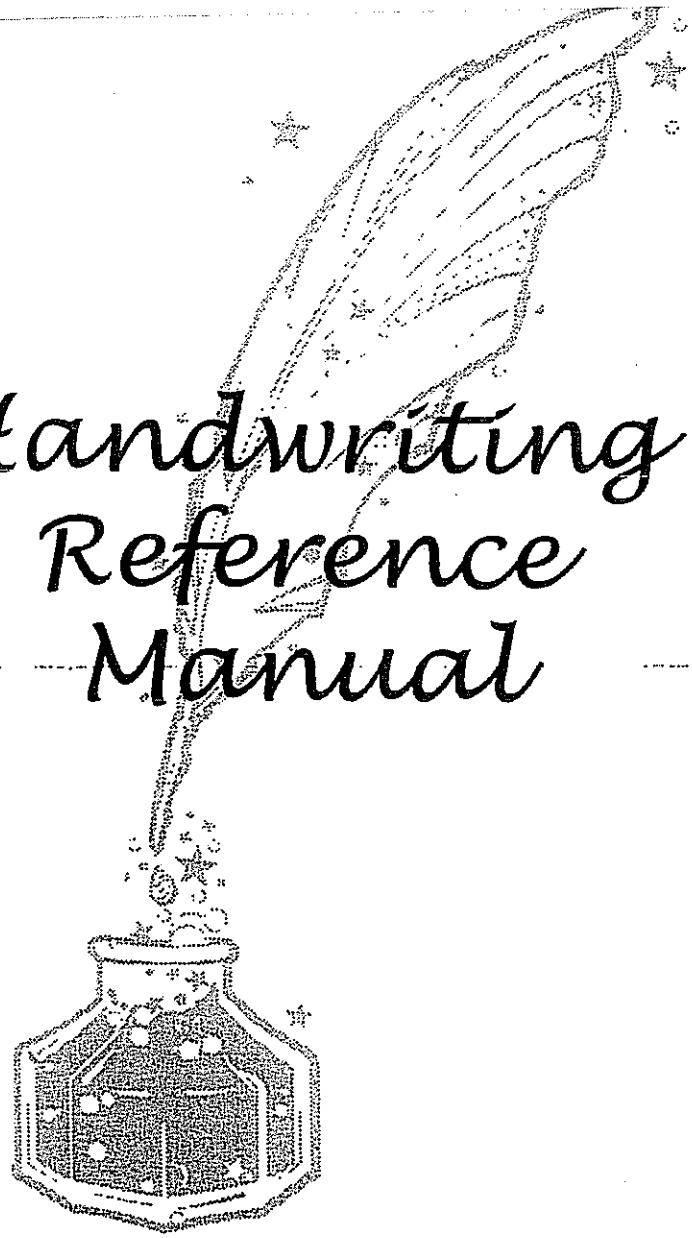
Handwriting Reference Manual



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HANDWRITING PREREQUISITES

SOME IMPORTANT THINGS TO NOTE:

Posture:
Sitting in a chair with feet on the floor and desk at a correct height is needed for good handwriting.

Pencil grasp:
Without a mature dynamic tripod or lateral tripod grasp it is harder to get finger muscles to move easily.

Hand development:
Good penmanship requires good in-hand manipulation skills, wrist stability, separation of the two sides of the hand, good thumb development and hand arches.

Finger muscles:
The small muscles in the hands need to move in a coordinated fashion to form letters properly. To do this, warm-ups and stretches are helpful (just as with other muscles).

Shoulder stability:
Shoulder muscles need to be strong to hold the arm so the fingers can move.

Writing without watching:
Fingers need to learn the feel of moving to make the letters, so attention can be paid to the content of a lesson, rather than the forming of letters. Once muscles learn a motor pattern, it is harder to change it (just like any habit), so it is important to learn it correctly the first time.

WHAT CAN WE DO?

Posture:

Proper chair and desk size and positioning can improve muscle control and fine motor writing skills. The "Positioning" Handout, on page 61, gives more information on this subject.

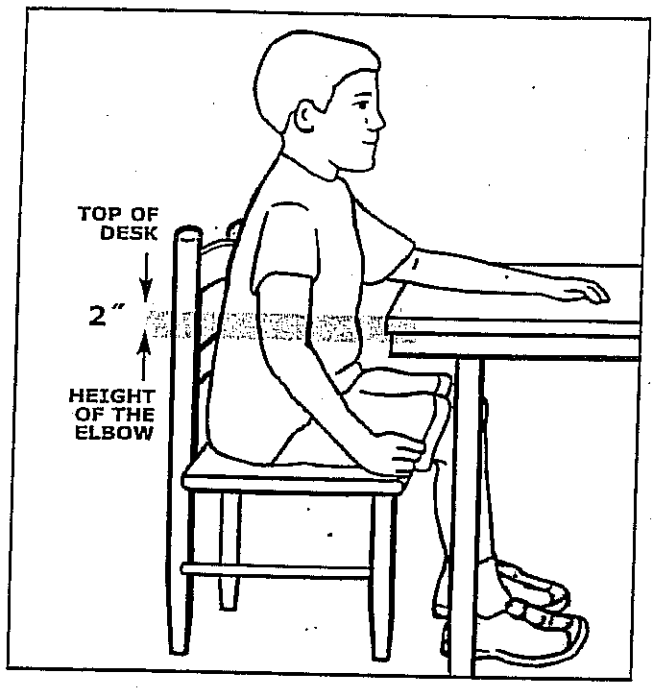
Pencil Grasp:

Pencil grips often help a student position the pencil to allow muscles to work in optimum position.

