

Graphomotor Development



Strategies for Improved Legibility of Handwriting

Natalie Kaiser MS OTR/L
Anne Murray M Ed OTR/L

What Is Occupational Therapy

- “Occupational Therapy is as a profession concerned with promoting health and well being through occupation. The primary goal of Occupational Therapy is to enable people to participate in the activities of everyday life. Occupational Therapists achieve this outcome by enabling people to do things that will enhance their ability to participate or by modifying the environment to better support participation”

” World Federation of Occupational Therapists”

Occupational Therapy in the School Setting

- **School Based Occupational Therapy** is a related service of special education that assists the student in performing learning and school related activities. We help children fulfill their role as students. Occupational Therapist help remove barriers, adapt tools-environment, and task, educate school personal for carryover of skills and help students to develop underlying skills for academic learning success
 - hand function
 - visual perceptual skills
 - sensory processing
 - self help
 - oral motor

Purpose of In-Service

- Provide basic information about fine and visual motor skill development
- Increase understanding of grade level handwriting expectations
- Address common legibility concerns
- Teach strategies and tools that can be used to help struggling students

Lets Write!

Copy The Sentence:

A quick brown fox jumps over the lazy dog

Copy the Sentences:

The zebra jumped quickly over many green boxes. We must print carefully on the lines so that our handwriting will be neat.

Copy The Sentence:

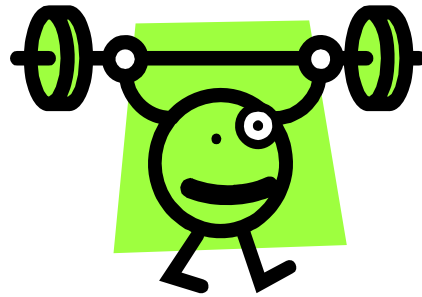
Diese Lander sprechen Spanisch.

What is Happening When I Write?

Writing is a complex motor activity that involves many sensory and motor systems

- Muscle tone and strength*
- Tactile discrimination and proprioceptive input*
- Visual motor*
- Kinesthesia*
- Fine motor coordination*
- Crossing midline/ laterality*
- Auditory and Visual processing*
- Attention, Cognition, and Motivation*

Muscle Tone and Strength

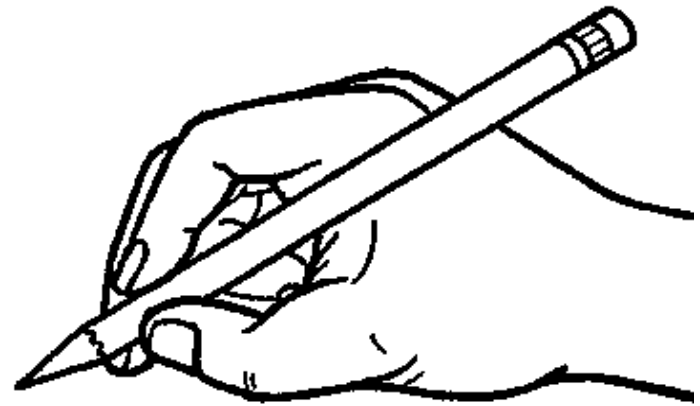


- Students need to have adequate trunk, arm, hand and finger strength
- Proximal Stability= Distal Control

Tactile Discrimination

Proprioceptive and kinesthetic input,

- Provides information regarding finger placement and grasp of writing tool
- Provides information related to pencil pressure, direction of movement of writing tool



Visual Motor

Visual Acuity, Ocular Motor Control, Visual Perception and Visual Motor



- Scanning printed lines
- Line regard
- Spacing between letters and words
- Left to right orientation
- Visual regard of model
- Formation of letters

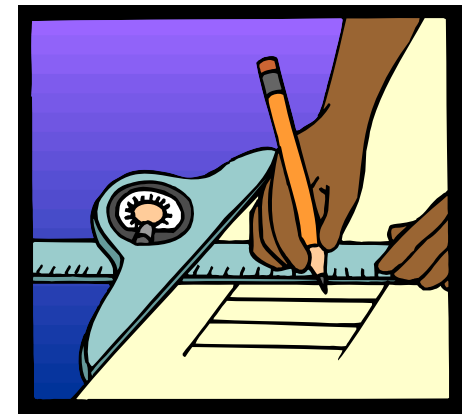


Fine Motor Coordination

- Separation of hand muscles for stability and fine motor control
- Fine motor control of the writing tool
- The ability to write, draw and color within a given space with good control
- In hand manipulation of pencil, flipping pencil to erase

