Chapter 5 – Assistive Technology for Writing, Including Motor Aspects of Writing and Composition

Assistive Technology for Writing, including Motor Aspects of Writing and Composing

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Writing is a complex process that involves both the motor aspects of handwriting and the cognitive component of creating or composing written material. Due to the importance of each component this chapter has been divided into two sections; **The Motor Aspects of Writing** and **Composing Written Material.**

This chapter will address **The Motor Aspects of Writing**.

Introduction

Students are required to produce written material (e.g. tests, worksheets, and essays) to demonstrate what they have learned. Handwriting instruction begins prior to kindergarten and continues through first and second grade. Penmanship is practiced through the third and fourth grade with keyboarding instruction starting at or before the fourth grade in most curricula. Technological advances have made alternatives to handwriting available, including keyboarding, handwriting recognition and voice recognition. The majority of schools not only have computer labs, but also computers within the classroom. Some classrooms designate an area as a writing center that includes a computer with writing, visual-mapping, and outlining software along with a variety of pens, markers, crayons, stamps and papers. This section will be looking at assistive technology tools for the motor aspects of writing whether it be penmanship or technology based.

Each section of this chapter is organized in accordance with the Decision Making Guide following the SETT format (Student, Environment, Task and Tool). The *Student* section will assist you in determining skills and abilities required by the student to perform the motor aspects of writing whether it is handwriting, keyboarding, or the use of various other assistive technologies. The *Environment* section poses questions to consider concerning the impact of the student's environment, the teachers' expectations, and how these impact the choice of assistive technology. The section on *Tasks* for motor aspects of writing poses questions to help determine what is required of the student in order to appropriately choose an assistive technology solution. Following "Tasks" is a section on Tools which includes the continuum of assistive technology to be considered. The continuum is organized from low- to high-technology. This is followed by a more extensive listing of tools and strategies under the continuum subtitles. The chapter concludes with a discussion of a feature match process and steps for implementation. Chapter appendices include sample IEP objectives, references, resources, and product charts.

Using the SETT process and Decision Making Guide
It is intended that you use this as a guide. The Decision Making Guide follows the SETT (*Student, Environment, Task, and Too*l) format with a subcategory of *Sensory Considerations* included with Student and Environment. There are three additional categories on the Decision Making Guide that further help in the selection and implementation of assistive technology. *Narrowing the Focus* helps the team identify a specific task for solution generation. The *Implementation Plan* assists the team in assigning trials, dates, responsibilities and data collection. The *Follow-Up Plan* directs the team to set a date for the team to reconvene and review the student's progress.

Again, this is intended as a guide; during the actual assessment process, each topic should be written in large print where everyone can see (e.g. on a flip chart or board). Information should then be transferred to paper for distribution, filing, and future reference. For more information about using the SETT process, please refer to Chapter 1 of this manual.

The questions posed in the guide are not intended to be all inclusive but rather to prompt the team to consider as many factors as possible in order to identify and try appropriate assistive technology tools and strategies for their students. Following the SETT process and the Decision Making Guide should ultimately result in the acquisition of appropriate assistive technology tools and strategies that, with maintained use, result in success for the student

WATI Assistive Technology Decision Making Guide

Area of Concern: <u>Motor Aspects of Writing</u>

PROBLEM IDENTIFICATION

Student's Abilities/Difficulties	Environmental Considerations	Tasks
• Review Section 4 of Student Information Guide (Chapter 1, page 30) • Physically • Visual Perception • Social Emotional • Cognitive • Organization	• Review Chapter 1 page 42 - Environmental Observation Guide • Student to teacher position/# students to adults/aid/ • lecture/small group/number of classrooms/travel Teacher expectations • W/C accessible/lighting/clutter • Workstation/desk • Student accessible computers/OS	• Writing assignments (worksheet/ sentence/paragraphs/pages) • Note taking • Projects • Tests • Reading
Sensory Considerations		**Narrowing the Focus**
Vision/Hearing/Tactile (hyper/hypo-sensitive)		i.e. Specific task identified for solution generation
Solution Generation Tools & Strategies	**Solution Selection Tools & Strategies**	**Implementation Plan**
Brainstorming Only No Decision Review Checklist	Discuss & Select Idea from Solution Generation	AT Trials/Services Needed: Date Length Person Responsible
		Follow-Up Plan
		Who & When Set specific date now.

Important: It is intended that you use this as a guide. Each topic should be written in large print where everyone can see them, i.e. on a flip chart or board. Information should then be transferred to paper for distribution, file, and future reference.

Background

This section will focus on the multiple factors involved with producing written documents. Handwriting is a complex skill involving visual perceptual, neuromuscular, and motor components. There are also cognitive and social emotional factors that influence handwriting. The student who may benefit from assistive technology in the area of writing may already be receiving occupational or physical therapy for motor challenges and the therapists should be consulted. The labor-intensive motor aspect of writing includes: holding the writing utensil; stabilizing the paper; visually guiding the hand; moving the writing utensil along the paper; visual recall of the letter; kinesthetic memory of letter formation; and word formation and writing and re-writing as part of the editing process. These all make writing one of the most difficult and complex skills acquired by students. Consider then how these mechanical challenges may affect the student's confidence, motivation, and self-esteem as they attempt to commit to paper what they actually know.

<u>Handwriting</u>

The following is a brief introduction to an understanding of handwriting, not meant to be all inclusive, but to give the reader a basic understanding of handwriting to better select appropriate assistive technology supports.

Handwriting is a complex process requiring *visual perception*, *neuromuscular abilities*, *motor skills, cognition and social emotional factors.*

Visual perception is the ability to understand and interpret information taken in through the eyes, which is a highly cognitive function. Visual perceptual components necessary for handwriting include:

- *Visual Discrimination* - the ability to identify like characteristics or features of visual information; and in the case of handwriting, identifying like characteristics of like letters and numbers in order to eventually replicate them.
- *Visual Memory* - the ability to demonstrate recall of visual information; and in the case of handwriting, appropriate letter formations and the sequence in which a series of letters must be placed to form words.
- *Visual Spatial-relations* - the ability to perceive the position of two or more objects in relation to each other; and in the case of handwriting, the ability to visually interpret the position of the letters/words appropriately on the lines of the paper and space appropriately between letters/words.
- *Visual Form constancy* - the ability to discriminate between similar objects; and in the case of handwriting, letters/words.
- *Visual Figure-ground* - the ability to perceive a form and find it from among an assortment of other matter found in the background; and in the case of handwriting, the proper spacing between letters and words.
- *Visual Closure* – the ability to recognize a figure when it is not complete; and in the case of handwriting, the ability to determine if a letter is correctly formed or (in)complete.

Neuromuscular refers to abilities that combine muscle strength and postural control. Neuromuscular components include:

- *Muscle tone* - the ability to maintain a posture. During handwriting, the student must have adequate muscle tone to maintain an upright position without support from the hands, freeing them up to grasp a writing instrument.

- *Strength* – the ability to maintain a grasp of a writing instrument over time both while moving it dynamically or holding it statically.
- *Postural control* - the ability to make appropriate postural adjustments while writing. It is important to develop proximal strength or position a student for trunk stability before fine motor skills can be addressed. The student's positioning must be considered for motor aspects of writing. (See Chapter 2 – Assistive Technology for Positioning, Seating and Mobility.)

