

Strengthening the Mind's Eye

The case for continued handwriting instruction in the 21st century.

BY VIRGINIA WISE BERNINGER

W if it's not tested, it doesn't get taught" is the prevailing belief that guides many educators' practice of only teaching skills that are addressed in the latest governing standards. Most states have now adopted the Common Core State Standards (CCSS), which don't cover handwriting or spelling. Consequently, some states and school districts have stopped—or will stop—teaching these skills, which support the composing process. Although the CCSS specify desired goals at specific grade levels, the standards do not offer a plan for reaching those goals that takes into account the scope and sequence of developmentally appropriate curriculum *and* teaching practices. Even though handwriting is not specifically covered in the CCSS, handwriting instruction and mastery of the practice help students meet the standards that are included.

Handwriting 101

Handwriting is the use of the hand to produce units of written language—single letters, written words, sentences, and text—to express ideas and thinking. Handwriting instruction remains important, despite present-day doubts about its continued significance in the technology age. Through handwriting students fine-

tune several motor skills: planning handwriting movements, controlling them during letter production, and executing them.

Contrary to popular belief, handwriting is not merely a motor skill; it is also a written language skill. The following non-motor mental processes are also involved:

- **Working memory**, a temporary memory system for storing and processing letter forms in the “mind’s eye.” That is, our eyes provide a window through which the written language we read and write enters our mind, which in turn has an inner “eye” for viewing and analyzing letters and written words as we read and write.
- **Naming letters**, which helps find the letter form in long-term memory and then write it.
- **Planning to form letters** before the motor system writes them.
- **Incoming visual and touch sensory information** as letters produced are viewed and hands and fingers move.
- **The orthographic loop** of working memory, which integrates the letters and written words in the mind’s eye with the sequential hand and finger movements during writing.

Multiple dimensions of handwriting are also instructionally relevant. To

begin with, letters should be formed legibly so that others can identify them. Spatial arrangement on, above, or below a resting line on lined paper can also affect legibility. In addition, letters should be formed automatically (effortlessly and quickly) so that the writer’s limited working memory resources are free to focus on generating ideas, choosing words, constructing sentences, and adapting the text to the audience. Finally, proportionality of component strokes that differentiate a given letter from others needs to be obtained, unless using a keyboard. For example, printed n and h are differentiated only by height of the left stroke.

Why Handwriting Is Still Important

Brain research has revealed the importance of handwriting. Karin James and Thea Atwood at Indiana University showed that handwriting leads to better perception of letters in reading than does keyboarding. Forming letters might help create the letter form in the mind’s eye better than does selecting them by key press.

Todd Richards and I, both at the University of Washington, found that developing writers with and without handwriting difficulties activated many more brain regions in learning a new letter than in writing a highly practiced letter. They differed significantly in writing familiar letters in a



brain region where letters and written words are analyzed in the mind. Also, brain activation during serial finger movements as used in handwriting is related not only to handwriting, but also to spelling and composing. Thus, handwriting is important because it:

1. Trains the orthographic loop, which supports spelling and composing.
2. Facilitates perception of letters, which transfers to reading real words, as shown in both instructional and brain imaging studies.
3. Trains serial organization, which pioneer cognitive psychologist Karl Lashley, in 1952, proposed underlies human cognition.

Teaching Handwriting

In the 1960s and 1970s, writing instruction overemphasized handwriting and spelling and neglected composing. In the 1980s and 1990s, process writing introduced composing and neglected handwriting and spelling. Students need all three skills—handwriting, spelling, and composing—to succeed in writing. School psychologist Kristen Begay has offered this research-supported analogy: Handwriting is to written expression of ideas as the paintbrush is to the artist's expression of ideas through painting.

“Despite advances in computer technology, research supports the argument that today’s students still need instruction in handwriting.”

Cross-disciplinary communication and collaboration between occupational therapists and classroom teachers is needed to teach the multiple dimensions of handwriting. For example, occupational therapists have expertise in assessing and teaching motor planning, control, and execution skills. Teachers are skilled in teaching letter formation, assessing response to this instruction, and integrating handwriting, which is both a language skill and a motor skill, with reading and writing activities.

Research indicates that effective writing instruction:

- Is directed at the orthographic loop;
- Provides a visual plan with numbered arrow cues for forming the sequential strokes in each letter form;
- Includes practice in copying letters, writing them from memory, and finding letters in the ordered alphabet series in long-term memory;
- Emphasizes that letters should be both legible (recognized by others) and automatic (written effortlessly);
- Teaches transfer of handwriting to composing;
- Aims instruction at all levels (units) of language close in time so that all the components of working memory perform in synchrony, like the musical instruments in an orchestra; and
- Adds instruction in transcription (handwriting and spelling) to writers’ workshops and process approaches to written composition.

Research shows that students who learn from teachers with professional training in handwriting demonstrate more improvement in their handwriting and in transfer to better composing. Thus, professional development for teachers in handwriting instruction

Handwriting Timeline

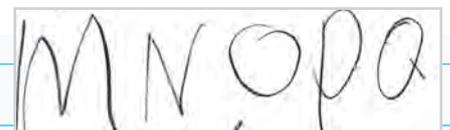
With a national goal of preparing students to enter kindergarten ready to learn, more focus needs to be placed on prewriting skills during early childhood. Consider the following developmental stepping stones for reaching the Common Core State Standards for writing.

