

Commentaries

A Continuing Dialogue on Critical Education Policy Issues

Vol. 19, No. 1

A Publication of the POLICY INFORMATION CLEARINGHOUSE

March 2013

This month's Commentary is by Virginia Berninger, one of the nation's leading researchers on handwriting development, effective handwriting instruction, and the brain and genetic basis of writing. Dr. Berninger is professor of educational psychology at the University of Washington. Here she responds to a recent NASBE *Policy Update* on "The Handwriting Debate."

Commentaries are occasionally published writings by members of state boards of education, other education leaders, researchers or practitioners, and NASBE staff. NASBE welcomes submissions for new Commentaries, as well as responses to current articles. Please send all correspondence to David Kysilko, Director of Publications, at NASBE headquarters or to davidk@nasbe.org.

Educating Students in the Computer Age to Be Multilingual by Hand

by Virginia Berninger

The myth that handwriting is a dinosaur that has been left behind in the 21st century is widespread. Many parents, students, teachers, and policymakers are asking, "In an era of rapidly evolving technology, why would anyone have to write by pen or pencil when one can touch, click, select, and press?"

Still, educators today are expected to use evidence-based practices. So, what does the research evidence show about teaching handwriting? Is printing or cursive writing better? Is keyboarding or handwriting better? Is finger tracing, stylus or keyboarding better for technology tools? Are there unmet needs related to equity or diversity in writing instruction?

The answers to these timely questions, offered by this scientist-practitioner in response to NASBE's Policy Update on "The Handwriting Debate," may depend on a) the writer's developmental level, b) the writing task, c) instructional practices, and d) writers' individual differences. Here is what the evidence shows:

★ Writer's developmental level. During early childhood, writing letters improves letter recognition, as shown in brain imaging studies; and teaching handwriting leads to improved reading, as shown in instructional studies. But studies also found that when it comes to speed of composition, handwriting (which requires only one hand), lost its relative advantage over keyboarding (which requires coordination of two hands) during early adolescence, when imaging shows frontal brain regions support more efficient cross-hand coordination.

- ★ Writing tasks. The handwriting advantage in speed was observed only during composing texts. The keyboard had an advantage for writing the alphabet in order. It may take less time to find and press letters than form letters stroke-by-stroke. No differences were found in accuracy or time for composing isolated sentences in handwriting and keyboarding. So handwriting's advantage may be related to sustaining writing for a first draft. During middle childhood, written composition, spelling, and alphabet writing (by handwriting, but not keyboarding) predicted brain activation in five regions while tapping fingers in sequence from index to baby finger. Forming letters stroke by stroke by one hand may draw on different processes than alternating two hands and all fingers to operate a keyboard.
- ★ Classroom instruction and home writing activities.

Teachers were surveyed at the beginning of a study in which children's writing skills were assessed for five years in a row, beginning in 1st or 3rd grade; and each year parents completed questionnaires about home literacy and educational programs. Handwriting instruction varied greatly in the early grades. Across all grade levels computers were not integrated in the daily instructional program, and children did not receive explicit instruction in using computers for different writing or writing-reading tasks at school or home. So, experience may also explain the handwriting advantage before adolescence. Computers were used mainly at home for homework and computer games.

★ Individual differences. Human beings share 99 percent of genes in common, but no two human beings are the same because they inherit different combinations of genes and have different kinds of home and school experiences. Thus, nature-nurture interactions result in individual children bringing different learning profiles and experiences to learning to write and writing to learn. Individual differences are also observed in whether students look at the keys or monitor or use one hand or both hands during keyboarding, and whether they prefer printing, cursive, or a mix.

Making a Case for Educating Students to be Multi-Lingual by Hand

As I see it, two controversies remain unresolved: whether two years of handwriting instruction in the beginning grades is sufficient, and whether it is necessary to teach cursive writing at all. Preschoolers and primary grade children can learn cursive letter writing, as is the instructional practice in Europe, or they can learn to print letters, as is the instructional practice in the United States. No clear research evidence supports one being better than the other.