Motor skills require the assimilation and interpretation of sensory information in order to accommodate with an appropriate motor response. Neuromuscular abilities lay the foundation for the development of motor skills.
Motor skills include:
- *Crossing the midline* - the ability to cross the midline of the body without disruption of body position; and in the case of handwriting the ability to move the hand across the middle of the body while writing on a horizontal surface.
- *Bilateral integration* - the ability to use the two hands in a coordinated fashion; and in the case of handwriting, grasping a writing instrument with one hand and stabilizing the paper with the other.
- *Laterality* - the ability to demonstrate a preference of one hand over the other for a task requiring coordinated movement; and in the case of handwriting' demonstrating the consistent hand preference for use of a writing tool.
- *Praxis* - the ability to plan and execute new motor movements; and in the case of handwriting, the ability to demonstrate appropriate letter formations and sequence letters by arranging letters in appropriate order to form words.
- *Fine motor coordination* - The muscle control required to make small, precise movements; and in the case of handwriting, the ability to manipulate the writing instrument to move and adjust the position of the writing instrument, turn the writing instrument over to erase, etc.
  1. Grasp is the ability to hold an item and in the case of handwriting the ability to hold a writing utensil. The tripod pencil grasp is the most frequently observed though there are other efficient grasps. The correlation between grip and handwriting success is very low and grip is generally very difficult to change.
  2. Motor accuracy is the ability to control fine motor movements and in the case of handwriting controlling the motor movements so that letters are correctly sized and on the line.
- *In-hand manipulation skills* -The ability of the small muscles of the hand to perform coordinated movements including the ability to pick up and move small items to and from the hand as well as the ability to rotate items; in the case of handwriting, the ability to move up and down the pencil when adjusting grip as well as switching from the writing end of the pencil to the erasing end.
- *Visual motor integration* – The ability of the eyes to guide hand movement and in the case of handwriting the ability to trace, and imitate or copy number/letters accurately.

Cognitive
The level of cognition required for writing is often misinterpreted. Some professionals often think that there needs to be an average level of cognitive ability in order to write. However, most students with a desire to share information, do have the ability through assistive technology to perform a writing task. Combing strategies that build upon background information and high interest topics with assistive technology can support even the most cognitively challenged students to produce written work. Students who want to share information with others may be given opportunities to write with pictures, letters, words, or other alternative media. Hanser (2006) delineates an approach to a low-tech way to foster emergent writing with students with severe disabilities. Using partner-

assisted scanning to choose letters through auditory, visual or tactile methods allows students with severe disabilities to demonstrate emergent writing skills. Students who are verbally expressive and are using AT should be able to translate their thoughts to paper, using pictures, letters, words and text.

Social-Emotional

Considering the level of difficulty involved in the motor aspects of writing, some students may experience social-emotional reactions relating to tasks requiring writing. In the case of handwriting, maladaptive behaviors ranging from minimal output to extreme avoidance behaviors may influence the production of written work. Avoidance behaviors have frequently been misinterpreted as laziness, unwillingness or general misbehavior when in fact the student is demonstrating difficulty with the motor aspect of the task. The easiest way to determine if it is a behavior problem versus a problem with the motor component of writing is to ask the student to tell you what they want to write on the paper. If the student has a desire to write and can tell you what they want to write, the behavior may be a reflection of their inability to get the information on the paper.

<u>Handwriting Research</u>

Complexity and multiple factors involved with handwriting

For a review of the literature related to handwriting research and articles addressing a multitude of components related to handwriting, there are several research articles that delineate the various factors involved in handwriting. Cornhill and Case (1996) address factors that relate eye-hand coordination, visuomotor integration and in-hand manipulation to good and poor handwriting. They found that visual motor integration and in-hand manipulation were significant predictors of handwriting. Tseng and Murray (1994) in their research on the perceptual motor factors involved with good and poor handwriting addressed these components of handwriting: visual perception, visual motor integration, manual dexterity, hand-eye coordination, fine motor praxis, and kinesthetic perception. They found that visual motor and hand-eye coordination were the best predictors of all handwriting. With the poor handwriters, praxis (motor planning) contributed the most to legibility and visual perceptual skills contributed the most to legibility of good handwriters.

More recently, research by Volman, van Schendel and Jongmans (2006) on the underlying mechanisms of handwriting difficulties looked at the various factors involved in the motor aspects of handwriting. They found that the poor handwriters had lower skills on visual perception, visual-motor integration, fine motor coordination and cognitive planning. Visual motor integration was again the significant predictor of handwriting. Tseng and Chow (2000) looked at the perceptual motor skills of children with slow handwriting and found a significant difference between slow and normal handwriters in upper-limb coordination, visual memory, spatial relation, form constancy, visual sequential memory, figure ground, visual-motor integration, and sustained attention. For an overview of handwriting research, Graham and Weintraub (1996) have undertaken a meta-analysis of the handwriting research from multiple disciplines. All of these journal articles help the reader understand the extreme complexity of a task that is often taken for granted—handwriting.

Grip

Grip is often the first indication of a problem or possible problem with handwriting. In their research on grip, Schneck and Henderson (1990) provide a descriptive analysis of the developmental progression of grip. It includes pictures representative of grip that can be difficult to verbally describe. Schneck (1991) looks further at grip comparisons of students that have good and poor handwriting. Their results suggest that children with handwriting difficulties may demonstrate a

lower grip score than children without handwriting problems. In addition, among children with poor handwriting, those with decreased proprioceptive-kinesthetic finger awareness may demonstrate a lower grip score than those with good proprioceptive-kinesthetic awareness. Tseng (1998) also evaluated the development of grip positions in preschool children finding that there is more than one grip that is functional. Yakimishyn and Magill-Evans (2002) looked at grip in addition to tools and surface orientation found that a short writing tool used on a vertical surface positively influenced the grasp of young children. Grip form and graphomotor control were compared in a study undertaken by Burton and Dancisak (2000). Their research supported the use of a grip assessment in documenting the grip, and at the same time finding that changing grip did not assist poor writers. Use of this research is helpful when gathering the information on how assistive technology can help students with poor or inefficient grip patterns. Despite its easily observed differences, most researchers agree that grip does not correlate with handwriting as there are many functional writers with unusual grips and many writers with good grip that have difficulty with handwriting.

Visual motor integration
Researchers Weil and Amundson (1994) confirmed to a significant degree what others have found in the correlation between handwriting and visual motor skills. The ability to copy shapes as a predictor for success with handwriting is evident. Cornhill and Case (1996), Tseng and Murray (1994) and Volman, van Schendel, and Jongmans (2006) in their research also agree regarding the influence of visual motor integration on handwriting. There is a significant correlation between visual motor skills and ability as a predictor of handwriting.

Time spent on fine motor skills
Important to handwriting and fine motor skill development is the amount of time spent on this type of activity in the elementary school years. McHale and Cermak (1992) found that 30% to 60% of the day was allocated to fine motor activities, with writing tasks predominating over other manipulative tasks. This illustrates the difficulties and frustrations that children with fine motor issues may encounter every day. Assistive technology may be a way to support students to work through writing with adaptive materials.

Handwriting instruction
Handwriting instruction also impacts the development of handwriting skills. See authors Marr and Cermak (2001) for a literature review of research on the affect of consistency on handwriting instruction.

