visual/spatial orientation problems can make it difficult to read columns of numbers or remember the location of text on a page. Using the computer keyboard to produce text rather than paper and pencil can reduce many of these difficulties. Word processors automatically control the orientation of text on a page and provide a variety of methods for locating text or reading columns of numbers.

4.2

A learning disability may be the result of a single processing deficit or of the complex interactions of multiple processing deficits. There are no simplistic solutions to this disabling condition. The issue being addressed is not so much adapted access to the computer per se, but rather how to use the computer as a dynamic medium for the production of written materials and the identification and correction of syntactical errors resulting from the effects of processing deficits and utilization of computer assisted instruction as an aid to strengthen and reinforce basic skills.

Individuals with significant processing deficits might require the use of one or more of the following adaptations:

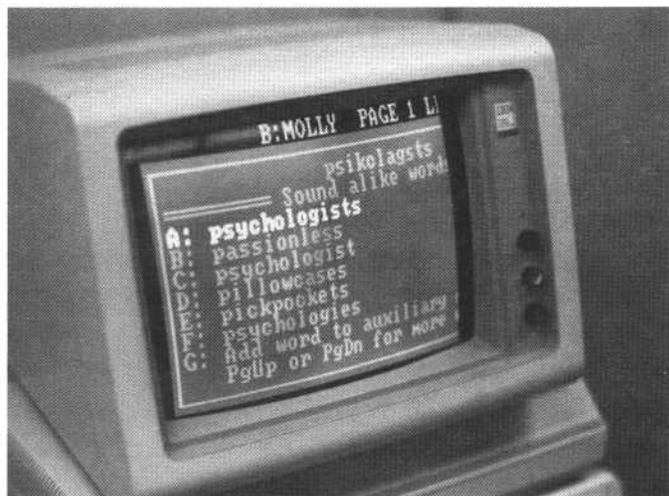
### **A clearly structured word processing system**

Word processing systems to be used by learning disabled individuals should incorporate a minimum number of commands, make good use of function keys and utilize well formatted, uncluttered screen displays. In addition, the word processor should be accessible to "real time" spell checkers as well as screen reading programs; it should also produce output which can be examined by grammar and usage checking programs. Using such a system, the student should, with instructor assistance, be able to produce a written document within an hour and comfortably use the basics of the system within two to four weeks. For many learning disabled students, the icon-based environment of the Macintosh computer may be significantly easier to learn and use than the more text- and command-oriented systems found on PC-type computers.

4.3

### **A "real time" spelling checker**

Students with visual processing deficits frequently experience severe difficulty with spelling. A "real time" spell checker monitors spelling as words are actually being typed. The moment a spelling error is detected, a tone sounds. Pressing a single key displays a list of probable words. Pressing an additional key carries out the spelling correction. It is most important that the spell checker base its display of likely words on sound alike (phonetically spelled) words rather than attempt to closely match actual spelling. A well designed spell checker should, for example, suggest "psychologist" as the correct spelling of "siekkologist." Ideally the spell checker should handle common letter reversals and maintain the correct verb tense



when correcting a word. Additionally, the spell checker should provide a definition of the word in question along with its grammatic form (verb, noun, adjective, etc).

### **A screen reading system**

Individuals with moderate to severe visual processing deficits can benefit substantially from many of the adaptations employed by blind computer users. Use of a screen reading system and sophisticated speech synthesizer in combination with a word processor and "real time" spell checker allows for the creation of a writing environment in which the error identification and correction process is carried out through auditory feedback in conjunction with the screen display. When text is reviewed auditorially, the impact of the visual processing deficit is minimized, and errors which might have gone undetected are easily identified and corrected. Screen reading systems employed for this purpose should be capable of reading letters, words, lines, sentences, screen pages or complete documents and of making maximum use of the speech output capabilities of the attached speech synthesizer. It is highly recommended that only sophisticated speech synthesizers capable of producing easily understood, naturally inflected speech be employed for this purpose. To inflict the burden of having to decode the robotic utterances of less sophisticated speech synthesizers would substantially reduce the utility of such a system. For additional information on screen reading systems and speech synthesizers, refer to the chapter of this manual dedicated to adaptations for blind computer users.

4.5

## **A "smart" word processing environment**

For individuals with severe visual processing deficits, "smart" word processing systems used in conjunction with "real time" spell checkers and screen readers attached to sophisticated speech synthesizers may be very effective.

Smart word processors employ the newly emerging technology of artificial intelligence to make amazingly accurate predictions about word choice while a sentence is actually being written. Using a predictive rule base about how the English language works, word frequency patterns and a history of the user's word choice preferences, such systems can very accurately predict the completion of a word being written based on its first two or three letters. The user is shown a list of likely choices and may elect to complete the word or phrase by pressing a single key. Such systems also automatically manage such tasks as inserting the correct number of spaces after periods and other punctuation marks and beginning each new sentence with a capital letter. Additional options allow the user to insert commonly used phrases, add header and signature blocks to letters or modify verb tense. The utility of such a program becomes apparent when used with individuals whose processing deficits are so severe as to make errors in virtually every word produced. The interventions provided by smart word processors can dramatically reduce the incidence of error and therefore speed up the writing process.

