

The Motor Component: Handwriting & Keyboarding in the 21st



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Working Memory

"Writing is the act of dealing with an excessive number of simultaneous demands or constraints. Viewed this way, a writer in the act is a thinker on full-time cognitive overload."

(Flower and Hayes as cited by Torrance and Galbraith,
Writing Research 2008 Edition, 67)

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Transcription Skills ▶ Some Observations

- Transcription skills, including spelling, mechanics, and handwriting, are **not** connected to intelligence, **but** difficulty with these skills interferes with working memory, preventing a student from putting her thoughts on paper effectively.
- Transcription skills **distinguish speaking** from **writing** and make writing a more difficult process for most.
- One essential reason for automatizing these transcription processes, then, is that it **frees working memory** for the higher-level writing skills.

Skills Required for Handwriting

- Planning to form letters
- Assessment of space requirements
- Incoming visual and touch sensory information
- The phonological-orthographic loop of working memory: integration
- Motor skills: planning movements, controlling movements during production, and executing the writing
- Combination of accuracy + speed = fluency

(Berninger, 2012)

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Importance of Automaticity

- **Automatic** – occurs without voluntary control and interferes minimally with other processes (Pashler, 1994b)
- **Spelling and Handwriting** – required in written production but not in speech (no correlation with IQ)
- When written production less practiced, interferes with conscious retrieval process (Bourdieu, 1999; Bourdieu & Fayol, 1994, 1996, 2002)

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Handwriting Impacts the Writing Process

- Students in grades K-3 benefit from direct and explicit handwriting instruction. (Graham, 2009-10)
- Handwriting in students 3rd grade and below (both regular ed and LD) may impede text generation. (Graham, 2009-10)
- "...rapid, legible, and comfortable handwriting facilitates writing production. (Mather et al, 2009)
- Automatized handwriting significantly improves both the quantity and quality of writing. (Berninger 2012; Graham, 2009-10)



Steve Graham



Nancy Mather

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Handwriting Impacts the Writing Process

A recent study argues that 2nd grade students (both those continuing with manuscript instruction and those learning cursive) showed advancement in language skills, including alphabet writing, spelling, and composing. Surprisingly, "a method of providing handwriting instruction embedded in other literacy activities, which previously was thought to be needed only for students with specific learning disabilities, has been shown to benefit typically developing writers in the general education classroom" as well. This study adds to the continuing body of research arguing in favor of handwriting instruction for ALL students.

(Berninger, Wolf, & Abbott 2016)



Virginia Berninger



Beverly Wolf

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Handwriting Impacts Reading

- "Learning to form letters by hand improves perception of letters and contributes to better reading and spelling." (Berninger, 2012)
- "Writing is essential for developing the networks involved in letter processing." (James, Jao, & Berninger, 2016)
- "...learning to write and perceive letters during early childhood may affect learning to spell and read words during middle childhood." (James, Jao, & Berninger, 2016)



Virginia Berninger

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Handwriting vs. Keyboarding

- Printing “recruits the letter/reading processing network” better than typing or tracing. (James, Jao, & Berninger, 2016)
- “...there is neuroscientific evidence for a writing route to reading as early as the preschool and kindergarten years. Also, results document the value of forming letters (handwriting) over pressing letters (key touch) in learning to perceive the letters.” (James, Jao, & Berninger, 2016)

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Handwriting Instruction ▶ Lasting Effects

- “In grades 4 to 6, handwriting fluency still accounts for 42 percent of the variability in the quality of children’s writing...” (Graham, 2009-10)
- “...students’ handwriting speed continues to increase at least until Grade 9.” (Graham, 2009-10)
- In three separate studies, researchers found that college students who took notes by hand performed better on assessments than their peers who typed their notes. (Hotz, 2016)

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Teacher Knowledge ▶ What Matters

- 90% of 1st-3rd grade teachers teach handwriting.
- More than half agreed that it is important.
- 39% of teachers said their students’ handwriting was adequate.
- Disappointingly, 12% believe they received adequate preparation to teach handwriting in their college education courses.

Graham & colleagues (2009-10)

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What to Write On ▶ Tactile Surfaces

- Sand, finger paint in a bag, carpet squares, lap boards, etc.
- Vertical surface (cinder block wall, wall-mounted whiteboard)



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Getting into Position ▶ Pencil Grip

- Pencil grips, rubber bands, rubber balls, tissue, and more



Stenographer's grip

- Short pencils, #2 pencils, pencil flips, and the triangular grip

Wikihow has great visuals with some animation of these suggestions:
<http://www.wikihow.com/Hold-a-Pencil>

Here's a Youtube video showing the tripod grip as well:
<https://www.youtube.com/watch?v=ZIxUtwO29r8>



Standard tripod grip

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Getting into Position ▶ Body & Paper

Sit upright, both elbows on table

- Manuscript: paper slanted slightly to dominant hand
- Cursive: paper slanted 45° to dominant hand



LLP: writing posture & grip; right-handed

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Hand & Eye Dominance

A good diagnostician tests not only hand dominance but also eye dominance.

• Right-handed/right-eyed children will write with a pronounced right-hand slant. Left-handed/left-eyed children will write with a pronounced left-hand slant.

• With proper paper position and pencil grip, a cross dominant child (left eye/right hand or right eye/left hand) will have handwriting with a less-pronounced slant.