Using AT to support students with handwriting deficits

When determining how to best meet the needs of students with handwriting difficulties through the use of assistive technology, there are several articles that can help the reader to see what others have done. Moser (2004) reviewed research on both handwriting and assistive technology and reported on the outcome measures for these interventions. This is an excellent article to use when looking for data supporting the use of assistive technology and for information on research for students with handwriting difficulties. Handley-More, Billingsley, and Coggins (2003) addressed the use of technology to facilitate written work. They found that use of word processing with word prediction improves the legibility and spelling of written assignments completed by some children. They concluded that, "It is important to evaluate each child individually and provide training and ongoing support for technology use." Rogers and Case-Smith (2002) looked at the issue of keyboarding versus handwriting and its affects on written work. They found that keyboarding had only low to moderate correlation with handwriting performance, suggesting that they require distinctly different skills.

Most students who were slow at handwriting or had poor legibility increased the quantity and overall legibility of text they produced with a keyboard. This supports the use of keyboarding as a way to increase and improve a student's writing. Press and Banton (2007) use the SETT process to analyze technology solutions for struggling writers in the school setting and recommend using a feature match process to choose the technology, followed by an implementation plan including, trial, data collection and finally obtaining the technology for the student.

Student's Abilities and Difficulties - Motor Aspects of Writing

As a team, discuss what the student's abilities and difficulties are related to the motor aspects of writing. Please complete and review Section 4 of the WATI Student Information Guide: Motor Aspects of Writing (Chapter 1, page 30).

Indications of writing difficulties are demonstrated in many ways. The student needs adequate support and skills to perform written tasks. To help the team to better understand the abilities and difficulties there are questions that may be asked to elicit the child's current level of functioning. Some examples of questions that you might ask are:

Physical
- Does the student have a desk and chair that fit? (See Chapter 2 on Seating and positioning)
- Does the student demonstrate positioning issues such as laying on desk, frequent need for movement such as rocking, kicking, sitting on feet, excessive walking around?
- Does the student have an efficient grasp of the writing utensil?
- Is the student able to write in the appropriate space?
- Does the student fatigue when writing?

Visual perceptual
- Does the student complete written work in a timely manner?
- Is the student able to maintain their place on the paper?
- Does the student visually attend to all answer fields on a page?
- Does the student fit their answers in the allotted space?
- Is the student able to read the work they have written?
- Is the student able to correctly transfer information by copying?

Social emotional
- Does the student exhibit avoidance behaviors when asked to write?
- Does the student orally express more than they are able to physically write on paper?

Cognitive considerations
- Does the student demonstrate an interest in sharing information?
- Does the student demonstrate attention to task?
- What is the student's learning style?
- Does the student's learning style affect the writing task?
- Is the student able to see the need for producing written work?

Organization
Does the student efficiently prepare materials to initiate writing tasks?
Does the student use and follow an outline or other organizing prewriting technique?

Student Sensory Considerations

Some students are adversely affected by environmental stimulation which others can filter out or ignore. Some common factors which can impact a student's learning and focus include hypersensitivity or hyposensitivity to stimuli such as

- Visual clutter
- Fluorescent lighting versus full spectrum lighting
- Classroom and background noise
- Tactile stimulation
- Awareness of physical space / personal space
- Other individual specific sensitivities

Although these factors are not directly related to the motor aspects of writing, they impact the student's ability to focus on instruction and learning so should always be considered.

Other Considerations

Each individual student has specific skills and areas of concern. Be certain to address those as you capture the particular traits of the student in this part of the SETT process.

Environmental Considerations - Motor Aspects of Writing

As a team, discuss and write on chart paper any environmental considerations that might impact the student's motor aspects of writing such as auditory or visual distracters, placement in the classroom, number of different writing environments or any other environmental impacts.

Environmental considerations pertinent to the student's success include:
- Ability to maneuver about the room/school as needed, need to travel from class to class; the number of class changes, and if there is sufficient time for these transitions.
- Lecture or small group, the ratio of adults to students, if the student has an aide.
- Teacher expectations.
- Positioning of the student in clear view of the teacher, the board, displays.
- Sufficient light, board free of glare.
- Ability to hear the teacher; is the auditory stimulation in the room conducive to the student, are students nearby talkative/distracting, is there excessive noise outside the room, does the student need background music to focus best?
- Visual stimulation both in and outside the room, the amount of distracting clutter.
- Student's organization skills; desk/workstation.
- Physical aspects including desk height.
- Positioning of the student with good trunk stability, stability of materials to keep them from falling on the floor.
- Use of a slant board to correctly position papers for visual and dexterity purposes.
- Use of software, availability in all environments needed in the correct platform.
- Accessibility of computers in the classroom.

Environmental Sensory Considerations

Different environments have different levels of sensory stimulation. If the team has determined that sensory impacts are influential for the student's learning, identify the acceptable sensory levels in each environment in which the student will be writing.

Assistive Technology: past and present

What assistive technology (AT) has been employed in the past or is currently used with the student? List all assistive technologies that have been used with the student. If some have been discontinued, make note of the reasons. Sometimes effective tools are discontinued for reasons that no longer exist such as computer conflicts, lack of training, lack of interest, or other reasons. Do not discount assistive technology that was previously tried and discarded. There may have been a mismatch between the assistive technology and the student's skills at the time. Differences in skill development, maturity, a different environment or other factors may make a significant difference. If the student is currently using assistive technology, note the AT used, location, level of effectiveness, trained staff, and any other issues that are pertinent to the student/building. Be certain to list low and high tech AT supports.

Tasks - Motor Aspects of Writing

As a team, discuss and write on chart paper the motor aspects of writing tasks that the student needs to do.

One of the most important questions when assessing a student's need for assistive technology is: What are the tasks the student needs to do? Teachers require written communication in many forms including note taking, worksheets, essays, and tests. In this instance what motor aspects are required to complete the writing task? These are some questions to consider:

- What tasks are required of the student that would influence their choice of assistive technology?
- What is required in the curriculum?
- Is the majority of writing single words, fill in the blanks, sentences, paragraphs, or multiple page term papers?
- What are the daily or weekly written assignment requirements?
- Are test questions taken from lecture notes?
- If the student has difficulty taking notes are peer or teacher notes available?
- What is the format of the test? Essay, multiple choice, true/false?
- Are there pop quizzes?
- Before considering reducing the quantity of the required writing or increasing the time element, would the task be more efficient with the use of assistive technology?
- Are there aspects of the writing assignments that are "busy work" that is not specifically beneficial to increasing the student's understanding?
- Is the student able to meet the reading requirements in order to perform the writing tasks?
- Is someone currently performing the writing tasks for the student and is the goal to make him more independent?

Consider your student's writing development with this typical progression of writing:

- Early Childhood four- and five-year-old kindergarten students are combining letters to write words and their name.
- Kindergarten students are combining letters to write words and their name.
- First graders are filling in worksheets and writing simple sentences.
- First through third graders practice penmanship and learn cursive handwriting. Computers are used, but not using structured keyboarding.
- By fourth grade, students are writing paragraphs and short stories as the writing demands at this stage become increasingly difficult. Computers are used and touch typing keyboarding is taught.
- Middle school and high school students are required to do various types of writing, including extensive papers and projects as well as demonstration of competency to show what they have learned. Handwriting and keyboarding are both used.

