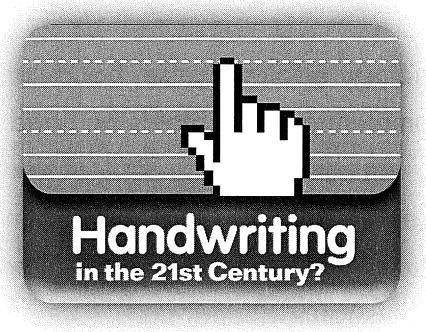

AN EDUCATIONAL SUMMIT

Handwriting in the 21st Century?

Research Shows Why Handwriting Belongs in Today's Classroom

A Summary of Research Presented at Handwriting in the 21st Century? An Educational Summit

SAPERSTEIN ASSOCIATES

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Introduction

In a society that values technology above all else, handwriting instruction has begun to fall by the wayside. Although completing assignments by hand remains a prevalent practice in many elementary schools,[5] an estimated 25–33% of students are struggling to achieve competency in this skill.[4] Research indicates that handwriting influences reading,[1,6] writing,[1,5] language,[8] and critical thinking.[10] Yet, statistics show that not all students are being provided with adequate instruction for this foundational skill.

As students become increasingly reliant on communication via digital device, some educators have shifted their focus from handwriting instruction to teaching keyboarding instead. In the 21st century classroom, keyboarding is undoubtedly necessary, but teaching this skill in lieu of handwriting can leave students at a disadvantage. If handwriting isn't learned and practiced (especially in the earlier grades), students are not given the opportunity to experience the related benefits of this skill that has been shown to

- increase brain activation.[6]
- impact performance across all academic subjects.[2]
- provide a foundation for higher-order skills.[1,10]

> [Doubt about the value of handwriting instruction] is similar to what happened with math as calculators and computers came into vogue... people wondered whether students needed to learn how to do math. The answer in both cases is absolutely "yes." Writing is not obsolete.
>
> – Daniel A. Domenech, executive director of the American Association of School Administrators

Handwriting: A Laissez-Faire Approach

Most states have now adopted the Common Core State Standards (CCSS), which offer a framework to prepare students for 21st century success in college and career. Although research shows that handwriting increases a student's potential for academic and professional achievement, this skill is rarely mentioned in the CCSS—and cursive handwriting is excluded altogether. Furthermore, manuscript handwriting instruction is only required until Grade 1 (but fluency and automaticity in handwriting have been shown to develop well beyond then).[5]

According to the CCSS, handwriting instruction is no longer mandatory when students progress beyond Grade 1. After that time, states can choose to teach manuscript handwriting, cursive handwriting, or a combination of both by invoking the right to augment the standards with an additional 15% of content that they deem appropriate. Or they can eliminate handwriting instruction entirely. The result of this laissez-faire approach is an inconsistency in handwriting instruction, and in turn, an inequity regarding students' access to a skill that lays the groundwork for academic achievement.

What exactly does the research say about how handwriting instruction affects learning? What are the implications of including—or not including—handwriting instruction in the curriculum? "Handwriting in the 21st Century?: An Educational Summit" recently gathered educators and handwriting researchers to explore and debate these important questions. Research presented at the handwriting summit demonstrated how this skill supports students' cognitive development[6] and overall academic achievement.[2] However, despite studies that demonstrate the efficacy of handwriting, the lack of consistency in its instruction remains. This pertinent issue warrants a set of benchmarked standards that can be implemented by all states. With this research summary, the education community can better codify the elements of handwriting that are most important for effectively teaching this skill, thereby contributing to the highest-level of education for all students—regardless of the state in which they reside.

Research Shows Handwriting's Impact On...