However, a case can be made for teaching both formats. Children encounter manuscript fonts more often than cursive fonts in reading hardcopy books or written texts on their computer monitors or e-book readers. Cursive, introduced in the 19th century before typewriters were invented in order to speed up handwriting, links all the letters within a word with connecting strokes and facilitates attention to all letters in a word, thus improving spelling and the speed of writing and reading.

Teaching BOTH of these handwriting formats has advantages, including learning to recognize and write letters despite small variations in letter forms sharing the same name. Consider all the fonts computer users can choose from for word processing. Apple's Steve Jobs was an accomplished calligrapher before he became a pioneer in technology tools to support writing—and that is one of the reasons we have so many font styles to choose from in computer writing! Yet, with appropriate and sufficient experience in writing and reading varied fonts, writers still recognize a whether produced by a word processing program or in handwriting with a ball and stick format or a cursive format with connecting strokes. Using a keyboard also requires cross-case abstraction. All letters on a standard keyboard are in capital case, but writers produce text with mostly lower-case letters.

University of Washington research is testing whether individuals learn best to spell and express ideas when using their index finger or a stylus to write in manuscript or cursive or all of these modes. The research questions are: 1) What works for whom for which writing task? 2) Do developing writers benefit from being multilingual by hand?

Evolution of Common Core Writing Standards

Developing Common Core standards for writing is challenging, considering developmental differences, variety of writing tasks

in and out of school, variation in classroom and home literacy experiences, individual differences among developing writers, and today's multiple modes for letter production. On the one hand, proposing a set of clearly articulated learning goals at the national level was a step forward. On the other hand, the current Common Core standards are not sufficiently based on research evidence for writing development, tasks, instruction, and modes of letter production in the 21st century. For example, following a Summit on Handwriting in January 2012 for sharing research, several states that had dropped handwriting from the curriculum based on the Common Core standards, returned handwriting to the curriculum based on research.

A brief overview follows of what research and practice have shown about handwriting instruction related to development, tasks, instruction, and individual differences that could inform future Common Core standards for writing.

- ★ Developmental steppingstones. Cross-disciplinary research shows that handwriting is critical to teach from preschool to high school, but targeted skills for instruction and periodic review change as students develop: Modes refer to each kind of the handwriting (pen, pencil, or marker) or technology (index finger, stylus, or keyboard) used for letter production.
- Preschool: Strengthen hand muscles by playing with clay or play dough; develop fine motor skills by playing with pegboards and stringing beads; use fine tip markers or pencils to complete mazes; and write one's name, name alphabet letters in books or other written material, and connect dots with arrows to form letters.
- Kindergarten: Name and print all lower and upper case letters through observing teacher model letter formation, tracing over letters with the eraser end of the pencil, copying from models, and closing eyes and writing letters by pencil or marker from memory. Use dominant hand for handwriting and index finger with laptop to form manuscript letters during self-generated composing.
- *First grade:* Use both modes to practice (a) writing alphabet from memory in lower-case manuscript letters, always naming them, (b) adding capital letters to first letter and names in provided sentences, and (c) self-generated composing. Graph progress in legibility for both modes: Can others recognize the letter out of the context of a word?
- Second grade: Same as 1st grade, but focus on both legibility and automaticity. Graph progress in legibility and times for both modes. Write the letter before or after teacher- named letter, which research showed increases composition length, across modes (stylus too).
- *Third grade:* Same as 1st grade, but teach lower and upper case cursive showing how connecting strokes link letters within words. Write lower-case letters alone and in words, with focus on legibility.