Narrowing the Focus - Motor Aspects of Writing -

As a team, identify by circling or highlighting those few tasks the student needs to do for writing that will have the most impact.

After the team has generated a list of tasks that the student needs to do, you may want to refine the list to limit the tasks that the team (including the student) will focus on. Too many tasks can overwhelm the team. Introduction of too many factors and tools may reduce your ability to determine effectiveness. Maintain your original list of tasks and review it later. Some tasks may already be effectively addressed with the new tools/strategies that you are using. The tasks that remain can become your new focus at a later date.

Solution Generation: Tools/Strategies - Motor Aspects of Writing

As a team, brainstorm and write on chart paper any assistive technologies and/or strategies you think will assist the student in successfully completing those tasks you identified.

The team brainstorms strategies and assistive technology tools that may be of benefit for the student to complete the identified tasks in the given environments. Do not critique or otherwise evaluate the suggestions at this time. List all suggested tools and strategies including those currently in use on chart paper for all to see. The tools and strategies discussed below follow the general continuum for motor aspects of writing. The continuum is generally organized from low to high assistive technology. It is not intended to be used as a step-by-step protocol for using AT tools with a student, but rather an organizational continuum of types of assistive technology. Subsequent to the continuum is a more in-depth description of select tools.

Sometimes effective tools are discontinued for reasons that no longer exist such as computer conflicts, lack of training, lack of interest, or other reasons. Do not discount assistive technology that was previously tried and discarded. There may have been a mismatch between the assistive technology and the student's skills at the time. Differences in skill development, maturity, a different environment or other factors may make all the difference. If the student is currently using assistive technology note the AT used, location, level of effectiveness, trained staff, and any other issues that are pertinent to the student/building. Be certain to list low-and high-tech AT supports.

A CONTINUUM OF CONSIDERATIONS FOR ASSISTIVE TECHNOLOGY

The Motor Aspects of Writing

Environmental and Seating adaptations

↓

Variety of pencils/pens

↓

Adapted pencil/pen

↓

Adapted paper

↓

Writing templates

↓

Prewritten words/phrases

↓

Label maker

↓

Portable talking dictionary

↓

Portable word processor

↓

Computer with accessibility features

↓

Computer with word processing software

↓

Alternative keyboards

↓

Computer with scanner

↓

Computer with word prediction

↓

Computer with voice recognition software

Low Tech Solutions to Improve Motor Aspects of Writing

- ♦ **Environmental & Seating Adaptations**
  - ▪ (See Chapter 2 – Assistive Technology for Seating, Positioning and Mobility)
    - • Slantboard
    - • Workspace environment (desk height etc.)
    - • Seating
  - ▪ **Variety of pencils/pens** Office supply and even many discount stores carry a variety of different pencils/pens. They vary in diameter, shape, type of lead used, and many are constructed with a built-in gripping surface. According to research, (Carlson and Cunningham, 1990), allowing the writer to experience a variety of writing tools and allowing then to choose the one that best meets their needs is preferred to selecting the tool for the student.
  - ▪ Variations of less conventional writing mediums offer students alternatives to the more traditional paper and pencil. For example, markers produce less "resistance" than writing with a pencil, allowing students who might not have the strength to apply adequate pressure to write on paper. Other students may require additional adaptations, such as a *dry erase board* in addition to a marker. Dry erase boards require even less pressure to produce a mark and errors can be easily erased. You can purchase *Memo Board*™ dry erase removable paper made by Contact and create your own low cost dry erase boards.

- ♦ **Pencil/pen with adaptive grip**
  - ▪ Just as there are many different pencils and pens, there are also many types of pencil grips. They vary in size, shape, and composition as well as aesthetic qualities such as color. Collect a variety and allow the writer to choose which is most beneficial. Author of *Living in the State of Stuck*, Scherer (2004), feels that the user of the assistive technology needs to have a say in what is prescribed, chosen or used. Having a variety of grips to choose from lets the student know that their opinions and desires are important when choosing a grip or any type of AT.
  - ▪ You can also make a quick and inexpensive pencil grip using *Adhesive Mounting Putty*.
  - ▪ *Sculpey* oven bake clay may be formed into custom made grips and baked for a permanent adapted grip.
  - ▪ Crayons may be melted into various shapes/molds and a Velcro cuff may be added to secure crayons in the student's hand.
  - ▪ *3M*™*Vetwrap*™ *Bandaging Tape* is also easily shaped around a writing utensil and comes in colors that are motivating for children.
  - ▪ Grip on the writing utensil can also be adapted by using the *HandiWriter* splint available from Pocketfull of Therapy. This splint holds the writing utensil in the web space between the thumb and index finger and provides a bead to be held by the ring and little finger. It simulates an efficient grip enabling the child to use this grip until their hands have developed the strength and coordination to do it independently. It can also be fabricated with easily available materials for students using their choice of colors and beads, giving the student input to splint and helping to engage them in using the splint.

- ♦ **Adapted paper**
  - ▪ There are a variety of papers available at school supply and discount stores. Some variations include line width, color, and texture for students requiring additional sensory input.
    - o *Right Line Paper*; wide rule, narrow rule, stop-go red-green with raised lines.

- o *Literacy Lined Paper* notebooks.
  - You can make your own raised line paper
    - o Using *Elmer's glue* carefully trace the lines on paper then let it dry
    - o Using *Wikki Stix*™, place stix on lines for temporary raised line
  - You can use the software *Boardmaker* to make sheets with boxes for students to write in. The boxes provide a visual space to write in and help corral the student's writing. They can be made different sizes and help the students learn the concept of space between words as a box is left blank between words. Using different sized boxes can also help determine what the optimal space size best meets the student's needs.

♦ **Adapting worksheets/Writing templates**
  - For fill in the blank worksheets, draw a box in the answer space to help the child corral their writing and see what space they have to write in.
  - Another way to adapt the worksheet is to use a word bank and number the words. The student can then put the number of the word in the blank and if time allows they can write the words in after all the numbers are put in the blank. This way the writing does not interfere with content of the worksheet. The writing can still be practiced, but if there is not enough time to complete the writing portion, the knowledge has still been demonstrated.
  - Enlarge the worksheet on a copy machine so that the child does not need to make as small or precise a mark as the other students may help with their ability to perform independent written work.
  - Taping the worksheet to the desk or placing it on a clipboard may also make it easier for the student to write on by stabilizing it for them. This is especially helpful for students with use of only one arm or who have difficulty with having their hands do two different movements at the same time.
  - *Magnet letters, words or phrases* may be used by students as an alternative to writing their response.
  - Using things like masking tape, *Velcro*™, *Dycem*®, *gripping stuff*, or non slip rubber mats from Rubbermaid is another way to hold things in place. These simple items can go a long way to help make materials more accessible.