Shoulder Stability:

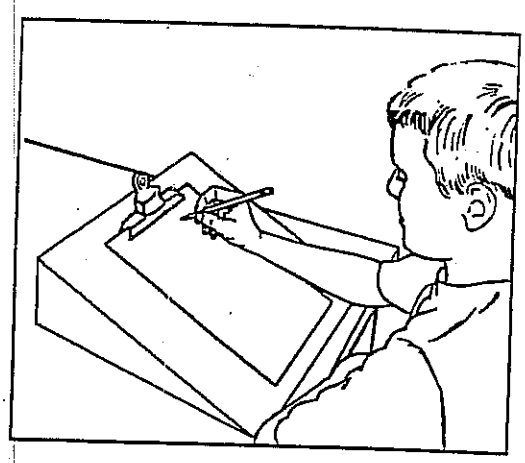
Have students write on a vertical surface such as a blackboard or an easel.

Proper Desk Size



The height of the top of the desk or table should be 2 inches above the height of the elbow when the student is sitting.

Modifications



Easels or slanted tops on the desk often help a student to sit up straighter because they do not require the student to bend his neck forward.

When a student works on a vertical surface the student automatically extends the wrist which puts the hand in an optimal position for manipulation and writing.

Positioning Writing Paper

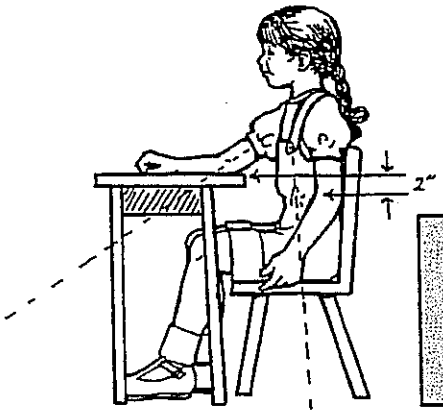
1. When sitting properly the student should fold their hands on the desk and place the paper under the writing hand in the triangle formed by their arms.

2. The paper should be angled:
   20-35 degrees for right handed students
   30-35 degrees for left handed students

3. Place a line on the desk for students with difficulty positioning their paper.

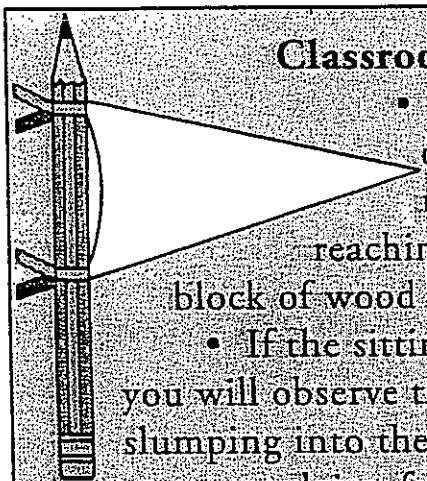
Postural Control

One of the most neglected classroom prerequisites for efficient handwriting is assuming and maintaining a balanced sitting posture. The height of the chair and writing surface can dramatically affect a student's efficiency and attention to a writing task. Below is a diagram that demonstrates the correct sitting posture for handwriting:



- chair back slightly below the shoulder girdle
- writing surface 2" above the bent elbow
- knees and hips bent at 90 degrees
- feet flat on floor

The stability provided from proper positioning allows the shoulder, elbow, hand and eyes to function together for efficient handwriting to occur.



Classroom strategies:

- One indicator that a chair/desk is too high can be observed when a student wraps his or her legs around the legs of the chair/desk to compensate for not reaching the floor. If the chair/desk cannot be lowered, try a block of wood or telephone book under the feet to provide stability.
- If the sitting surface is too small or the writing surface is too low, you will observe the student hanging the head into the shoulders or slumping into the seat to get closer to the writing surface. The student may complain of neck or eye strain or complain of cramping while writing.
- If the writing surface is too high, the student will compensate by displacing his or her weight backward and stretching the arms forward. This position will limit wrist movement and cause the writing movement to be directed from the shoulder or from shifting of the torso. Some students may boost themselves by sitting on their feet, which causes them to lean over onto one side of the desk.
- If a child still appears unstable following proper positioning, try a slant board or allow the student to work on the vertical plane (ie., chalkboard).