- *Fourth grade:* Same as 2nd grade, but for lower- and uppercase cursive letters alone and in words.
- Fifth to eighth grades: Introduce keyboard instruction at a time in children's development when the brain most likely supports efficient bimanual coordination. Teach children to transition from hunt and peck while they look at the letters on the keyboard to touch-typing in which their eyes are focused on the screen, not keys, so they can get visual feedback about their self-generated writing. Repeated instruction and practice across the years may be needed to fully master touch typing.
- Fifth to twelfth grades: Teach strategies for composing using both modes. For example, handwriting is useful for graphic organizers during planning or generating a rough first draft, but technology-supported word processing programs are useful for creating multiple drafts during the revision process. Teach listening and note-taking skills for learning from lectures and studying for tests. Research shows an advantage for handwriting in this kind of note-taking, but also students benefit from strategies for note-taking when reading source material. Keep handwritten and technologygenerated products in portfolios. Classmates circle the letters and/or spellings they cannot recognize so the writer gets feedback about which letters or written words others cannot identify. Based on illegible letters, the teacher provides weekly "tune-up" review for those letters. Just like cars, developing multi-modal writers need periodic tune-up!
- ★ Writing tasks. Initial handwriting instruction should focus on accurate letter formation legible to others, but once legible, then forming letters automatically—quickly, with minimal effort so mental resources can be devoted to generating and translating thoughts into written spelling, sentence structures, and text organization. Research showed that automatic alphabet letter writing by hand is the best unique predictor of composition length—how many words written within a constant time limit.

Another research-supported principle is following handwriting instruction by instructional activities that use handwriting for other writing tasks—spelling written words, constructing sentences, and composing text. One effective, research-supported strategy is to teach handwriting at the beginning of lessons as "warm-up," just as athletes do warm-up exercises before a game and musicians do warm-up exercises before a concert. The warm-up is then followed by spelling and composing instructional activities. Handwriting instruction does not have to take up valuable time for meeting other Common Core standards. Less can be more, especially if handwriting is taught as a tool for idea expression.

★ Curriculum and instruction. Missing from the Common Core standards is teaching students to integrate the levels of language (letters, words, sentences, and text) in writing by hand. All are needed for success during and after school. Even

with spell checks, research shows that developing writers need explicit spelling instruction. Also, handwriting plays an important role in learning math—from writing numerals initially and then on to writing multi-place numbers, fractions, equations and so on. However, the Common Core does not sufficiently address writing across the curriculum, especially in regard to handwriting. Also, as discussed in NASBE's "Handwriting Debate" Policy Update, teachers do not typically get sufficient pre-service preparation in how to teach handwriting, especially for developmental steppingstones, integration with other written language and cognitive tasks across the curriculum, and individual differences.

★ Individual differences. Although not dealt with in the Common Core, some students have developmental disabilities (DDs), which typically have associated motor disorders. These students will need the standards modified for their developmental levels, and they often benefit from assistive technology to support all aspects of writing, as well as occupational or physical therapy services.

Other typically developing students may have specific learning disabilities such as dysgraphia—impaired handwriting, forming letters by hand, which is not just a motor disorder. Dysgraphia results from impairments in the mind's eye (storing and analyzing written words and their letters in working memory and integrating these letter codes to finger movements to form letters). Dysgraphia is treatable, but often computers are used only as accommodations rather than teaching handwriting, which research has shown is effective during early intervention and the later grades, and modes of using computer tools for letter production.

Studies show that about one in five may struggle with writing. Some have dysgraphia, which affects their spelling, but some also have dyslexia—impaired word-reading and spelling. Often dysgraphia and dyscalculia (impaired written calculation) cooccur. Future Common Core standards should acknowledge these biologically based learning disabilities affecting production of letters or numerals and need for appropriate, specialized instruction for them in general education.

Common Core Standards, Equity Issues, and Poverty

★ Diversity issues. Culture, language, and race are not the same, but the Common Core standards do not deal with any of these issues, which are relevant to writing development. Some groups for which the achievement gap is widest may not come from cultures with a written language tradition. For example, research has shown that combining the oral tradition with evidence-based literacy instruction leads to better literacy outcomes for Native Americans. Research is finding benefits for bilingualism, but these may depend on parental level of education and/or working memory disabilities. Biracial children make up our fastest growing minority population. Much remains to be learned about how their racial identity issues may interact with their response to writing or other instruction.