Preschool Years. Writing begins at about 10 months of age when the infant can grasp a writing tool with his or her fist and leave visible traces on paper. The pincer grip develops during the first year of life. Two-year-olds



operate a computer using a mouse, with a handgrip guided by the thumb and pointing finger. Preschoolers imitate scribbling, vertical strokes, and horizontal strokes as well as copy lines, circles, and squares. Preschoolers also benefit from play with clay or play-dough to develop motor strength, and bead stringing, pegboards, mazes, and puzzles to develop fine motor control.

Educators also must monitor oral language development, and if necessary provide early intervention, because many children who have motor or prewriting problems also have oral language deficits.



Kindergarten. Handwriting should be accurate and legible. In instruction, teachers model sequence of motor acts, which children observe and imitate, tracing over letters with the eraser end of a pencil before writing the letter while naming it. Children go on to copy and name letters. Names serve as retrieval cues for letter forms in developing automatic orthographic loop function and are as important as learning sounds associated with the alphabet.

might be another key to helping more students master the CCSS in writing.

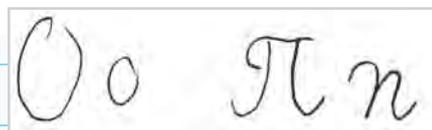
Print Versus Cursive. Controversy continues over whether one format of writing is better than the other. Beginning writers can learn either format; developing writers show individual differences in which they prefer; and both formats might contribute to writing development, but in different ways. For example printing, which has a manuscript format most like that in books or on monitors, might show the most transfer to reading, but cursive might train executive functions for self-regulation of the writing process. Also, students need to be able to read others' writing which might be in printed, cursive, or mixed formats. Evidence supports teaching both formats of handwriting and then letting each student choose which works best for him or her, as is customary in Australia.

Pen and Paper Versus Keyboarding. Evidence reveals an advantage for handwriting using pen and paper over keyboarding for students in grades 2 to 6 for amount written, rate of word writing, and number of ideas expressed. Handwriting by pen requires writing with a single hand, which activates the opposite side of the brain. Keyboarding requires bimanual letter production and communication to and between both sides

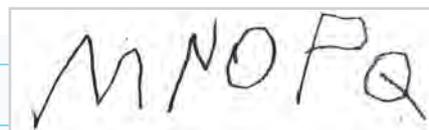
of the brain. Because the fibers that support communication across both sides of the brain don't fully mature until adolescence, there might be an advantage for writing by a single hand early in writing development but not after adolescence. It's not a surprise, then, that the advantage of keyboarding emerges for writers in grades 7 and 8, when neural paths are more likely developed for communication across the two sides of the brain. However, research also shows that generally handwriting is used during the school day and computers are used for homework, suggesting that the role of practice might explain these results. Also, younger children might benefit from explicit keyboarding instruction during the school day. Keep in mind that many other computer tools now exist besides keyboards for producing written language.

Despite advances in computer technology, research supports the argument that today's students still need instruction in handwriting for two primary reasons. First, learning to form letters by hand improves perception of letters and contributes to better reading and spelling. Second, automatic letter writing promotes better composing—both amount written and quality of writing.

Schools that have halted or plan to stop handwriting instruction should



First Grade. The goal is to move beyond drawing letters and to develop automatic letter writing. Educators should teach a consistent plan, with numbered arrow cues to practice each alphabet letter every day (in a different order each day), and teach for transfer so that students can compose writing and share it with peers.



Second and Third Grade. The goals for second- and third-grade handwriting are improved written expression of ideas and development of long-term memory by teaching fast and automatic retrieval of letter forms from the ordered alphabet letters.

Principal ONLINE

Access the following web resources by visiting *Principal* magazine online: www.naesp.org/MayJun12

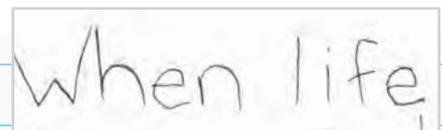
Read "**Creating Better Readers and Writers,**" a white paper by J. Richard Gentry and Steve Graham that examines the importance of spelling and handwriting instruction in improving academic performance.

"In Dysgraphia: When Writing Hurts," from the *Principal* archives, Jeri Fischer and Michael A. Rettig look at this little-known disorder that might be responsible for students' poor and illegible handwriting.

Tap into **research and additional resources** recommended by the author.

reconsider. Educators can set up their students for academic success by choosing an instructional program for handwriting that supports Common Core standards, providing adequate professional development for teaching handwriting, and assessing students' development of legible and automatic handwriting. 

Virginia Wise Berninger is a professor of educational psychology and principal investigator for National Institute of Child Health and Human Development funded research at the University of Washington.



Fourth Grade and Beyond. The goal is now periodic tune-ups to review legible and automatic letter formation and to teach strategies for self-monitoring of letter legibility for the various kinds of writing assignments students are given across the curriculum, which often involve integrating writing with reading or listening.