Screening-Age Appropriate Skills

Fine Motor Skills

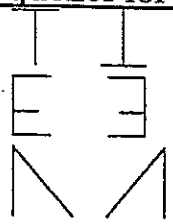
Handwriting	Age Accomplished (Years)
Gross pencil grasp	4 and under
Transitional pencil grasp-static tripod	4 to 6.5
Mature grasp-dynamic or lateral tripod	6.5
Colors within lines	5 to 6
Connecting large dots	5 to 6
Reversals common	Up to age 6
Reversals decreasing	7
Pencil rotation one handed	7.5
Visual Tracking	
Systematic scanning	6
Filtering irrelevant stimuli	7
Ocular motor skills	7
Drawing	
Tadpole-head with legs	3
Person with four features	4
Body appears	5
Natural use of color	7
Comprehension of Spatial Language	
Around, in front of, high, in back of next to	4
Beside, bottom, backward, forward	4.5
Down, low	5
Behind, ahead of, first, last	5.5
Copying Figures	
Vertical stroke	2
Horizontal stroke	2.5
Circle	3
Cross	4
Square	4.5
Oblique cross (X)	5
Triangle	5.5
Diamond	6

Developmental Sequence for Position in Space Differentiation

Vertical

Horizontal

Diagonal



Throwing Skills	Age Accomplished (Years)
Overhand throw without stepping	Under age 5
Overhand throw stepping same side foot	5
Overhand throw stepping with opposite side foot	7.5
Fastenings	
Unbuttons front fastenings	4
Buttons front fastenings	4.5
Ties a half-knot	5.5
Complete bow know	6.5
Clothing Management	
Independent except jean fastenings	5
Feeding Skills	
• Spoon and fork use	3
• Cup use-one handed	3.5
• Butter knife usage	5.5
Cutting Skills	
Cuts along straight line	4 to 5
Cuts out simple geometric shapes	4.5 to 5
Cuts out complex shapes following outlines	5.5 to 6
Mature scissors grasp (the middle finger in the lower hole of the handle, the ulnar two fingers flexed, and the index finger positioned to stabilize the lower part of the scissors)	6.5
CUTTING (Exner, 1996)	
Snips with scissors	2
Cuts across a 6-inch paper	2.5
Cut a line that is 6 inches long	3 to 3.5
Cut out a circle	3.5 to 4
Cuts out a square	4.5 to 5
Complex cutting age	6 to 7

HANDWRITING
ESSENTIAL SKILLS

PRE-K

- participates in many activities to develop fine motor skills
- begins to demonstrate correct pencil grip
- begins to form manuscript letters in first name using capital and lower case letters
- begins to write random numerals

KINDERGARTEN

- participates in activities to develop fine motor skills
- demonstrates correct pencil grip and sitting position
- forms upper and lowercase manuscript letters in first name
- forms numerals 0 - 12
- forms upper and lower case manuscript letters as provided in a model
- begins to form letters on a single line

PRE-1

- participates in activities to develop fine motor skills
- demonstrates correct pencil grip, paper slant and sitting position
- correctly and legibly forms manuscript letters in first/last name
- forms numerals 0 - 20
- correctly and legibly forms upper and lower case letters using a single line

GRADE 1

- demonstrates correct pencil grip, paper slant and sitting position
- correctly forms numerals and manuscript letters legibly using three lined paper
- spaces letters, words, sentences

GRADE 2

- demonstrates consistent legibility and fluency in manuscript writing
- begins to form lower case cursive letters
- demonstrates proper paper position and sitting position
- forms first and last name using upper and lower case cursive letters
- spaces letters, words, sentences
- uses punctuation

GRADE 3

- demonstrates consistent legibility and fluency in manuscript, numerals and lower case cursive writing
- forms upper case cursive letters correctly and legibly
- spaces letters, words, sentences
- utilizes uniform sizes and formations

GRADE 4

- positions paper correctly and displays proper posture
- writes numerals, manuscript, and cursive letters legibly and fluently
- spaces letters, words, sentences
- uses uniform sizes, formations and slant

GRADE 5

- writes numerals, manuscript, and cursive letters legibly and fluently
- spaces letters, words, sentences
- uses uniform sizes, formations, and slant

Facts About General Handwriting Development

Pre-Kindergarten to Second Grade:

- Children develop hand dominance and specific fine-motor skills at different rates.
- Children can continue to develop hand dominance until the age(s) of 7-8 years.
- Children develop fine-motor skills until the age of 10.
- By age 5, most children begin to use their hand and fingers to manipulate small objects. If a three-finger grasp is not demonstrated by age 5 or 6, this should be your main goal when teaching handwriting. (See the section on pencil grip on page 6).
- A child's brain is continually changing and developing new pathways and connections for information processing. Children are thought to be undergoing the most rapid change and development prior to the age of 7 due to the plasticity of the brain tissue in these early years.
- Some of the important skills maturing at this age include eye-hand coordination skills and visual-motor skills. Children are acquiring visual-perceptual skills needed to "decode" letters, match forms and detect size differences. These skills are necessary for writing and reading.
- At this age, a child's vision can change and impact a child's ability to write and copy. The visual system is developing important skills needed to help children see close and far. Children need to develop "brain-eye coordination" skills to help shift their vision from far (chalkboard) to near (desktop).
- Attending skills are also developing at this time. The child can attend to activities for longer periods of time.
- By the middle of second grade, students are expected to have developed mastery of upper and lower case manuscript letters, and demonstrate proper spacing, letter size, shape and slant.
- Reversals and associated mouth movements are common during writing activities.