## **A method for review and correction of faulty sentence structure**

Once a document has been written using a word processor, programs exist which are capable of

performing a rigorous analysis of usage and style. Although still somewhat in their technological infancy, such programs are capable of pointing out a wide variety of grammatical, usage and style errors. Run-on sentences, vague terms, missing punctuation marks, sexist terminology and awkward word choices are all within the scope of problem areas which can be identified. As another tool in the error identification/correction process, grammar and usage checkers can be extremely valuable.

### **Methods for modifying color and size of text display**

In some instances, modifying the size of text displayed on the computer screen, changing the color in which text is displayed or the background color upon which text is displayed can have a beneficial effect on the learning disabled student's ability to accurately read the screen display. For additional information on large print displays, please refer to the chapter on adaptations for low vision computer users. Many word processors, spell checkers and grammar/usage programs provide built-in options which allow the user to change the text display and/or background colors. If such options are not available within the program, they can be performed using very simple commands within the computer's operating system.

4.7

### **Alternative methods for issuing word processing commands**

Individuals whose processing deficits result in difficulty remembering abstract information and/or sequencing instructions may have difficulty utilizing the complex command structures of some programs. Alternative command selection methods

exist which can greatly reduce these problems. Programmable, touch-sensitive tablets can be employed. Commands can be stored at various locations on the tablet's surface and color coded or labeled in other ways which are meaningful to the student. To carry out a particular word processing or spell check command, the student simply touches the correct location on the tablet. In an attempt to simplify access to the computer in general, many new systems are incorporating icon based programs in which commands are replaced by symbols that can be selected using a mouse or other pointing device. Such symbol oriented systems may prove much more accommodating to individuals who experience substantial difficulty remembering, sequencing or manipulating abstract commands.

4.8

Providing a functional computer environment for a learning disabled student requires a thorough understanding of the scope and extent of the processing deficits involved. Once this has been accomplished, a wealth of opportunities can be provided using a variety of readily available programs. Many of the difficulties experienced as a result of some types of processing deficits are reduced simply because of the nature of the computer itself. The liabilities of an auditory processing deficit are reduced when information is gathered through a text oriented computer display. The difficulties experienced by an individual with tactile and/or kinesthetic deficits in the production of handwritten text do not occur in a computerized word processing system. As of this writing, excellent software exists for IBM PC, PC compatible, Apple Macintosh computers and, with the exception of large print systems, for the Apple IIe as well.

## **Word Processing Strategies for the Learning Disabled**

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In order to facilitate the mastery of word processing on the microcomputer by adult, learning disabled students, a number of learning strategies can be utilized. Several general strategies are presented which relate to the basic process of teaching learning disabled individuals as well as a variety of specific strategies which relate to the step-by-step teaching of word processing. To understand these specific strategies, it is necessary to identify what students have to know in order to operate the word processing program and, within this context, to explore how the student best learns and retains this material so that he or she can successfully apply this new information to written assignments.

4.9

Ten general strategies facilitate overall understanding of word processing. They are presented in boldface print. Underlying each of these strategies is the core concept of "chunking" information into small, more easily assimilated units of information.

It is vitally important to use a **multisensory approach** which stresses hands-on work at individual microcomputers. Students should be encouraged to sub-vocalize information from the screen as an aid to error location; they should also be encouraged to sub-vocalize the steps necessary to write, edit, save, and print.

All the strategies discussed here are best applied in small groups of six to ten students. Smaller class sizes and individualized instruction tend to reduce the ef-

fects of distractability, a frequent consequence of the neurologically based cognitive processing deficits common to many learning disabled persons. The instructor should also include frequent **repetition** of the necessary sequences to enter, edit, save, print, etc. The student should make use of lab hours to work by himself and record successes and problems which occur during such lab sessions.

When the student gets "stuck," the instructor should **model** the question(s) necessary to resolve the problem. For example, "How do I move a block of text? First I, etc." Be specific to whatever program and microcomputer are being used. Build into the daily lessons **brief reviews of the concepts** covered. These reviews could take the form of questions or demonstrations either for the group or an individual. Provide short tests of the concepts, and review the answers with the students before moving to the next lesson. Ask the student to **demonstrate** the various commands he/she needs to complete his/her list, letter, paragraph or essay.

4.10

For any task requiring sequencing, ask the student to **visualize** the steps he or she needs to follow in order to initiate and complete the command. Recommend that, in his mind's eye, the student see himself turning on the computer, putting the software in the correct drive, starting the word processing program, etc. If the student is unclear about any one of the steps in the process, he or she should refer to a quick reference card or ask the instructor for clarification.