- ★ Poverty. The biggest challenge facing education in the United States is poverty, which occurs across cultural, language, and racial groups. Depending on geographic region, one-fourth to one-fifth of school-age population lives in poverty. Many do not have homes to go to when school is over or reliable access to food in the evening or summer. Meeting basic needs of a safe place to live and adequate nutrition are necessary to meet the Common Core standards in writing and across the curriculum.
- ★ Lifelong, system approach to raising writing outcomes. National statistics point to underachievement in writing as a condition that leads to school dropout, grade retention, and failure to graduate from high school or college. Today, P-20 initiatives are emerging as lifelong, system-wide approaches to dealing with the issues of poverty for diverse groups in the population— and writing plays a big role in whether students in these groups have the skills for completing high school, successfully transitioning to postsecondary level, completing postsecondary education, and acquiring job-related competencies. National policy experts in preschool and community colleges could well join forces with those involved in K-12 standards to support writing outcomes for ALL, P to 20, across their educational journeys.

Acknowledgements

Preparation of this commentary was supported, in part, by HD P50HD071764 from the Eunice Kennedy Shriver National Institute of Child Health and Human Development (NICHD) at the National Institutes of Health (NIH). The views expressed are the author's and do not represent official policy of the NICHD.

The author thanks the organizers of the National Handwriting Research Summit in January 2012, who invited researchers to participate in the dialogue about the role of handwriting instruction in the 21st century and share research findings with American Association of School Administrators.

Bibliography

- M. Batshaw, N. Roizen, and G. Lotrechiano, *Children with Disabilities*, 7th Edition (Baltimore, MD: Paul H. Brookes, 2013).
- V. Berninger, "Strengthening the Mind's Eye: The Case for Con-

- tinued Handwriting Instruction in the 21st Century," *Principal* (May/June 2012): 28-31.
- V. Berninger and B. Wolf, "Understanding Dysgraphia," International Dyslexia Association, "Just the Facts" online information, www.interdys.org/ewebeditpro5/upload/UnderstandingDysgraphiaFactSheet3-14-12.pdf.
- V. Berninger (Ed.), *Past, Present, and Future Contributions of Cognitive Writing Research to Cognitive Psychology* (New York: Psychology Press/Taylor Francis Group, 2012).
- G. Duncan and R. Murnane (Eds.) Whither Opportunity? Rising Inequality, Schools, and Children's Life Chances. New York: Russell Sage Foundation, 2011).
- M. Fayol, D. Alamargot, and V. Berninger (Eds.), Translation of Thought to Written Text While Composing: Advancing Theory, Knowledge, Methods, and Applications (New York: Psychology Press/Taylor Francis Group (2012).
- E. Grigorenko, E. Mambrino, and D. Preiss (Eds.), Writing: A Mosaic of Perspectives and Views (New York: Psychology Press, 2012).
- S. Katusic, R. Colligan, A. Weaver, and W. Barbaresi, "The Forgotten Learning Disability: Epidemiology of Written-Language Disorder in a Population Birth Cohort (1976-1982), Rochester, Minnesota," *Pediatrics* 123 (2009): 1306-1313.
- D. Kysilko, "The Handwriting Debate," *NASBE Policy Update* (September 2012).
- J. Mascolo, D. Flanagan, and V. Alfonso (Eds.), Essentials of Planning, Selecting and Tailoring Intervention: Addressing the Needs of Unique Learners (New York: Wiley, in press, 2013).
- E. Silliman, A. Stone, and G. Wallach (Eds.), *Handbook of Language and Literacy: Development and Disorders, 2nd ed.* (New York: Guilford, in press, 2013).
- H.L. Swanson, K. Harris, and S. Graham(Eds.), *Handbook of Learning Disabilities*, 2nd ed. (New York: Guilford, in press, 2013).
- L.C. Wilkinson and E.R. Silliman, *Academic Language: Routledge Education Companion* (London, England: Routledge, 2012).



Commentaries is published by the National Association of State Boards of Education, 2121 Crystal Drive, Suite 350, Arlington, Virginia • 703.684.4000 • www.nasbe.org. David Kysilko, Director of Publications.