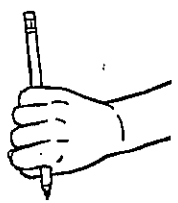
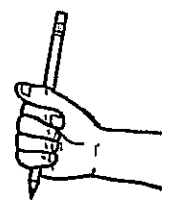
Second Grade and Above:

- Hand dominance and pencil grip are generally established.
- Students have developed mastery of upper and lower case manuscript.
- Lower case cursive formations are introduced in second half of 2nd grade.
- Students should demonstrate understanding of the keys to legible handwriting: consistency of size, shape, slant and spacing.
- Mouth movements and reversals should be uncommon from 3rd grade on.
- Visual-perceptual skills mature by 3rd grade and students begin recognizing writing errors.
- It is expected that writing be automatic and efficient by 4th grade.
- Volume of writing increases from 4th grade on with attention to spelling, vocabulary and grammar.
- Motor memory becomes essential for automatic letter production.

Writing is the most critical academic output skill for children in the middle and upper elementary school grades. (Levine 1987).

- Discovery is not an effective approach for learning handwriting. Teachers need to provide structured handwriting instruction and encourage proper writing skills during practical writing assignments.
- As children write, handwriting instruction should focus on addressing individual student's difficulties and reinforcing the handwriting skill that the teacher has systematically introduced. It may be appropriate to provide smaller writing groups with self and peer critiques.
- Requiring students to use only one kind of pencil or a certain size of paper may be unnecessarily restrictive.
- Effective handwriting programs have been found to have the following characteristics: opportunities to verbalize the rules of letter formation and evaluate their own success; combine verbal and visual feedback with rewriting or reinforcement.

PENCIL GRASP DEVELOPMENT

Grasp Illustration	Mean Age
	3y 4m
	3y 8m
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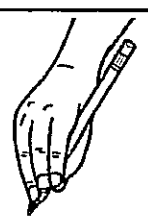
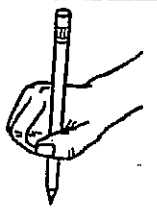
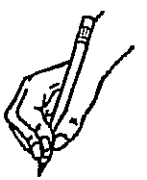
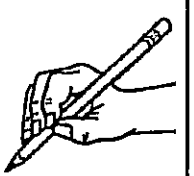
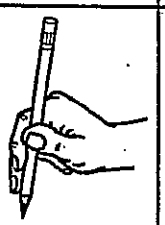
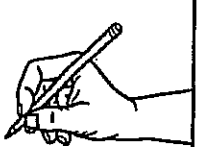
	3y 10m
	3y 11m

Grasp Illustration	Mean Age
	4y 5m
	4y 5m
	4y 7m
	5y 2m
	5y 3m

The above references were compiled and modified from: Visual Reference, Description: Schneck & Henderson (1990)

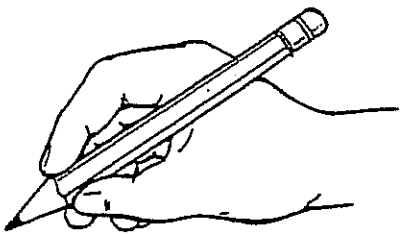
Pencil Grip

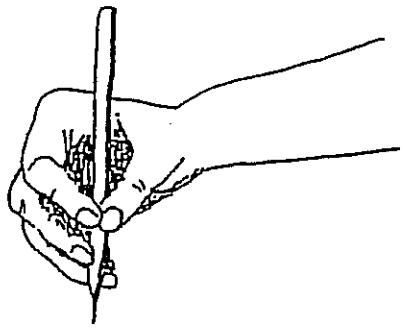
Pencil grip is important because it allows the fine movement necessary for writing. An atypical grip is not necessarily a predictor of poor handwriting. In judging whether a pencil grip is functional for writing, the following should be considered:

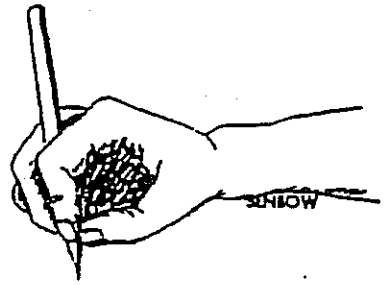
- Is handwriting legible and efficient?
- Are there stress points or tension within the hand, ie., white knuckles, torn paper, or broken pencils?
- Can the student comfortably maintain his or her grip to finish assignments?
- How much control does the grip give the student of the pencil?