♦ **Use of Prewritten Words/Phrases**
  - It is extremely important to provide students with the opportunity to produce written language even though they may not have the motor skills to adequately do so in the traditional method using a pencil and paper. One way to do this is to provide words already written that can be placed in sentences and paragraphs. This requires only a swiping motion to move the words into the desired arrangement. *Magnetic Poetry*® is a commercial product offering preprinted words in various sizes. You can create your own pre-written words and phrases using magnetic paper or a label maker. Words can be printed on paper or card stock and stuck to magnetic material or be printed directly on magnetic paper. The student can then arrange them on a metal surface. Magnets can also be used by students to indicate choices on worksheets mounted on a cookie sheet beneath plastic.
  - Preprint numbers, letters and or words with a label maker and allow the child to choose what they need and stick it on the paper. An egg carton(s) works well for storing the letters and numbers for the child to choose from. A sticker of each letter can be put on the side of each egg cup so the child can easily see what they letters are.
  - Use rubber stamps for stamping student's name on papers or for answering one-digit answers on worksheets. The student's needs and environment need to be assessed when looking at

stamps. In particular, pay attention to the size of the stamped image, the need for an ink pad, and the grip and pressure required to use the stamp. Some stamps are self-inking. This can reduce the need and the potential mess of a stamp pad.

- Software programs that help you to create your own word banks. Any word processing program can be used to make word banks. More specialized software manufacturers include Slater Software, Mayer-Johnson, IntelliTools and Crick. These word banks can be used on the computer or printed out.
- The *IntelliShare Classroom Activity Exchange* site http://aex.intellitools.com/ is one source that offers already created activities that allows a student to retell a story, sequence events, create their own story, etc.

♦ **Writing templates**
- A variety of plastic or metal *writing guides* are available from independent living aids catalogs. Writing guides are pieces of plastic with cut out areas for writing within cutout lines. They come in various sizes for writing checks, signatures, letters and envelopes. You can also make your own templates out of cardboard, manila folders or a thin plastic such as overhead transparencies.
- *Wikki Stix*™ may be used as a writing guide. *Wikki Stix*™ are colorful, flexible "sticks" made out of a wax coated string that is tacky to touch. They stick to any surface and peel off without a trace. They can be placed on the bottom or top writing line as a guide. Children can form letters with *Wikki Stix*™ or use them as letter guides when writing.
- Teacher-made templates for note taking can reduce writing demands by providing a fill in the blank format. This works well for learning note taking skills, as the teacher can leave out important words for the child to fill in as they are listening. The student is not required to write down all the extraneous information.
- Students who are unable to write even single words are often given the notes from the teacher. It is important to encourage attending to the lecture by requiring the student to circle, highlight or otherwise mark the main idea as it is being discussed. This helps discourage students from thinking they don't have to pay attention because their notes are already done. It also gives the teacher a way to monitor a student's attending skills and comprehension. The teacher may easily redirect the student's attention to the copy of the notes to ensure that they are used correctly.

Mid and High Tech Solutions to Improve Motor Aspects of Writing
♦ **Label maker**
- The new *electronic label makers* are another way for students with difficulties forming letters to produce written work. They can be used to type a word or phrase, print it out and attach to a worksheet or other document. You may be able to check in your local school office area to borrow one. Since these devices are readily available, using a feature match will help determine the best choice for the student. There are numerous types and sources of label makers. When choosing a label maker here are some features to consider:
  - Keyboard- Size of keyboard, size of buttons, layout (QWERTY vs. ABC)
  - Features -fonts, font sizes, color of text, memory, complexity of special features,
  - Tape- size, length, color or transparent
  - Tape cutter- automatic or manual
  - Cost- machine and tape refills

♦ **Portable talking dictionary**

A student with spelling challenges may need to look up words in a dictionary. The added benefit of the *talking dictionary* is that it provides additional auditory support to students during the writing process. Some dictionaries will spell the word one letter at a time allowing the student to write the word without having to look back and forth to the dictionary.

- ▪ *Franklin Children's Speller & Dictionary*
- ▪ *Franklin Homework Wiz Speller & Dictionary*

♦ **Portable Word Processors**

If you are looking for increased computer access for students with disabilities but need to keep costs down, you may want to consider purchasing a portable word processor that will interface with a computer. Portable word processors are lightweight (2.3 lbs. or less) and extremely inexpensive (under $400) when compared to a laptop computer. There are many portable word processors available, however below is information on some of the more popular ones that you might want to consider. They are very similar, but each has slight differences in features that you will want to consider when purchasing.

- ▪ *Dana*™ by AlphaSmart® is an alternative, lightweight keyboard/computer that provides portable access to a full-featured word processor in addition to the organization tools of the Palm™ operating system. It is an electronic notebook that you can synchronize with a computer or send files directly to a printer. The organization tools include a Data Book with calendar and alarms, an Address Book, and a To Do List for prioritizing tasks like assignments. *TextPlus*, a word prediction applet, and many other inexpensive software programs that run on the *Dana* are also available to help a student.
- ▪ *CalcuScribe* is a portable word processor that allows the student to create text files that can be used by any application once sent to a computer. It also houses an interactive calculator for arithmetic, algebra, and trigonometry that allows the student to do math problems in a word processing environment and save the calculations to send to a computer. Using the infrared pods, files can be shared with other *CalcuScribes* or sent to a printer without going through a computer first. (The printer needs IR to do this.)
- ▪ *The Fusion Keyboard* by Advanced Keyboard Technologies is a portable notetaker which features a large LCD screen with a choice of font sizes, word prediction, keyboarding and optional text to speech.
- ▪ The *Laser PC-6* by Perfect Solutions offers the additional feature of text-to-speech capabilities to the portable word processor. Text can be viewed on a changeable 4 line by 40 or 8 lines by 80 character screens. It comes with eight built-in programs including a word processor with word prediction, sticky keys, spell checker, homework calendar, typing tutor, database, spreadsheets, and a scientific calculator. It weighs 2.75 lbs with battery and has a memory of 256K which allows for 45 named files and 14 pages max of text per file with 100 pages text overall. Perfect Solutions also offers 2 add-on options. The text-to-speech cartridge provides talking word processing including talking spell checker and word prediction, and it allows text to be spoken in letters, words, sentences or paragraphs.
- ▪ *NEO by AlphaSmart*® is a light-weight, portable, stand-alone notebook for word processing and math. Ready to send text to any computer or printer using USB cable or infrared. Features include file management, word-processing with spell check, thesaurus, calculator, features for special needs including sticky keys, slow keys.
- ▪ *The Writer* by Advanced Keyboard Technologies is a portable word processor that allows students to organize and store their assignments, by name, in 1 of 16 password-protected work

folders. Features include wireless infrared file transfer capability or via a USB connection to a Mac or PC computer, spell check, and word prediction.

- *UBI DUO* is a device that resembles two small portable keyboards. It was designed for the deaf or hearing impaired to communicate with anyone at anytime, without a third party, personal interpreter. The communication mimics text messaging and instant messaging. It is not intended as a word processor but has features that would make it appropriate for note taking, real time modeling, or asking questions.

A chart that compares some of the features of the portable word processors is on the following page.