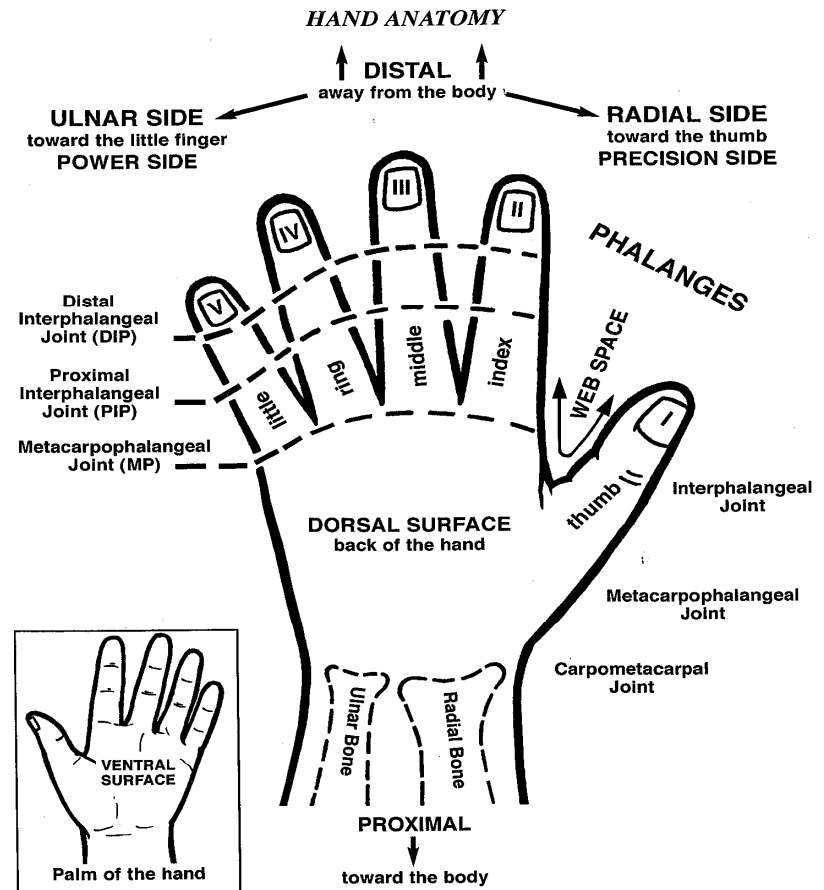
Graphomotor Skill Development

1. Anatomy of the Hand
2. Grasp development by age
3. Tool Use
4. Visual motor integration
5. Are they ready to write?



Anatomy of the Hand

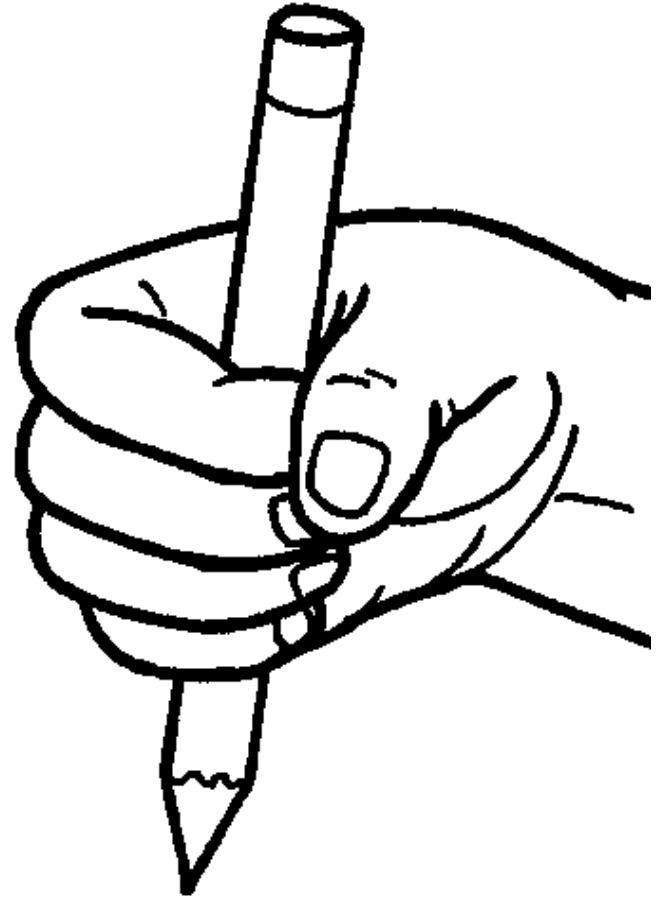
- Opposition-the ability to touch thumb to finger
- Finger isolation-the ability to isolate finger movements
- Separation of radial (precision/ control) and ulnar (stability sides of the hand)



Power Grip

1-1/2 years

- Fisted neutral hand
- Wrist flexed
- Arm moves as a unit



Pronated Grasp

2-3 years

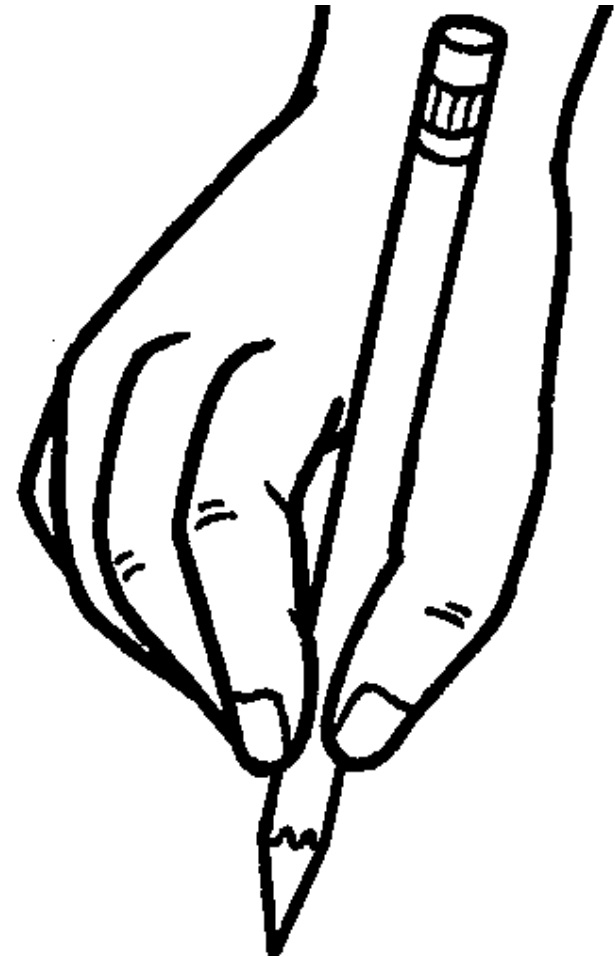
- Wrist Pronated (thumb down)
- Tool held with fingers
- No web space
- Arm moves as a unit