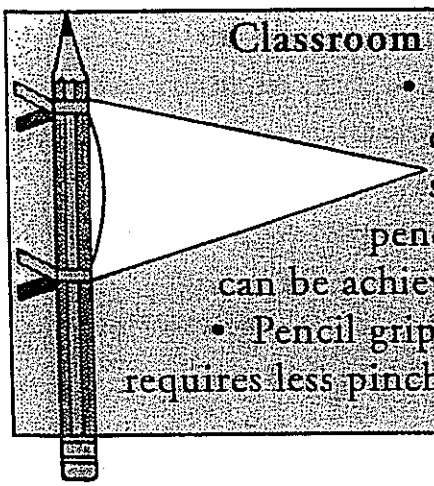
Intervention to modify a student's grip may be warranted when handwriting results in muscular tension and fatigue or when writing proficiency, such as speed and legibility, is impeded. By the beginning of second grade it may be stressful and almost impossible to change a student's pencil grip.

There is more than one acceptable pencil grip. Below are diagrams of the most commonly used pencils grips:









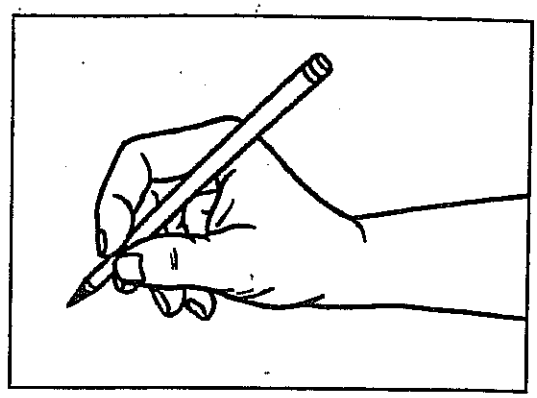
Classroom strategies:

- Markers, pens and dry markers are easier for some children to use for writing because they glide over the surface with less friction than pencils. Try a variety of pencil shapes and sizes to see if a more comfortable grip can be achieved for the student.
- Pencil grippers sometimes provide a more secure grip that requires less pinch strength for maintaining the pencil in the hand.

PENCIL AND TOOL GRASPS

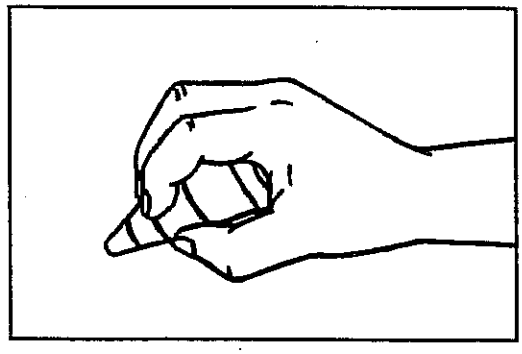
Dynamic Tripod Grasp:

Pencil rests against the tip end of the middle finger, held by thumb and index finger pinching the pencil. Wrist is bent up and the forearm rests on the table with an open web space seen by a circle formed by the finger and thumb. The thumb and first two fingers move during writing, while the ring and little fingers are bent into the palm and add stability.

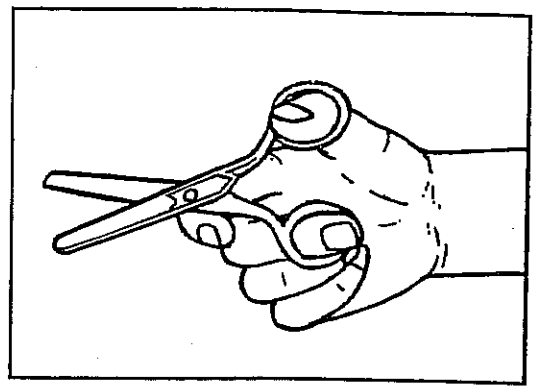


Preschool Crayon Hold:

This is a spherical grasp in which the cone shaped crayon is held more toward the thumb side of the hand. These crayons promote an open web space and provide a static support for a child's hand while drawing or writing (Myers, 1992).