Portable Word Processors

Product	Ordering Info	Features	Advantages	Disadvantages
NEO	AlphaSmart, a division of Renaissance Learning, Inc. P.O. Box 8036 Wisconsin Rapids, WI 54495-8036	Full size keyboard Large LCD screen USB & Infrared Special Needs features (sticky keys etc.) Small to Extra large fonts	Portable & rugged 2 MB software storage for multiple applets 512KB storage for 100's of text pages Alternative keyboard layouts Under $250.00	
CalcuScribe	CalcuScribe 98 Cervantes Blvd. Suite #1 San Francisco, CA 94123-1672	Word Processing Calculator 300 hours on 3 AA 50 page memory Full sized keyboard Infrared capabilities 2.75 lbs	Sticky Keys Auto-repeat option Zoom feature – 8 pt to 16 pt Unlimited files Under $275.00	Unable to download files from PC
Dana	AlphaSmart, a division of Renaissance Learning, Inc. P.O. Box 8036 Wisconsin Rapids, WI 54495-8036	Runs Palm applications Date book Address book, Memo Pad, To Do List Infrared capable	Lightweight Onscreen keyboard/graffiti Easy touch keyboard Larger LCD runs over 10,000 applications Under $430.00	Graffiti and onscreen input available only in vertical setup
The Fusion	The Writer Learning Systems PO Box 186 Paso Robles, CA 93447-186	portable notetaker word prediction Dictionary & Thesaurus keyboarding tuition optional text to speech.	Large LCD up to 10 lines of print Large font for vision issues lightweight Under $415.00	
Laser PC-6	Perfect Solutions Software, Inc 15950 Schweizer Court West Palm Beach, FL 33414-7128	Word Processing Spell Checking Spreadsheets	Adjustable size of text Typing tutor Text-to-speech Under $150.00	8 built in programs add to complexity
The Writer	Advanced Keyboard Technologies, Inc. P.O. Box 2418 Paso Robles, CA 93447-2418	Infrared capabilities Auto-Thesaurus Spell Check Password protected folders	KeyAcademy ™ keyboarding program – 116 lessons WriterExpress™ -customized formatted files Word prediction in Education Package Power skin overlays available Good writing checklist Under $200.00	
UBI Duo	SComm 6238 Hadley Street Raytown, MO 64133	2 keyboards in one device Wireless Allows 2-4 people to text each other Adjustable Font size 12 to 24pt Change contrast between text and background	2-4 people can communicate Could provide just-in-time note-taker Download text to computer Save text $1995	

♦ **Operating system Accessibility Features**

Both Windows and Mac platforms offer accessibility settings helpful to people with visual, hearing, and mobility needs. Some examples of these are sticky keys (the ability of one key to stay depressed so that another key can be pressed at the same time-- i. e., when you press the shift key), key repeat rate (changing the key repeat rate so that students with difficulties releasing the keys do not get multiple letters printed), magnification (the ability to change the size of the information on the screen), visual or auditory alarms (to compensate for the typical alarms that may not work for the student's disability).

- To learn about Microsoft accessibility features go to: http://www.microsoft.com/ENABLE/
- Go to Apple Accessibility website for information about accessibility settings and pdf. files that describe in detail the settings and how to use them. http://www.apple.com/accessibility/

♦ **Computer with Word Processing Software**
- The computer can be an exceptionally effective tool to support students who are struggling with writing. Word processing on the computer offers the opportunity to change letters, words, sentences, and paragraphs easily and quickly while allowing a clean, attractive, and readable end product.
- Formatting options such as font styles, color and size are beneficial for the visually impaired and motivating for students who have struggled to produce legible materials.

♦ **Alternative Keyboards / Alternative Access**
Another means to provide access for a student who is experiencing difficulties with the motor aspects of writing is to use an alternative keyboard (See Chapter 4 – Assistive technology for Computer Access)
- *IntelliKeys*® USB from IntelliTools, Inc is an alternative keyboard that enables students with physical, visual, or cognitive disabilities who can press and release a part of the keyboard to type, enter numbers, navigate onscreen displays, and execute menu commands. The *IntelliKeys*® keyboard comes with six standard overlays (plus a setup overlay) that are ready to use with any word processing program or software that requires keyboard input. These overlays include an alphabetical overlay which is very useful for early writers. The *IntelliKeys*® is a programmable alternative keyboard which can be configured to almost any layout based on student need. Mac/Win compatible.
- *Big Keys* is an alternative keyboard with large keys and features which may include color coded keys or high-contrast lettering and an optional detachable Plexiglas keyguard. Features: optional ASSIST Mode (for those who cannot press 2 or more keys simultaneously or need 1-handed typing; works with and enhances the Windows "Sticky Key" Accessibility Option), and optional ability to switch between ABC and QWERTY layouts. No special software required; it is a plug 'n play device. This keyboard comes with a USB adapter making it compatible with both Win and Mac computers.
- *Logitech diNovo Mini* is a palm sized cordless mini keyboard that connects to the computer or is used for running entertainment options. This keyboard has the thumb layout of many phones which proves to be more accessible to some users.
- Another popular alternative keyboard is the *TASH USB Mini keyboard*, a small size alternative keyboard that plugs directly into a computer with no special interface needed. The membrane keys are less than one half inch square and are closely spaced for easy access. This is especially useful to someone with limited range of motion.
- *Dana/Neo:* see portable word processors above.
- *Onscreen keyboards* provide the various keyboard layouts on the computer screen. Depending on the software, selections on the keyboards may be made by mouse click, mouse dwell, or scanning. Use of the onscreen keyboard decreases the physical space between the keyboard and the monitor, thus eliminating some distracters. Onscreen keyboards are now available through the latest versions of both Windows and Mac.
- *Handwriting recognition* is a feature available through Microsoft Word. Your natural handwriting is converted to typed characters and inserted into the word document. You can write directly on a Tablet PC or on non-touchscreen computers by using a handwriting input device, such as a G*raphire pen tablet device* used with 3-D drawing programs or *Computer Aided Drafting (CAD)* software, or you can write using your mouse.

- *Handheld computers* offer a small, portable tool for written language. Handhelds allow input of text into various applications including memo pad, to do list, and word processing programs. Text can be inputted via a small onscreen keyboard and stylus or by writing on the handheld's LCD screen. The latest in handheld operating system software allow the student to write anywhere on the screen and the written words are translated into text. A variety of keyboards are available for use with the handhelds including portable wireless keyboards and snap on thumb keyboards. Some handhelds such as the Blackberry, iTouch or iPhone come with a thumb keyboard and also touch screen and onscreen keyboards.
- *Tablet PCs* also offer word processing applications with all the capabilities of a laptop or desktop. The Tablet PC incorporates a touch screen with handwriting recognition capabilities.
- *iTouch* offers an MP3 device with Internet connectivity and hundreds of downloadable applications. Using an MP3 format, this device is not only beneficial for listening to audible books, but can be used as a writing tool through applications for word prediction, instant messaging, and email. The technology for this device is evolving and becoming very usable and much less expensive.

♦ **Scanning**

A scanner connected to the computer may be used to assist writing by scanning worksheets or chapter questions that the student may then access digitally on the computer. Worksheets may be designed with text boxes for short answer, fill in the blank, multiple choice or true/false. A student using other software to assist writing, such as word prediction or voice recognition, would then be able to complete worksheets using these types of programs. (See Chapter 7 – Assistive Technology for Reading.)

- Many of today's light portable scanners come with a scanning program and many are compatible with various scan and read software frequently used (e.g. *Kurzweil, WYNN, Read and Write Gold, Premier*)
- OCR (optical character recognition) scanning software is required if you intend to have the scanned documents used with text-to-speech software. Classic scanning software simply takes a picture of a document versus recognizing characters or letters as with the OCR scanning software. A classic scanning program may be used for worksheets that a student can read independently. Text boxes may be inserted to this type of document and the student may answer the questions digitally.
- Consider a high speed scanner for scanning entire textbooks or workbooks. Keep in mind copyright laws. The student must have a purchased workbook and be identified as a student with a print disability.(See Chapter 7 – Assistiive Technology for Reading-NIMAS Standards)

♦ **Portable Scanners**

Portable handheld scanners work like a digital highlighter to scan and read text from books, magazines, newspapers, and other printed documents. They capture the text to memory and allow the user to download the text to their PC via a cable. This tool allows a student to capture important information from textbooks, glossaries, research materials, etc. and download it directly into a word processor.