Static Tripod

3 ½ -4 years

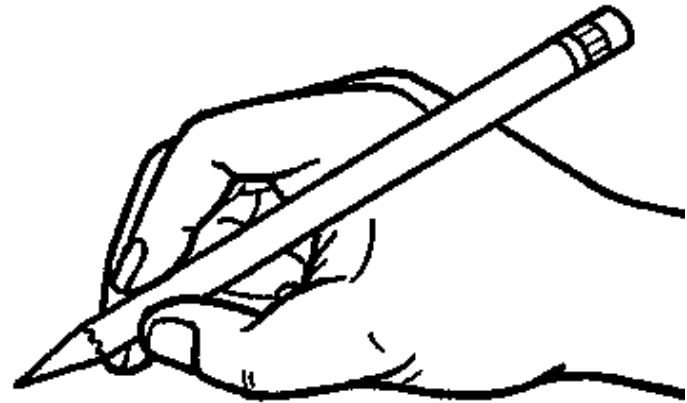
- Thumbs up
- Three fingers on writing tool
- Less open web space
- Hand moves instead of fingers during writing



Mature Dynamic Tripod

4 ½ -6 years

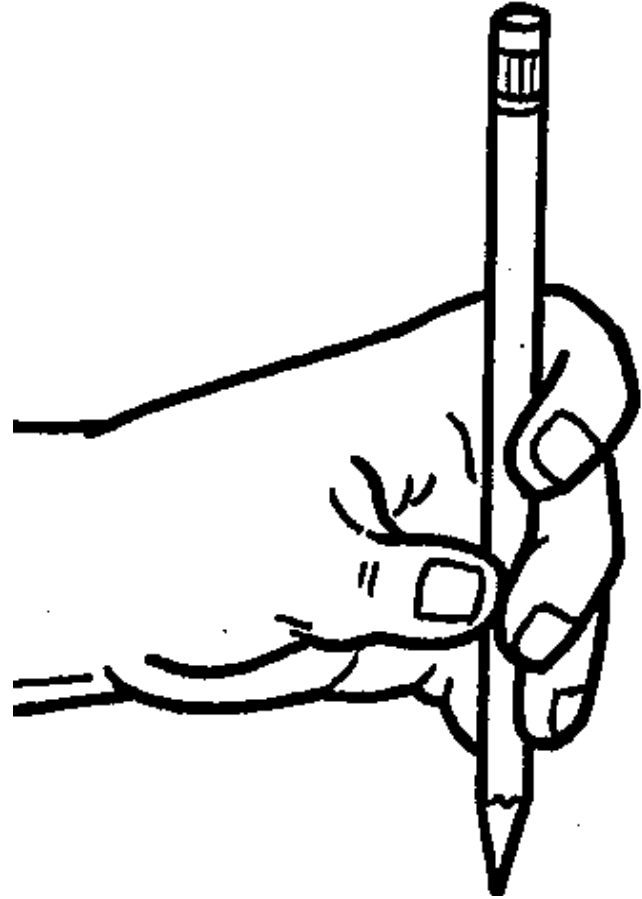
- Wrist extended up
- Grasp distal with opposition of thumb, index and middle fingers in a triad
- Open web space with thumb stable
- Fingers move during tool use



Maladaptive Grasps

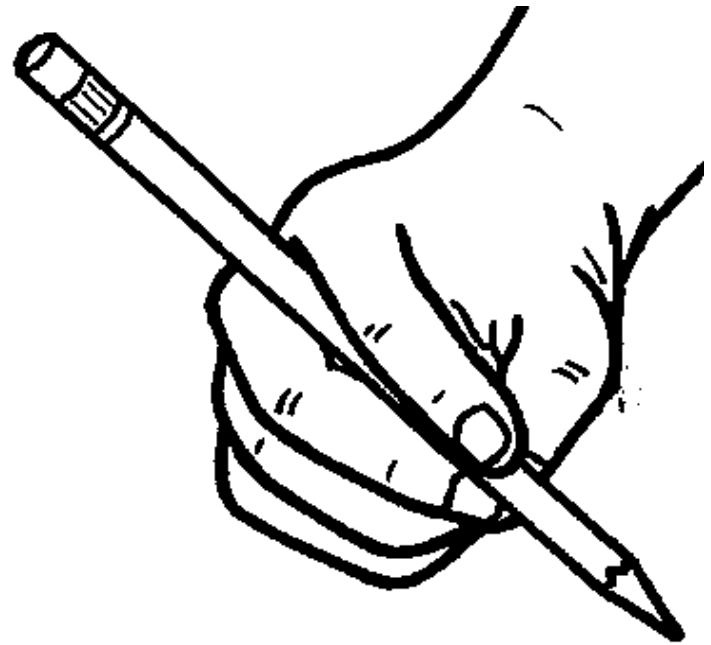
A maladaptive grasp does not follow a developmental progression and should be corrected