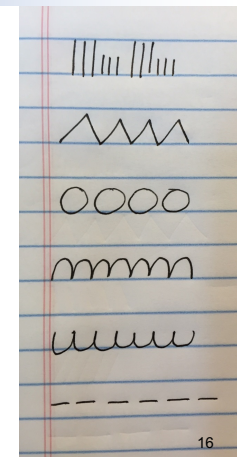


LLP: writing posture & grip; right-handed

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Before You Form Letters ▶ Getting Ready to Print

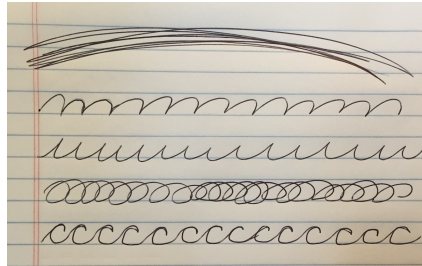
- tall and short grass
Important – orientation for most starting strokes
- zigzags (separated or not)
- circles
- mountains (separated or not)
- waves (separated or not)
- dashes



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Before You Form Letters ▶ Getting Ready to Write in Cursive

- windshield wipers
Important – activates hand/arm
- mountains
- waves
- circles
- c-stroke waves



These practice strokes warm up the arm. RELAX! Precision writing, writing within the lines, and so on are NOT important and will most likely detract from the usefulness of the task.

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Instructional Sequence

Order of instruction will vary by handwriting method. If your focus is on letter formation, then letters should be clustered and ordered by motor-stroke family.

• For example, in **manuscript** b, h, k, l, and t are grouped together because they all begin with a top-to-bottom tall grass stroke. d would be grouped with c and a because, though it is tall, its beginning stroke is identical to the beginning stroke in a and c.

• For example, in **cursive** a, c, d, g, and q would be grouped together, once again because they all begin with the same stroke – in this case a c-stroke wave.

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Manuscript vs. Cursive

- Research is inconclusive regarding teaching manuscript versus cursive in mainstream students who do not struggle. (Graham, 2009-10)
- Research does indicate the following:
 - Students should not be taught both simultaneously.
 - Students need 2 years of instruction to automatize a handwriting process. (Berninger, Wolf, & Abbott 2016)
- Arguably, then, students could learn manuscript in K-2 and then cursive in late 2-4.

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Explicit Instruction ▶ Introduction of Letter Form

I do it.

- Model the letter formation
- Stress orientation to the lines. (*Hair line, Belt line, Foot line*)
- Model letter formation a number of times. Use verbal prompts.

Watch me make a lower case p. I start at the belt line. Touch down. Touch around. Watch again. Touch down. Touch around. Say it as I write a lower case p. Touch down. Touch around.

(Archer, 2009)

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Explicit Instruction ▶ Introduction of Letter Form

We do it.

- Using the verbal prompts (e.g., touch down, touch around), guide the students in forming the letter.
- Monitor the student's letter formation

(Archer, 2009)

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Explicit Instruction ▶ Introduction of Letter Form

You do it.

- Have the students continue writing the letter as they say the letter name or its sound (depending on goal).
(Archer 2009)
- Continue until the letters are consistently formed correctly (Archer 2009)
- Note: Research does NOT support the student verbalizing the stroke. (Graham 2010)
- Research supports identifying a student's best letter and asking her identify her own as well.

Why Cursive for LD Students

- It cuts down on reversals (cursive b/d, m/w, etc.).
- In a proper lowercase alphabet, all letters begin on baseline.
- Spelling is better reinforced in the mind if continuous movement of cursive is used.
- It forces appropriate clustering of letters to create words and spacing between words.



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
A Useful Approach ▶ T.C.C.C.

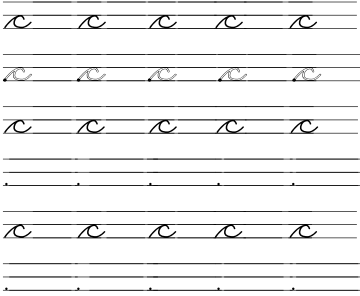
Follow a T.C.C.C. model, for both manuscript and cursive:


- **Trace:** Trace the provided letter, naming it as you trace.
- **Copy:** Underneath a provided model, copy the letter, naming it as you copy.
- **Cover:** Cover all written examples, and write from memory, naming the letter as you copy.
- **Closed:** With eyes closed or averted, write the letter, once again naming it as you write it.
- Remember that handwriting is a motor-language skill rather than a visual one.

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T.C.C.C. - Cursive Right-Handed

 Go up around the clock to 2 o'clock; backtrack and swing forward.



Eyes Closed: 

Sample page from *Learning Cursive*, Diana Hanbury King

taken with permission from King & Leopold's
Learning Cursive, Right-Handed Edition

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Say the Sound or Name the Letter

Ask Yourself These Two Questions:

1. Why speak at all?:

S.O.S. (or simultaneous oral spelling), a procedure discussed by Anna Gillingham in *The Gillingham Manual* and widely adopted in multi-sensory structured language approaches, adds two senses to the process of forming letters as the student must use kinesthetic speech as she forms the sound or letter and the auditory as she hears what she says.

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Say the Sound or Name the Letter

Ask Yourself These Two Questions:

2. What is the goal of the handwriting activity?

- If you're working on letter formation, naming the letter makes sense. You are creating a letter, and naming it will help cue it.
- If you're working on spelling and reading, current research supports saying the sound. You are creating a written version of a phonologically sequenced word, and pronouncing it will help to cue the correct spelling. Spellings (orthography) become **bonded** to pronunciations (phonemes) and to meaning (semantics) in memory (Ehri).

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Handwriting Recommendations

- Is handwriting currently taught?
- Is there a consistent and pervasive understanding of the importance of handwriting as it relates to the development and improvement of writing skills?
- How much time is allocated to handwriting instruction?
- Is there appropriate professional development in the teaching of handwriting?
- Does our district/LEA include handwriting in its written ELA curriculum?

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