Side by side instruction with the teacher or another student who has mastered the concept is preferable to physically standing over or behind the student. Work individually with students as much as possible. A self-paced format is best.

A typing speed of 15 to 20 words per minute is necessary to produce written material in a reasonable amount of time. For students not currently typing at

that rate, computerized typing tutor programs can be employed to help increase typing speed.

An unhurried approach, with time for questions and individual help, is an essential strategy. Maintaining a **checklist** of concepts mastered by each student can help the instructor individualize training so that each student moves at a comfortable pace.

In order to use a word processor, the student must understand five pieces of information. These pieces can be broken down into easily understood "chunks" of information. To master each of these information "chunks," specific learning strategies are employed. Each of these strategies is presented in boldface print.

## **Overview**

Discuss what a microcomputer is and how it can help students with writing projects. The difference between a typewriter and a microcomputer word processing program should be covered. Malfunctions of computer hardware and software should be explained. An important strategy to employ at this point is to encourage the student to identify specific projects for which he or she could use the word processor. Such projects might include to-do lists, letters, short paragraphs, essays or any written assignments.

4.11

Initiate class discussions concerning what a word processor program will not do. For example, it will not automatically turn out well-organized material, nor will it conceal the need for original research or knowledge of the subject.

The instructor should define basic technical terms such as wrap around, window, microcomputer, hardware, word processing program, software, boot disk, program disk, disk swapping, drives, file, keystroke,

icon, document and screen in understandable language. .

A written and illustrated syllabus documenting each lesson presented is essential for learning disabled students. The language used should be concise and easily understood with room on each page for notes and questions. Present only the amount of information needed to succeed at the defined task. Whenever possible, a numerical list of basic sequences should be given. Use color graphics to highlight various sequences. It is helpful for the student to have a personal file disk formatted by the instructor with the syllabus lessons copied on it, so he can put lessons on the screen as well as have them in written form.

### **Operation**

4.12

The student should understand the basic operation of the word processor. Information concerning disk drives, memory, on/off and monitor switches, power supply, printer, and handling of software should be presented. From this point on, the strategy to use is hands-on operation, so that the student controls his or her own input and output. Also, at this point, sequence becomes very important. An effective strategy is to list the steps needed to begin writing. On a plasticized reference card, place information appropriate to the specific word processing program you are using. For example:

1. Place the word processing disk in drive A:
2. Place the **file disk in drive B:**
3. **Turn on the computer**
4. Type WP and press the ENTER key, etc.

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To simplify the above sequence, some microcomputers can use color coded keys such as the escape key and other command keys. After developing a sequence such as that listed above, the instructor should ask a representative student to attempt to use the sequence without prompting. In this manner, the instructor can identify gaps in information, and confusing or unclear presentations.

### **Entry of Text**

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As soon as possible the student should be encouraged to enter his own text based on the objectives he/she and the instructor have previously defined. If the student is writing at the paragraph level, a prewriting exercise is workable. Demonstrate techniques for preliminary writing such as mindmapping (quickly recorded thoughts and ideas about a particular subject) or more structured outlining. With some microcomputers it is possible to enter a topic in the center of the screen and then use graphics to circle or box it. Supporting details can be entered in a wheel shape around the topic. Other appropriate prewriting techniques can be adapted to the particular microcomputer used.

At this stage, the mindmap or outline can be saved to a personal file disk and printed to paper so that the student can refer to it as he/she begins using these ideas to build sentences. Include on the first page of the reference card the necessary steps to save the document to a personal file disk; also include the basic print commands. As with the operational commands, list these steps in numerical order. Initially, the student's personal file disk should be formatted (prepared for data storage) by the instructor. After the student has mastered the basics of word processing, information about formatting disks and copying files can be presented.

Encourage the student to enter text without checking for errors when writing the first draft.

## **Editing of Text**

At this point in the writing process, strategies should be directed towards having the student review the text for mechanical errors, complete sentences and coherent structure. Introduction of spelling verification, screen reading and grammatical programs should occur here. Again, numerical sequencing of the steps necessary to complete these processes is very important. On the second page of the plasticized reference card, list the frequently used editing, spell checking or screen reading commands. Editing terms such as replace, delete, move and find should be introduced and the sequence for using these commands listed.

4.15

## **Printing**

Introduce necessary options such as spacing, margins, centering, justifying, unjustifying, and defaults. As with the above command sequences, introduce terms in simple language and **only provide information on the necessary options** to complete the assignment. For example, if specific margins or centered titles are not necessary for the completion of a specific assignment, do not present them. Print and page formatting commands can be listed on the third page of the reference card.

Word processing using a microcomputer is a useful tool which can be effectively employed to enhance the adult learning disabled student's writing ability and logical thinking processes. The application of the gen-

eral and specific learning strategies described here will help the student master and use this valuable information.

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