- Poor grasp due to low muscle tone
- Web space collapse
- Joints unstable in the hand are loose and may be hyper extended
- Hand may appear stiff



Adaptive Grasp

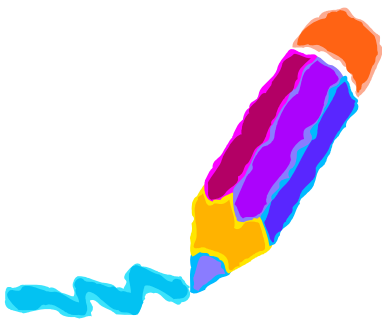
- An adaptation for the low tone grasp is positioning the pencil between the index and the middle finger
- This is a more stable position and the intrinsic muscles are in a position to work



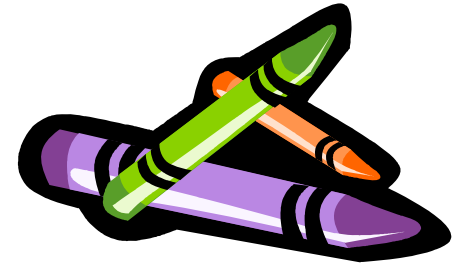
Activities to Develop Grasp

- Develop wrist strength and proximal stability-*work on inclined surfaces, chalk board-whiteboard*
- Develop small muscles of the hand- *theraputty, play dough, and small manipulatives like legos, use small crayons*
- Develop arches of hand-*opening containers, nuts and bolts, and stringing beads*
- Develop separations of sides of hands-*tweezers, tongs, chop sticks, spray bottles*

See attached list for more ideas!



Tool Use



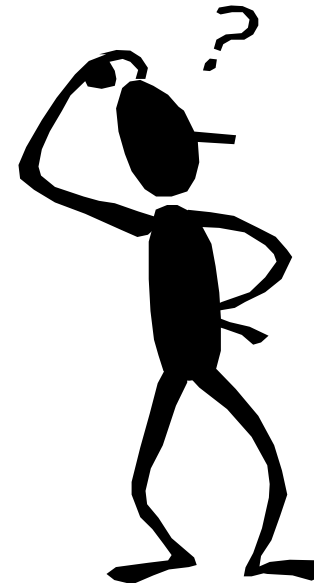
- Use small crayons and pencils to develop grasp
- Use triangle pencil to for three finger grip
- Weighted pencils provide more proprioceptive input for light writers
- Use vertical surfaces to develop wrist strength
- Wrist weights help stabilize wrist on writing surface
- Use of pencil grip to encourage proper grip
- Use of “pinky-pillow” or “Handi-Writer” to develop separation of hand muscles

See resources for list of suppliers

Visual Motor Integration

Are They Ready to Write?

Some children are ready to write at 4 yrs others are not ready until they are 6. Students who are able to copy age appropriate prewriting shapes and forms (| - ○ \ / + □ × △) and demonstrate sufficient fine motor and visual motor control are ready to learn letter formation in kindergarten. Activities with basic stroke patterns (| -) C \ / ○) help children learn verbal cues and directionality.



Stages of Prewriting

Development of Prewriting and Handwriting in Young Children	
TASK	AGE LEVEL
<i>Scribbles on paper</i>	<i>10-12 months</i>
<i>Imitates horizontal, vertical, and circular marks on paper</i>	<i>2 years</i>
<i>Copied a vertical line, horizontal line, and circle</i>	<i>3 years</i>
<i>Copies a cross, right oblique line, square, left diagonal line, oblique cross, some letters, numbers and may be able to write own name</i>	<i>4-5 years</i>
<i>Copies a Triangle, prints own name, copies most lower case and uppercase letters</i>	<i>5-6 years</i>

**Modified from the Berry Test of Visual Motor Integration and Baileys Scales of Infant development*

Grade Level Expectations-Pre-K

- Fine motor development: pincher grasp, in hand coordination, separation of right and left sides of hands
- Visual motor development: puzzles mazes, coloring, painting, stringing beads
- Eye hand coordination: ball toss, stringing beads, ripping paper
- Upper extremity strengthening: weight bearing, writing on vertical surfaces
- Motor planning: directionality, bilateral hand skills, obstacle courses
- Letter awareness: but not necessarily writing letters

Kindergarten Graphomotor Expectations

- Continued Fine and Visual Motor Strengthening
- Introduction to handwriting *upper and lowercase letter formation*
- Multisensory and Developmental approach: *visual, tactile, verbal cues*
- Write First and Last Name
- Copy simple sight words
- Draw simple pictures with supporting details, person with body, house, tree, sun
- Color, Cut and Paste with increased fluency and skill

1st Grade Graphomotor Expectations

- Continued fine and visual motor development
- Continue to Practice Letter Formation
(visual and verbal model)
- Developing self awareness of reversals with adult supervision
- Focus on line regard and spacing of words
- Color, cutting and drawing with increased skill and fluency
- Some near and far point copying