Reading, Writing, and Language Abilities

The CCSS recognize the interrelationship between oral and written language and how the processes that underlie these skills are essential for effective communication.[8] According to the standards, "oral language development precedes and is the foundation for written language development."[8] Written language is comprised of receptive (reading) and expressive (writing) language skills.[8] The ability to understand words (decoding and comprehension involved in reading), as the standards note, is the precursor to a student's ability to produce them (spelling and composition involved in writing).[8] Handwriting-related research indicates that this critical skill influences the processes associated with receptive and expressive language. However, when handwriting is not taught beyond Grade 1 (which is the highest level of instruction required in the CCSS), students are deprived of the opportunity to gain fluency and automaticity in this skill that has been shown to bolster reading and writing abilities.

> An estimated 25–33% of students are struggling to achieve competency in [handwriting].[4]

As students progress in their academic careers, the CCSS require proficiency in producing clear and coherent writing in multiple genres (argument, informative/explanatory, and narrative), under increasingly challenging time frames, and for "a range of tasks, purposes, and audiences."[7] Studies demonstrate a positive correlation between handwriting and the composing abilities called for in the CCSS. If handwriting is taught, students' writing quality, quantity, and speed have been shown to improve. Additionally, when handwriting becomes automatic, students can better focus on the planning and thought organization that is required for effective composition.[1,2]

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Handwriting influences a student's ability to write words, thereby improving the ability to transform ideas into written language by constructing multi-word sentences.[1] Dr. Steve Graham, Currey Ingram professor of literacy at Vanderbilt University, and Dr. Tanya Santangelo, associate professor of special education at Arcadia University, conducted a meta-analysis of research studies regarding students' handwriting proficiency.[5] After analyzing whether handwriting instruction produced greater gains than no handwriting instruction, they concluded that teaching this skill resulted in improved fluency and an increase in the quantity of students' writing.[5]

Dr. Virginia Berninger, a professor of educational psychology at the University of Washington, reports that, after studying students in Grades 2, 4, and 6, those who used handwriting wrote more words, wrote words faster, and expressed more ideas than those who used keyboarding.[1] In subsequent studies of children who were trained to find and write the letters that precede and follow other letters, results indicated that the length of compositions improved.[1] This improvement was especially notable during the transition between Grade 3 and Grade 4, when composing requirements increase.[1]

In addition to displaying writing competency, the CCSS also require students to proficiently and independently comprehend text of increasing complexity.[8] Research findings suggest that self-generated action, in the form of handwriting, is a crucial component in setting up brain systems for reading acquisition.[6] According to Dr. Karin Harman James, associate professor of psychological and brain sciences at Indiana University, handwriting appears to contribute to reading fluency by activating visual perception of letters and improving children's accuracy and speed for recognizing letters.[6] Also, Dr. Berninger conducted a study in which students in Grade 1 were taught to see letter forms in the "mind's eye."[1] When asked to write these letters from memory, the students exhibited improvement in word reading (as well as improved handwriting and composing).[1]

When students do not adequately develop handwriting skills, the negative implications can be lifelong.[4] Without consistent exposure to handwriting, research indicates that students can experience difficulty in certain processes required for success in reading and writing, including

- retrieving letters from memory.[1, 2]
- reproducing letters on paper.[1, 2]
- spelling accurately.[1]
- extracting meaning from text or lecture.[10]
- interpreting the context of words and phrases.[3]