- The *QuickLink Pen* from Wizcom Technologies, Inc., LTD is a handheld scanner that scans full lines of text from 6-22 point size, store it, and then transfer it to a computer, Palm Pilot, or text enabled cellular phone.
- The *SuperPen Voice* from Wizcom Technologies, Inc., LTD is a handheld scanner and translator. The pen combines the functionalities of the *Quicktionary II* and the *QuickLink*

Pen. This pen allows the user to scan full sentences of text and receive instantaneous auditory word-by-word translation. The pen weighs 3 ounces and is capable of storing up to 3000 pages of data.

♦ **Computer with Word Prediction Software**

Word prediction is most frequently considered for the student with spelling difficulties but should not be overlooked for the student with mechanical difficulties. The use of word prediction software may decrease keystrokes and increase quantity and efficiency; for the student with physical limitations, using fewer keystrokes to complete words and phrases will increase the quantity and quality of writing, while reducing fatigue. Word prediction software is fairly easy to use, and requires minimal instruction. Many programs include phonetic spelling prediction, auditory text to speech feedback and customized topic dictionaries to assist students in many curriculum areas.

- Most scan and read programs now include word prediction (e.g. *Kurzweil, WYNN, Read and Write Gold, SOLO*)
- Other word prediction programs*: WordQ* by Quillsoft, *Premier Accessibility Suite* including *Predictor Pro* by Premier Literacy, *Clicker 5, Pen Friend* and *Wordbar* by Crick, *Co:Writer* by Don Johnston, *IntelliTalk* by IntelliTools, *ClaroRead* by Claro Software.

♦ **Voice Recognition Software**

Voice recognition is a computer application that lets people control a computer by using speech. Students can write using voice recognition in conjunction with a standard word processing program. When users speak into the microphone their words appear on a computer screen in a word processing format, ready for revision and editing. Not only can voice recognition software benefit students with learning disabilities but also the student with physical access challenges. While many such students benefit from standard word processing, the visual-motor demands of keyboarding can be a major stumbling block that compounds the writing process. Similarly, students who are the poorest spellers are frequently unable to effectively use standard spell checkers. For whatever reason, if a student's oral language skills far exceed their ability to generate text with pencil and paper or standard word processing, voice recognition may enable them to become successful writers.

There are two kinds of voice recognition software: discrete speech and continuous speech. Discrete speech recognition requires the user to speak one - word - at - a - time. Continuous speech recognition allows the user to dictate by speaking at a more or less normal rate; both have their advantages and disadvantages.

Dragon NaturallySpeaking is one of the most comprehensive voice recognition programs for the Windows OS, enabling hands-free navigation and dictation in Microsoft® Word, Excel®, Corel® WordPerfect®, and virtually all Windows®-based applications. Dragon NaturallySpeaking may be used to create documents, reports, send e-mails, instant messages, surf the web, and even operate many of the computer functions.

Microsoft Office has incorporated voice recognition within *Microsoft Word 2003 and XP*. The voice recognition engine within Word is not designed specifically for individuals with disabilities; however, it provides an excellent diagnostic tool to use to determine if voice recognition may indeed be a useful tool for the student. The voice recognition component requires custom installation.

Microsoft Windows Vista operating system now has voice recognition built into the operating system.

SpeakQ by Quillsoft plugs into *WordQ* and adds simple speech recognition. Users can benefit from a combination of word prediction, speech output and speech input to generate text when stuck with spelling and word forms, identifying errors, proofreading and editing. Designed with special students needs in mind, it works in both discrete and continuous modes.

IBM ViaVoice for Mac OS X is a continuous speech voice dictation for Apple's Mac OS X. Users can dictate, correct, edit, and format text with their natural voice. Mac OS X Edition also provides voice command and control of the Internet, so users can move back and forth between Web sites. An enhanced Speech Recognition Engine takes advantage of Mac OS X audio features and provides for a fast enrollment.

Writing AT into the IEP

There are many correct ways to write AT into the IEP. It must be considered on the special factors form of the IEP and a listing of AT may be included there. It may be included as a related service and maybe also be included as a supplemental aid or service. If in an exploritory phase, do not write AT as a goal, put it in the special factors until the technology has been determined to work for the student.. (Purcell, Grant, 2002, 2004, 2007) and (Bateman, Herr 2003) state many examples of writing present level of performance, objectives and goals.

The following is a four step formula for writing an IEP goal.

(e.g. #1)

Time Frame: In 36 weeks

Conditions: Given a computer with adapted keyboarding

Behavior: Eric will use an onscreen keyboard to complete writing assignments

Criterion: in 10th grade English and civics class

(e.g. #2)

Given access to a computer with voice recognition (condition), the student will dictate sentences (behavior) averaging 15 words per minute in a 10 min. practice session (criterion) one of two opportunities (time frame).

Solution Selection: Tools & Strategies - Motor Aspects of Writing

Use a Feature Match process to discuss and select those ideas, tools, and strategies that were generated during the solution brainstorming. Select those that best match the student, the environment and the motor aspects of writing tasks that need to be accomplished. Limit your selections to a reasonable number and prioritize them according to those that can be accomplished immediately, in a reasonable time period and those that will be considered at a later time or require additional or significant staff training.

Implementation Plan - Motor Aspects of Writing

After tools have been selected and prioritized, identify any trials or services that are needed including procurement of trial materials, team member(s) responsibilities, start date and length of trial, training

needed and any other student/staff specific issues. Be certain to identify motor aspects of writing objectives and criteria of performance to determine the effectiveness of the trials.

Feature Match

The following charts are examples of ways to involve the student in the feature match process. The student can choose the template that appeals to them visually. Then the student can highlight or otherwise mark their thought process when choosing the tool for the specific task they need to accomplish. It can also be used to remind the student of the choices they may have. Additionally, the student can have copies of it available to them to use independently to further increase their ability to perform written tasks.