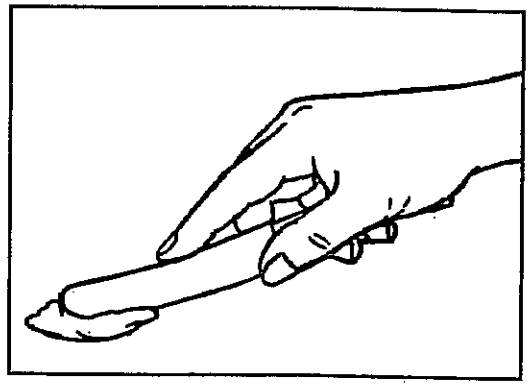


Scissors Grasp:



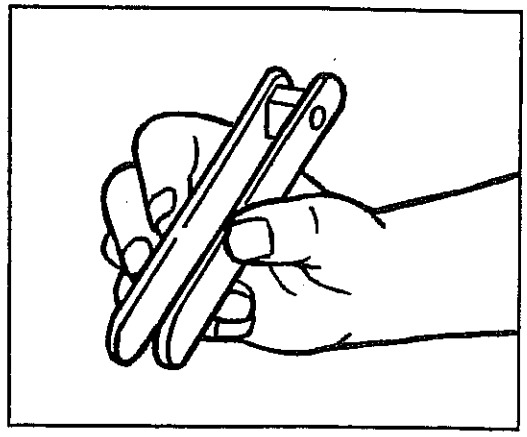
Using scissors correctly helps develop hand muscles for other fine motor skills. Four years of age is the appropriate time for the majority of children to begin learning scissor skills, as their hands have grown large enough for small scissors (Myers, 1992). The tips of the thumb and middle finger are in the holes of the handles of the scissors. The index finger is on the outside of the handle to stabilize the scissors, and the ring and little finger are curled into the palm. The wrist of the cutting hand should be bent up (Benbow, 1991). Cutting activities should use the muscles in the fingers, and require separation of the two sides of the hand. If the scissors are held incorrectly, or are the incorrect size, the student will use the large muscles of the hand which begin in the arm, decreasing precision (Benbow, 1991). Therefore, scissors should have small handles to match the student's finger size.

Knife Hold or Diagonal Volar Grasp:



This is a Power/Palmar Grasp. The ring and little fingers provide stability for the handle. The index finger is straight and placed on the knife so that it can reorient and direct the knife as necessary. This grasp helps in the development of arches.

Tweezers Hold:



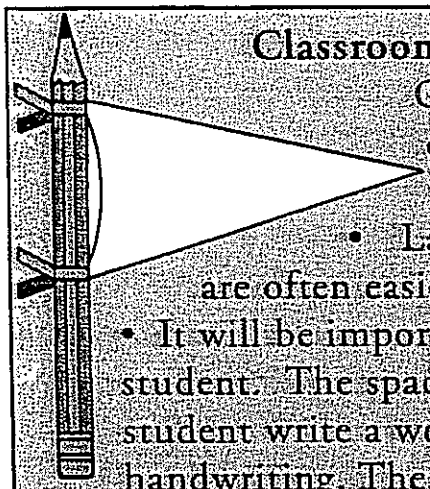
This is a three jaw chuck grasp on the tweezers, also called a three point pinch grasp. The thumb is facing up and is bent around to hold one side. The index and middle fingers are bent around to hold the other side. The ring and little fingers are curled in the palm. This hold promotes the separation of the two sides of the hand and opening of the web space.

Fine Motor Skills

Fine motor control is the ability to precisely utilize one's hand and fingers in a skilled activity. Good hand function is dependent on the balance between the extrinsic and intrinsic muscles of the hand:

- The **extrinsic** (large) muscles of the hand originate in the forearm and provide stability to the wrist as well as move the finger and thumb in gross movements necessary to hold objects against the palm of the hand.
- The **intrinsic** muscles are smaller and guide and grade the movements needed to shape the fingers and thumb to hold and rotate small objects within the hand.

Control of arm and hand movement develops from the shoulder out to the fingers and from large, inaccurate movements to highly refined movement for specialized skills — such as writing. To control fine movements, children must be able to hold some body parts steady while moving others.



Classroom strategies:

Compensatory strategies for children who demonstrate difficulties with fine motor control include:

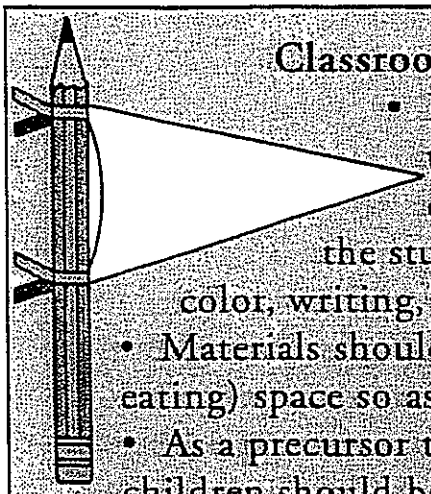
- Larger crayons, primary-size pencils, and thick markers are often easier to grasp and manipulate.
- It will be important to determine the appropriate writing paper for a student. The space between lines can be determined by having the student write a word or a sentence on a single line in his/her best handwriting. The child's optimum writing size can be determined from the sample.
- When incoordination interferes with classroom performance and is not improving regardless of practice, easier classroom activities are appropriate. Devise methods that do not require the refined movements that are difficult for the student (ie., circling correct responses rather than writing).
- Students with fine motor difficulties may need extra time for writing assignments or reduce the amount of writing expected.
- Hand and finger warm-ups prior to handwriting are beneficial for all students. (See your resource teacher for guidelines on specific warm-up activities that can be incorporated into your daily handwriting practice).