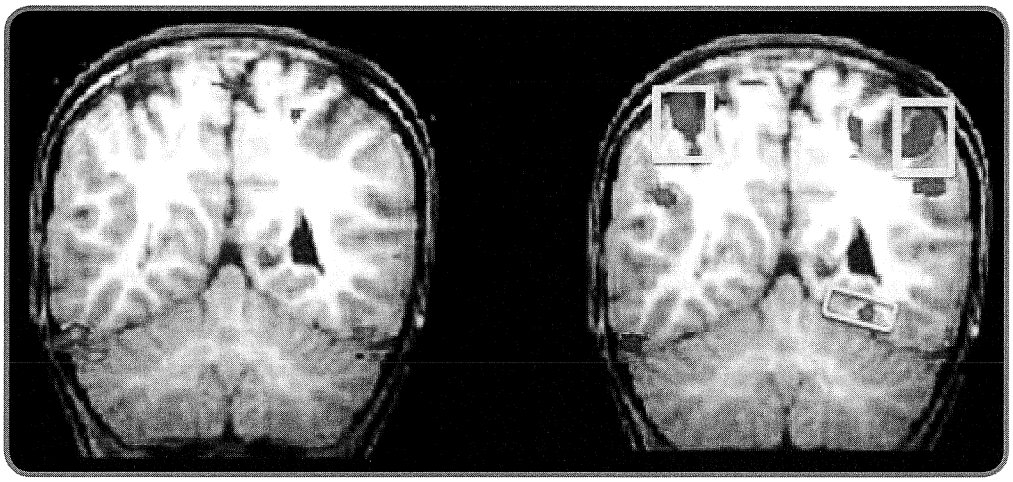
Brain Functioning

Handwriting has not only been shown to support literacy skills (reading, writing, and oral language), but it also has been shown to impact neurological processes. When children in a research study were asked to form a new letter using the same strokes as a familiar well-practiced letter, poor handwriters engaged more brain regions than good handwriters.[1] Functional Magnetic Resonance Imaging (fMRI) showed that the brains of poor handwriters consumed more of the oxygen required to burn glucose for fuel.[1] This fuel supplies the energy the brain needs in order to complete its work.[1] Therefore, the research suggests that children who struggle with handwriting are less efficient in engaging their brains when learning to write new letters.[1]

The Relationship Between Letter Printing and Brain Activation

EXPERIMENT

Using fMRI (functional Magnetic Resonance Imaging), Dr. James studied how letter printing affects the brain activation of children.[6]



Comparison of pre-experimental (left side) and post-experimental (right side) brain scans in children[6]

(Red indicates that there is a significant difference in conditions. Blue indicates that there is no change in conditions.)[6]

RESULTS

- After printing letters (interacting with the letters to create context, rather than simply observing letters as objects), brain activation in the children studied was significantly increased and showed similarity to that of adults.[6]
- When preschool children looked at and identified a letter, they did not exhibit the same brain activation as adults.[6]
- In the brain's visual regions, when comparing writing, typing, tracing, and visual control, much more activation was exhibited after the writing experience than any of the other experiences.[6]

IMPLICATIONS

- Neuroimaging is a sensitive marker of learning changes.[6]
- Knowing how a child's brain works should inform our educational practices.[6]
- The act of writing by hand makes a significant difference to brain activation patterns.[6]

Handwriting development begins as early as infancy, when children are first able to grasp a writing object and leave a mark on paper.[1] A child's corticospinal tract—which reaches the fingertips and impacts fine motor skills—is not fully developed until age 10.[4] This is another indicator that handwriting, a fundamental skill that strengthens fine motor processes, should continue to be taught throughout the early years of a child's life.

In addition to an evolving body of research that demonstrates a link between handwriting and brain functioning, experts suggest that handwriting lightens a student's cognitive load.[10] With consistent handwriting practice, the processes involved become less demanding and more automatic, enabling students to devote a higher amount of neurological resources to critical thinking and thought organization.[10] However, when students do not learn and practice handwriting, their struggle to achieve automaticity and fluency decreases their capacity to carry out higher-order skills.

Handwriting: A Standardized Approach

> Illegible handwriting is a problem for a large number of children...it can affect [children] not only personally (their self-esteem), but also academically, and their careers in the future. So, it's got a very long trajectory.[4]
>
> – Dr. Gerry Conti, assistant professor of occupational therapy at Wayne State University

The convergence of evidence provided herein leaves little room for doubt about the efficacy of handwriting and the continuing need for this critical skill in the 21st century classroom. Though keyboarding is indeed necessary in a technological era, the need for this skill should not influence an educator's decision to minimize or eliminate handwriting instruction. When properly taught, handwriting enables students to more efficiently perform the hierarchy of skills required in other subjects, which ultimately leads to better grades, better test scores, and better academic performance.[10]

By helping to build a solid academic foundation, research shows that handwriting is a foundational skill that helps achieve the CCSS' primary goal of preparing students for college and career "in a 21st century, globally competitive society."[9]