2nd Grade Graphomotor Expectations

- Continued refinement of fine and visual motor skills still using multi-lined paper for line regard
 - Writing upper and lowercase letters and numbers from memory
 - Increased written output, journal, book reports
 - Increased focus on revision and editing of writing
 - Increased near and far point copying
- **Pencil Grasp and letter formation are difficult to modify or change at this point**

3rd Grade Graphomotor Expectations

- Increased writing demands, composition, near and far point copying
- Decreased size of writing paper lines
- Letter formation needs to be automatic for speed and automatic so that focus can be on spelling, sentence structure and grammar.
- Continued revision and editing of writing
- Introduction to Cursive Writing
- Introduction to Keyboarding Skills

4th Grade Graphomotor Expectations

- Continued refinement of handwriting legibility, cursive and print
- Increased near and far point copying
- Note taking
- Composition
- Continued keyboarding instruction

5- 6th Grade Expectations

- Increased writing output demands in many formats: keyboarding, print, cursive
- Continued note taking, far and near point copy
- Continued Keyboarding Instruction, for increased speed and accuracy
- Use of computer for written work and editing purposes

Before You Write

- **Whole Class Movement Breaks** (see attached Whole Class movement Breaks)
- **Strengthening Exercises**, wheelbarrow walks, crab crawls, chair and desk push ups
- **Finger Exercises**, tweezers games, putty, mazes, donuts (circle warm ups)
- **Arm Activator** (Brain Gym)
- **Lazy 8's** (Brain Gym)

Sensory Movement Breaks

2-3 minutes 2-3 times a day between subjects

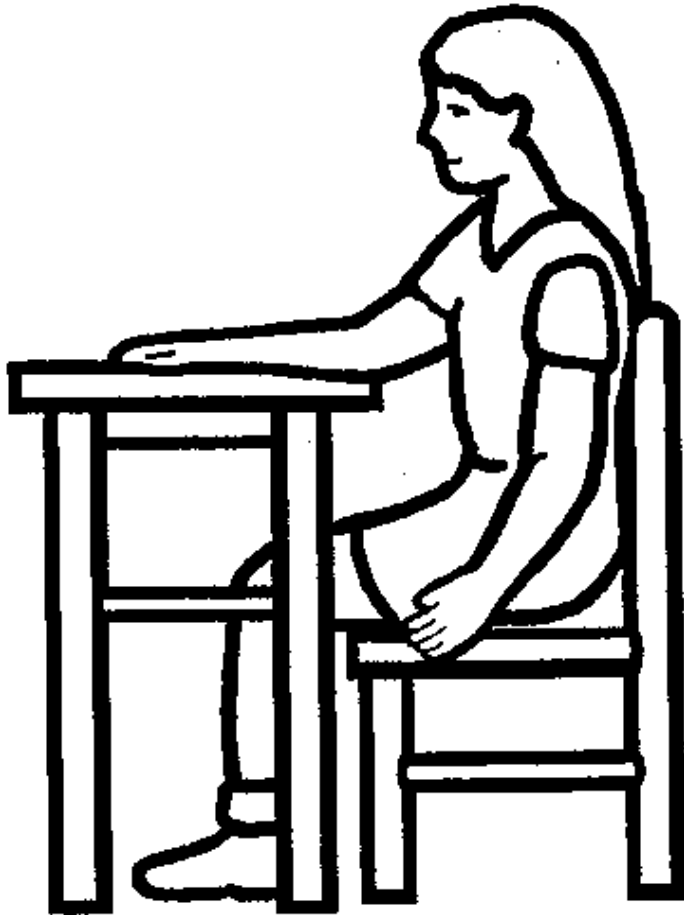
- Arm Stretches
- Chair Twist
- Hand warm ups
- Bilateral “Brain Gym” Activities, elbows to knees, hook ups, arm activator, lazy 8’s
- Eye Exercises
- Neck Stretches

Get Ready To Write

- Clear the Desk
- Check Posture
- Correct Paper
- Pencil
- Visuals as needed
- Soft Music



Encourage good body mechanics



- 90-90-90 (feet, knees, hips)
- Chair and desk height need to be individualized to meet students size

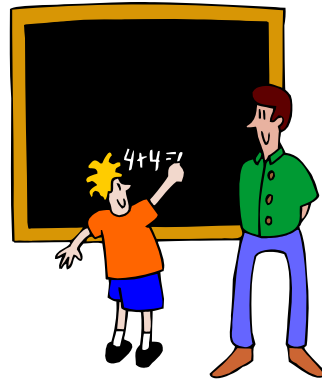
Activities to Improve Stability and Muscle Strength

- Work on Vertical Surfaces
- Encourage Heavy work
- Classroom warm ups



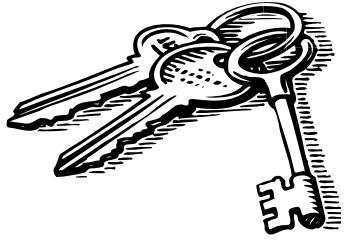
Work on Vertical Surfaces

- Write/ Draw/ paint on a chalkboard, easel or smart board
- Make an inclined clipboard out of a 3 inch binder
- Tape coloring pages on the wall/door