Hand Dominance

Many children who have fine motor problems may not have established hand dominance. Genetics, sensory processing and overall motor coordination can affect the development of hand dominance. The development of hand dominance can be thought of as an end product of good coordination between the two body sides and the ability to plan, time and sequence activities. A child who has the opportunity to develop solid sensory and motor functions usually will automatically establish hand dominance. It is important to keep in mind that a student may have a dominant hand but lack skill in using it.

If a student does not consistently choose one hand for writing. The classroom teacher should focus on:

- Identifying a preferred hand;
- Implementing classroom strategies for supporting the student during handwriting tasks so the student can be successful at his/her ability level.



Classroom observations/strategies:

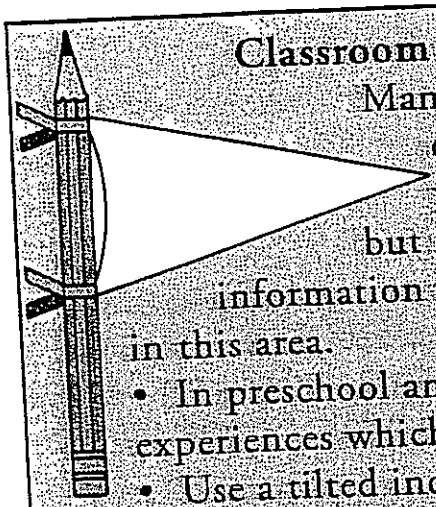
- In an effort to determine a child's preferred hand, the teacher and parents should keep an observational checklist for at least one week to observe which hand the student uses during specific fine-motor tasks such as color, writing, eating and cutting.
- Materials should be placed at the center of the student's work (or eating) space so as not to predispose the student to choose a hand.
- As a precursor to developing dominance, preschool and kindergarten children should be exposed to activities that encourage wide, random arm movements (scribbling on paper mounted on the wall at eye level, making roads in sand boxes, wiping table with sponges).
- Activities that emphasize bilateral and reciprocal coordination are highly beneficial to the development of hand dominance and should be incorporated into the school and home routine wherever appropriate. (See resource teacher for specific activity recommendations).
- Use the simple assessment tool on the next page to help in establishing the student's dominance.

Visual-Spatial Perception

Visual-spatial perception is how a person perceives the relationship of external space to his body, as well as how he perceives objects in space relative to other objects. The importance of eyesight in classroom performance is obvious, but sight alone is not enough. Vision needs to be combined with an interpretation of the physical environment to gain meaning from what we see.

Children with deficits in the area of visual-spatial perception may demonstrate the following behaviors during writing tasks:

- The formation of letters in writing may be laborious if a child is not able to identify visual and spatial similarities and differences.
- The student may not know where to start writing on the paper.
- The letters may vary in size, spacing and alignment.
- Letter and number legibility may be poor.
- Reversals of letters is often a common problem (3rd grade+).
- Copying words from a distance on to paper may be difficult.
- The student may have difficulty staying within personal boundaries and school supplies and belongings may be scattered and disorganized.



Classroom observations/strategies:

Many children with weak visual-spatial skills are likely to experience difficulty in this area throughout life. For younger children remedial activities can prove helpful, but teaching strategies for organizing and using spatial information should be a major focus for all children with difficulty in this area.

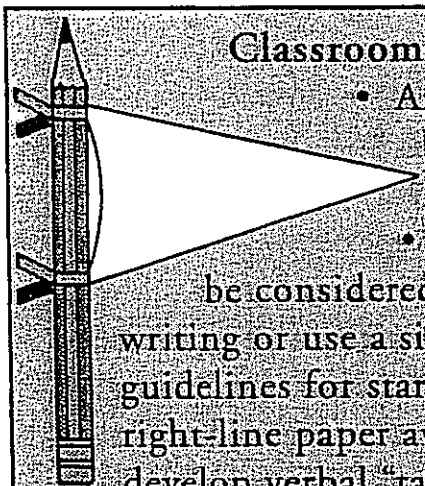
- In preschool and early grades, provide physical manipulative experiences which will help to develop visual-spatial concepts.
- Use a tilted incline on the student's desk to allow for improved visual access and greater wrist control.
- Use paper with clear boundaries for letter placement.
- Provide clear guidelines for expectation and organization of written work.
- Use masking tape on the student's desk to outline the correct paper slant.
- Place alphabet strips on the student's desk for easy reference.

Visual-Motor Control

Visual-motor control refers to the ability to coordinate visual information with motor output for precise visual guidance of movement. Handwriting is a skill that is highly dependent on good visual-motor control. In the beginning months of development, visual-motor performance is controlled automatically. As development progresses, children demonstrate increased refinement in this sensori-motor domain. The visual-motor skills necessary for writing usually develop in a predictable order and improve with practice. Children begin by randomly scribbling. Lines and shapes are first formed randomly, then traced, then imitated (drawn after demonstration), and finally copied from a model.