Motor Aspects of Writing Continuum: Matching the tool to the task
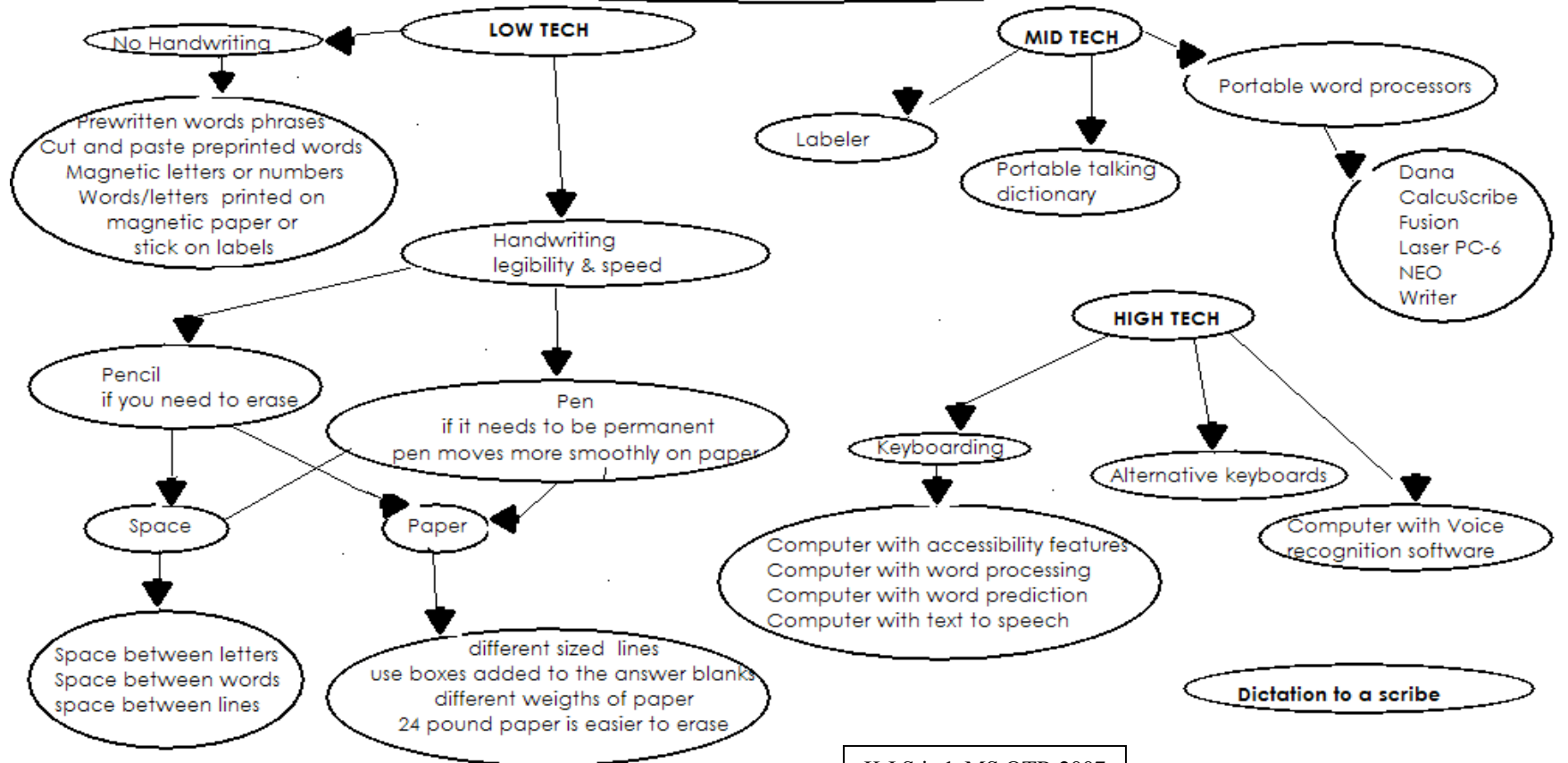A worksheet for users of multiple writing tools

Variables:
Purpose of the task (Are there other ways to do the work besides writing? circle, number, dictate)
Copying information..................review information...........................demonstrate knowledge.....................create new information
Amount of writing   single words...............sentences............paragraphs.....................essays...........................papers
Revisions or editing   none......................pencil editing.........................one draft..multiple drafts
Due date   immediately..........................next day...next week.................................next month

No Handwriting

LOW TECH

MID TECH

Portable word processors

Prewritten words phrases
Cut and paste preprinted words
Magnetic letters or numbers
Words/letters printed on
magnetic paper or
stick on labels

Labeler

Portable talking
dictionary

Dana
CalcuScribe
Fusion
Laser PC-6
NEO
Writer

Handwriting
legibility & speed

HIGH TECH

Pencil
if you need to erase

Pen
if it needs to be permanent
pen moves more smoothly on paper

Keyboarding

Alternative keyboards

Computer with Voice
recognition software

Space

Paper

Computer with accessibility features
Computer with word processing
Computer with word prediction
Computer with text to speech

Space between letters
Space between words
space between lines

different sized lines
use boxes added to the answer blanks
different weights of paper
24 pound paper is easier to erase

Dictation to a scribe

K J Stindt MS OTR 2007

Motor Aspects of Writing Feature Match- Matching the tool to the task

Factors to Consider

1. Amount of writing   **Very little**…………………………………………………………**to**……………………………………………………………..**Lots of writing**

Single words…………………………..Sentences……………………………Paragraphs……………………………………..Essays………………………………Papers

2. Due date   **right away**……………………………………………………**to**…………………………………………………………………**much later date**

Immediately………………………………Next day   …………………………………………Next week…………………………………………Next month

3. Purpose of task   Are there other ways to do the work besides writing?

Copying information………………………………Review information……………………………………Demonstrate knowledge…………………………………Create new information

4. Revisions or editing required
   None…………………… ……………Editing done with pencil……………… ………………One draft…………………………………………………..Multiple drafts

Low tech
- *Utensils*- Variety of sizes and types
- *Utensils* -Modified with pencil grip or splint
- *Paper*-different sized lines, boxes *heavier paper (24 pound) is easier to write on and erase*
- Templates- eliminate excess writing
- Prewritten words phrases
- Cut and paste preprinted words
- Magnetic letters or numbers
- Words printed on magnetic paper
- *Handwriting*
- Writing tools pencils, mechanical pencils, markers, pens
- Increasing handwriting legibility
- Space between words, between lines
- Margins -keep uncrowded
- Note taking- make copies, use carbon paper or get from teacher

Mid Tech
- Labeler
- Portable word processor

High tech
- Computer with accessibility features
- Computer with word processing
- Alternative keyboard
- Computer with word prediction
- Computer with Voice recognition software

No Tech
- Dictation to another person
- Although not assistive technology, dictation can solve some of the issues with written language assignments

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Product/Vendor Guide

Product	Vendor
3M™Vetwrap™ Bandaging Tape	Available locally
Adhesive Mounting Putty	Available locally
BigKeys	Graystone Digital, Inc.
Dana™	AlphaSmart, Inc.
Dragon Naturally Speaking	Nuance
Dycem®	Dycem Technologies
Franklin Children's Speller & Dictionary	Franklin Electronic Publishers
Franklin Homework Wiz Speller & Dictionary	Franklin Electronic Publishers
Handheld computers	Palm, Compaq, Handspring etc.
IBM Viavoice	Nuance
IntelliKeys®	IntelliTools, Inc.
Laser PC-6	Perfect Solutions
Magnetic Poetry®	Magnetic Poetry
Memo Board™ Contact Paper	Available locally
Microsoft Office	Microsoft
Microsoft Windows	Microsoft
NEO	AlphaSmart, Inc.
QuickLink Pen	Wizcom Technologies, Inc.
Quicktionary II	Wizcom Technologies, Inc.
Research Assistant for Students (and Teachers) with Bibliography Generator	ESSDACK
Sculpey modeling clay	Available locally
SmartApplets	AlphaSmart, Inc.
SpeakQ	Quillsoft
Product	**Vendor**
SuperPen Voice	Wizcom Technologies, Inc.
TASH USB Mini keyboard	TASH Inc.
The Writer	
Velcro™	Available locally
ViaVoice®	IBM North America
Wikki Stix™	Wikki Stix