Encourage Heavy Work

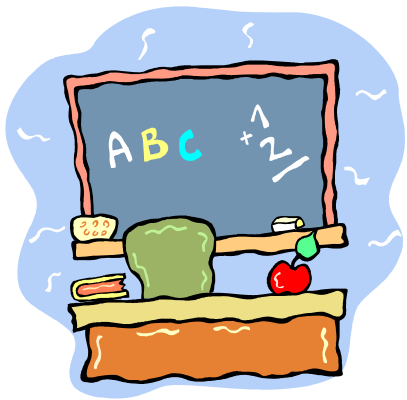
- On the playground: monkey bars, chin up, tug of war
- In the classroom: wall, desk or chair push ups, crab walks, moving desks & chairs, encourage weight bearing on forearms during class work (lying on floor during reading propped on elbows)
- At home: sports that work on strength and stability: gymnastics, swimming, yoga



Keys To Legibility

- Letter formation
- Size
- Line Regard
- Spacing Between Words

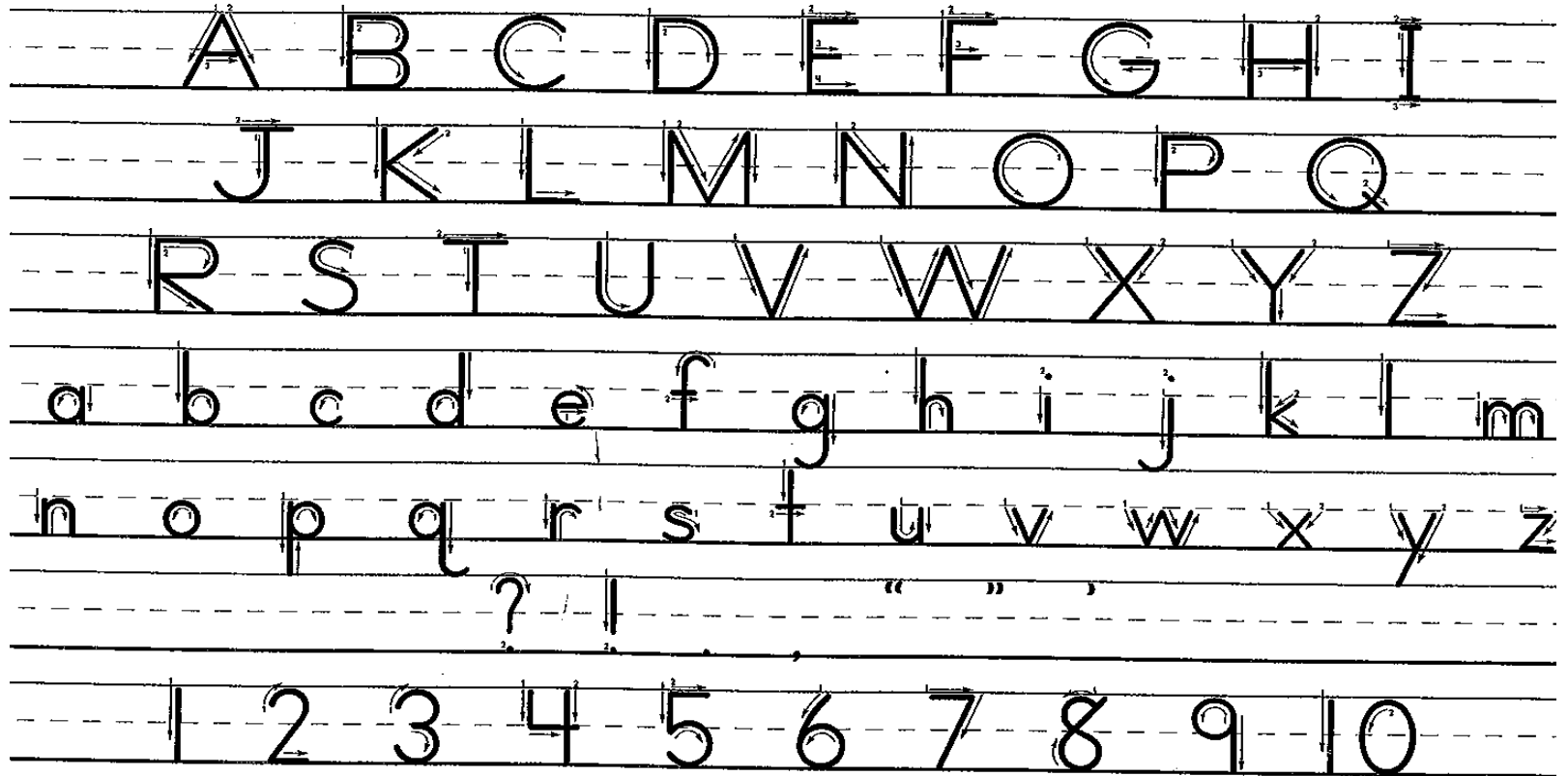




Letter Formation

Poor letter formation can become a bad habit and it should be corrected. Students need to be taught correct letter formation using a multisensory approach. It is difficult to change letter formation once the student has developed a motor memory for a writing a letter, usually around mid 1st grade. Correct formation issues early for greatest success.