Children can have difficulty with visual-motor skills for a number of reasons:

- Difficulty with control of movement
- Difficulty with visual processing
- Poor visual attention to task
- Lack of exposure to visual-motor tasks in the early years of development
- Poor visual-motor integration



Classroom observations/strategies:

- Any precise movement that requires visual guidance will be helpful for improving visual-motor control (stringing beads, lacing boards, mazes).
- Examples of specific classroom adaptations that can be considered include: increasing the size of the space required for writing or use a single line only, use paper that provides clear visual guidelines for start and stop and letter placement (ie., earth paper and right-line paper available from resource teacher), assist the child to develop verbal "tapes" by giving specific verbal directions and feedback.
- Using a variety of sensory modalities for students to get the "feel" for writing can be beneficial for the entire class. Activities could include using: sand or salt trays, pipe cleaners or Wikki Stixs, play dough or clay, or kinesthetic writing techniques (air writing, mystery writing, rainbow writing, tactile writing, vibrating pen — see resource teacher for details).

Handwriting Data Sheet

Student: _____ Teacher: _____ School: _____

Date of Birth: _____ Grade Level: _____ School Year: _____

Describe Problem Areas: (Include error patterns, frequency of errors, self-correction patterns)

_____

_____

_____

Speed and Accuracy: (Record students speed and accuracy every 2 weeks for an 8 week period. Use appropriate classroom level material, or see sample sentences.

Date				
Speed Letters per minute				
Accuracy Numbers of errors				

Norms: 3rd grade 30 letters/min.
5th grade 60 letters/min.

Sample Sentences:

Whales live in the blue ocean
The lazy brown dog jumped over the big white fence.
The old man seemed to be tired.

Pre-referral Interventions for Classroom Difficulties

The following interventions should be attempted for several weeks (4-6) before referring a student for an occupational and/or physical therapy evaluation.

Visual-motor problems (relates to Vision and General Intelligence domains)

- Highlight margins with markers (green for left margin to "go" back to the left margin and red for right margin to "stop" at the red line). Sometimes highlighting the writing lines helps cue the child who has difficulty remaining on a line while writing.
- For children with spatial difficulties, use lined paper rather than plain paper for writing projects to assist with organization of words on the page.
- If a child has difficulty folding paper in half, place a colored dot on each corner so the child can match the corners.
- You can use an index card under the line the child has to write on, having the child move the index card down as he/she writes.
- If a child has difficulty lining up math problems, use graph paper or turn lined paper sideways so child can write each number in a column. Graph paper can also be used to help a child with difficulty spacing between words.
- Tape a strip to the child's desk with a model of the manuscript or cursive upper/lowercase alphabet, numbers, or the child's cursive signature.
- Clear the desk of all clutter. Place a piece of brightly colored construction paper or desk blotter on the child's desk and place the worksheet or paper on top of the construction paper or blotter.
- Outline pictures with bright colors or use templates to help the child remain within the boundaries while coloring. You can place glue around the outline to be cut ahead of time so it can dry.
- Have the child write on strips rather than on a whole piece of paper.
- Keep the chalkboard clean by erasing irrelevant information and cleaning the board completely.
- Use colored chalk when writing on the chalkboard to provide visual contrast.
- If a child has difficulty copying from a chalkboard, he/she may need a model written on a piece of paper that placed on his/her desk to copy onto. Keep an open desk close to the chalkboard for children who have difficulty copying from the board.
- Keep worksheets clear and uncluttered, use half worksheets, prepare worksheets with only one problem on a sheet, or have worksheets with fill-in answers only (rather than expecting child to recopy math problem, for example).
- Cut out a window in a piece of cardboard and place it over a worksheet (or book child is reading from) so that only relevant information is showing through the window.
- Using a computer, demonstrating knowledge orally, using a tape recorder for note-taking, have another student share his/her notes, or decreased writing requirements may also be beneficial modifications.
- Having the child practice writing with his/her eyes closed encourages "feeling" how the letters are formed so writing becomes more automatic.
- Use these strategies for letter reversals:
    a) cognitive cues such as "c" comes before "d" (make a "c", then draw the line and it becomes a "d"); a lowercase "b" is like a capital "B" but without the top curve.
    b) keep a model of commonly reversed letters on the child's desk. Use different colors for the letter to reinforce directionality. Mark all "b's" and "p's" red to indicate the loop is on the right side of the line; and "d's" and "q's" in green to show that the loop is on the left side of the line.

Intervention Activity Recording Sheet

Date	Intervention / Activity	Description of Student's Response

Intervention can include: adaptations, environmental changes, pre-writing activities, positioning, self esteem building, or other ideas that you creatively incorporate into your program.

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