Traditional Manuscript Letter Formation



Developmental Sequence for Teaching Letters

- Capital letters first
 - Capital letters all start at the top, they are all the same size
- F E D P B R N M (Frog Jump Capitals)
- H K L, U V W X Y Z (Corner Starting)
- C O Q G S A I T J (Center Starting)

*Sequence based on “Handwriting Without Tears”

Sequence for Lowercase Letters

Teach letters with high frequency of use

e o a t n s h l l r w u d y m f k g b p c v j q z x

Teach letters with similar formation patterns

- c o s v w (uppercase partners)
- t
- a d g (magic “c” letters)
- u i e
- l k y j
- p r n m h b (diver letters)
- f q x z

*Sequence Based on “Handwriting Without Tears”

Common Area of Concerns and Strategies to Correct

1. Letter formation
2. Reversals
3. Size of letters
4. Spacing Between Words
5. Line Regard

Teaching Letter Formation with a multisensory approach

Letter formation motor planning begins before you ever pick up a pencil. Providing visual and verbal cues and a tactile experience helps student develop directionality and motor plan for each letter.

- Making letters with play dough, wood or block pieces,
- Tracing letters in sand, rice, shaving cream, on the backs of student hands helps with visualizing the correct formation.
- Visual Models: have visual model at desk and writing areas, use a green dot to indicate starting point and red dot to indicate end point
- Verbal Cues

*****Consistency is important*****

Practice, Practice, Practice..



- Practice with a variety of writing tools, wipe off boards, chalkboards, Smart Boards
- Reinforce skills with paper and pencil worksheets for increased motor memory and carryover of skills into variety of settings
- Provide Parents with Information regarding letter formation and tips for success at home



Reversals

Developmental reversals are not uncommon and considered typical until 2nd grade. Commonly reversed letters and numbers are “b & d” “p & q” backwards “s”, “z”, “3”, “5” “7” and “9”.

- *Use Visual and Verbal Reminders*
- *Provide Pre-Writing Exercises practice with difficult letters*
- *Self Correcting and Editing Encouraged*

Size of Letters

This is an area of continual refinement. The use of paper without line or one line is preferred when beginning to write so that there is not too much visual clutter and that the student can focus on letter formation. Then introduce multi-lined paper and teach letter formation using line guides for placement and size.

-Small letters: a c e i m n o r s u v w x z

-Tall letters: b d f h k l t

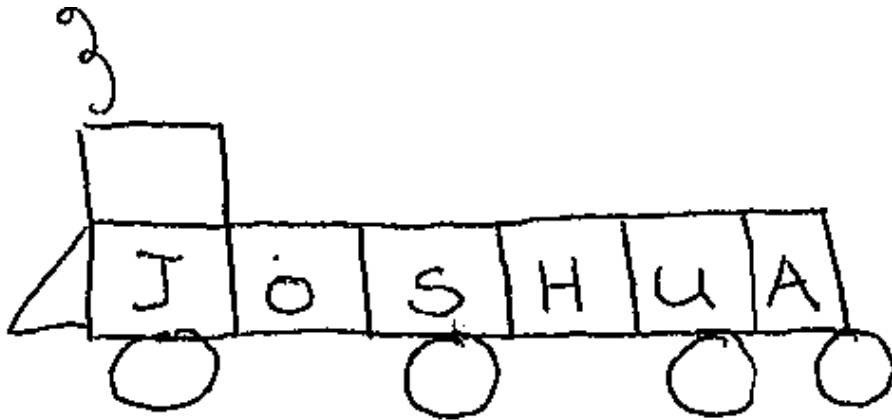
-Basement letters: g j p q y

Letter Size and Line Regard

- Color lined or pictures to indicate top (sky line) mid-line, and base (grass line).
- Paper with highlighted base to midline for increase line regard and size of letters
- Students who drift to the center of the page may benefit from paper with a green (start) dot or vertical line on the left and a red (stop) line or dot of the right of each line.
- Redi- Space paper allows a small area for each letter and space between words and provides the green and red reminders for left to right
- Raised line paper provides tactile input for line regard and is available in a variety of sizes
- Use of graph paper helps to align numbers for math

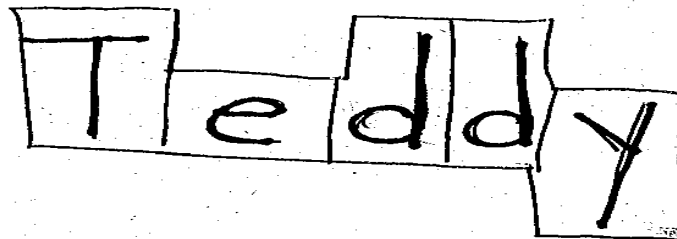
Name Trains and Boxes

- Young writers benefit from boxes to indicated size and placement of letters



$$1 + 8 = \boxed{9}$$

$$5 - 3 = \boxed{}$$



Example of raised line paper

9/27/06

Dear Charlotte

Yesterday I

fell into the
lost and found

I saw a sign
for Atlantis.

But I didn't
go in because

I was looking
for the hat
room.

9-27-06

Dear Charlotte

Yesterday I fell

into the lost

and found. I saw

a sign for Atlantis.

But I didn't go in

because I was looking

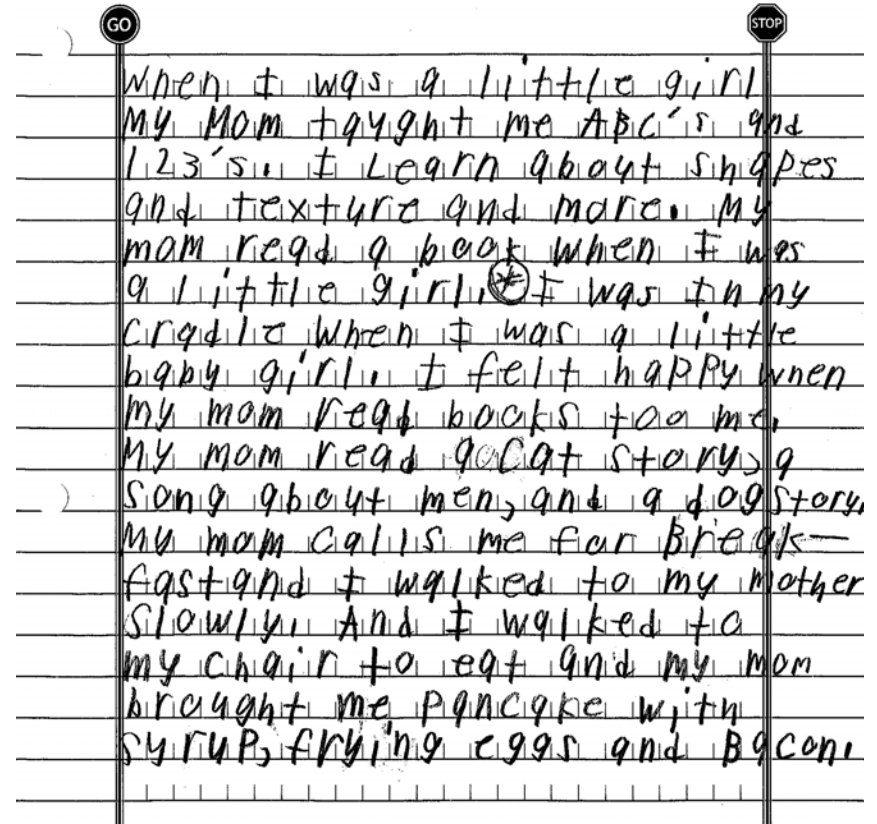
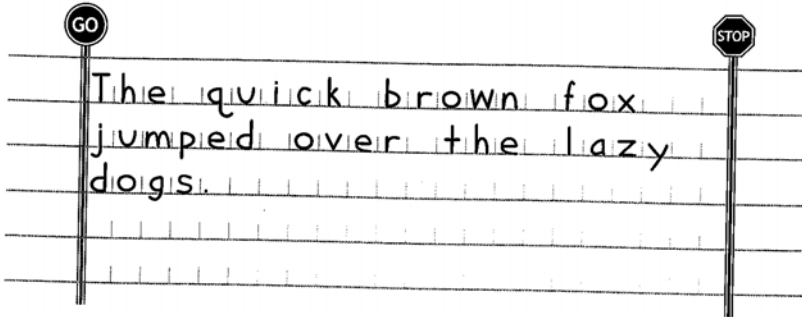
Example of Ready Space Paper

Writing Fundamentals by MEAD®

Tips for Successful Use of RediSpace® Transitional Notebook Paper

1. Start at the green **GO** line.
2. Stop at the red **STOP** sign.
3. Place one letter per space.
4. Make tall letters "TALL" and short letters within the space marks.
5. Skip a space between each word.
6. If there are not enough spaces to write a word, skip to the next line.

Example:



Spacing Between Words

- Finger space between words
- Space man built the popsicle stick
- Skip every other line
- Highlight word space,
- Use paper with decreased visual distractions fewer lines and more defined writing space

Near and Far Point Copying

- Use Easy Reader or blank colored (red or black) paper or index card to underline passage to be copied from text
- Position student so they can easily see the smart board to copy information
- Provide near point model when needed
- Provide highlighted outline to fill in the blanks
- Provide dictation of difficult to spell words
- Encourage Students to “chunk” 3-4 letters/words at a time when copying



Writing Speed



- *Writing speed tends to increase with each grade level. Speed may fluctuate with composition or copying depending of the student*
- *May need to cue the student to **slow down** for increased legibility*
- *Accommodations for extra time for timed writing assessments or decreased length of written expectations for students special needs*
- *Cursive is typically faster than print, if learned fluidly*

Questions?



Resources Catalogs

These catalogs offer information and supplies to support student fine motor and sensory motor skills. Such as pencil grips, adaptive papers, inclined writing surface, move and sit cushions

- Therapro: www.therapro.com
- Integrations: www.intergrations.com
- Sammons Preston: www.sammonspreston.com
(theraputty and theraband)



Resources-Books

Activities for Fine Motor Skill Development-Jodene Lynn Smith,
Teacher Created Resources

Handwriting Without Tears- Jan Z Olsen, OTR/L www.hwtears.com

Zaner Blozer Handwriting- www.Zaner-Bloser.com

The Slingerland Approach- www.slingerland.org

Pre-Handwriting Fun-Sherrill B Flora, Key Educational Publishing

Pre-Handwriting Practice-Sherrill B Flora, Key Educational Publishing

Let's Learn to Print-Sherrill B Flora, Key Educational Publishing

Creating the Peaceable Classroom-Sandy Bothmer

Brain Gym Teacher's Edition-Paul Dennison

Addressing Learning Differences Sensory Integration-Michael
Abraham

Fine Motor Skills in the Classroom-Jayne Berry