

Paper and Pen: What the Research Says

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Reading: Paper vs. Screen

1. Why paper books are better than e-books for young children
 - Parents and children interact differently: Conversation is more about content, inferences and observations, as opposed to how to use the device.
 - Understanding and recall is better; children will remember a “favorite page.”
2. Interactive e-books on tablets result in lower comprehension
 - Children skip whole pages, looking for animation
 - Interactive features: “gimmicks and distractions”
 - May overwhelm limited working memory
 - Children lose the “thread” of the narrative
 - Comprehension better with traditional books
3. Advantages of e-books: lower cost, convenience, built-in dictionary; but high school and college students prefer printed books (both for work and leisure).
 - 92% “concentrate better” (fewer distractions)
 - “easier to focus”
 - “sticks in my head more easily”
 - “read more carefully”
 - “less eye strain”
4. Study: 72 Norwegian tenth graders, four page document. Comprehension of paper text “significantly better” than .pdf on a computer screen. Possible causes:
 - Scrolling has negative effect on concentration
 - Screen lacks “fixity” of text making “mental maps” (and therefore recall) more difficult.
 - Visual ergonomics
5. Study: Adults, 28-page mystery story, half read with Kindle, half with paperback. Paper readers scored higher:
 - empathy, transportation, immersion
 - significantly better plot reconstruction (14 points)
6. Marilyn Jager-Adams, Brown University, cognitive psychologist and literacy expert (2013): “All those cues such as what the page looks like, what the book felt like, all those little pieces help you put together the whole thing... And they are just impoverished on a Kindle or tablet.”
7. Study: 12 healthy young adults, 2-week experiment: Reading before sleeping, light-emitting screen vs. paper book
 - Longer to go to sleep
 - Suppressed melatonin
 - Less REM sleep
 - Groggier on waking
 - May have impacts on general health, performance
8. Study: College students prefer real books.
 - No difference in preference of previous e-book users
 - Students will pay for paper copy of free e-books
 - Students not likely to use special e-book features

Writing: Typing vs. Handwriting

1. Study: Laptops in classrooms hinders learning (for all).
 - Laptop multitasking participants scored lower on comprehension of material presented during lecture.
 - Participants in view of multitaskers also scored lower.

2. Three studies: Taking notes on paper is more effective than notetaking on laptops.
 - Even when distractions removed (games, Internet)
 - Laptop note-takers lower on conceptual questions
 - Paper notetakers write less, listen more
 - Laptop notes tended to be verbatim
 - Paper notes more “rephrased,” therefore internalized.

3. Yale psychologist Paul Bloom (a skeptic about the Mueller-Oppenheimer study): “With handwriting, the very act of putting it down forces you to focus on what’s important,” he said. He added, after pausing to consider, “Maybe it helps you think better.”

4. Study: Memory of words better when written vs. typed
 - 36 adult females
 - Words were read out loud to them
 - Free-recall of words higher in writers (~15%)

5. Virginia Beringer, Univ. of Washington, Dept. of Education. Five-year, overlapping cohort, longitudinal study:
 - Writing letters by hand speeds up recognition
 - Children grades 2–5, on paper, wrote more words, ideas
 - Handwriting improves self-control
 - Causes more and different neural activity

6. Anne Mangen, multiple studies:
 - Use of hands affects both reading and writing.
 - fMRI data shows different brain areas activated; writing on paper causes more bilateral cortical activity. “Broca’s area”(language), execution, imagery
 - Strong relationship between sensory-motor activity and cognitive processing.

7. Karen James (Univ. of Indiana), multiple studies:
 - Pre-reading children writing letters had more complex (adult-like) neural activity than those who had only seen or selected letters.
 - Children attempting to copy letters freehand showed significantly more neural activity than selecting on a screen or tracing.

Handwriting: Printing vs. Cursive

1. Modern attitude: Morgan Polikoff, Asst. Professor of Education at USC
 - Cursive should not be taught
 - Very few use it now
 - Little research to show positive effect on other learning
 - Common Core, well-constructed, no cursive
 - Cursive instruction would take from more important areas of learning.

2. The Argument for Cursive
 - Cursive should be taught
 - Builds sensory-motor coordination
 - Develops brain better than printing
 - Learning to write in cursive allows a person to read it
 - Cursive letters are more distinct, easier to recognize
 - Cursive writing prevents letter reversals, helps with dyslexia
 - Students acquire a sense of accomplishment, pride, and individuality as their cursive develops.

3. Writing in cursive uses a different part of the brain:
 - Stroke victims or “Alexia” (impaired reading)
 - Some lose ability to read print, but retain ability to read and/or write in cursive.
4. Cursive writing helps train the brain to integrate visual and tactile information and fine motor dexterity. The neurological benefits are similar to what you get by learning to play a musical instrument.
5. Correlation (not necessarily causation): Students with better cursive handwriting receive higher scores on composition (especially SAT). Interesting, but... “Doctors’ poor handwriting is responsible for the death of over 7000 people each year” (National Academy of Science’s Institute of Medicine).
6. Cursive as Treatment for ADHD: Retrain the Brain, Jeanette Farmer
 - “Movement is key to learning. Through motion, we train the brain.” (Allan Hopson, M.D.)
 - Combination of cursive copywork and rhythmic music.
 - Builds concentration, reduces need for medication.
7. The Argument for Cursive First
 - Young children naturally make curves and circles, not straight lines.
 - Writing habits are formed in the first few years.
 - Printing first can cause resistance to cursive
 - Historically, only cursive was taught until 1900s
 - Children can learn to print as well, after cursive

Pencil vs. Pen

1. Pudewa’s observations:
 - Pencils are neurologically, tactilely, emotionally disturbing
 - Pencils contribute to “Tired Hand Disease”
 - Erasing is a waste of time.
 - Erasing disrupts flow of thought.
2. Obscure (1967) research:
Results of switching first grade students to pen:
 - Less grip tightness
 - Faster writing speed
 - Papers less smudging
 - No erasing encouraged better thinking

Thoughts Regarding Technology

1. Field studies: An inverse correlation between technology and basic skills (reading, writing, math)
 - Conclusion: Technology amplifies whatever you have (productive, organized, efficient)
 - What are 10-year-olds like?
2. Duke University Study: Children with Home Computers Likely to Have Lower Test Scores “...the introduction of home computer technology is associated with modest but statistically significant and persistent negative impacts on student math and reading test scores.”
3. Technology will atrophy the skill it replaces. So...
 - How do we coach homeschooling parents?
 - What role/limits/purpose does technology have in a home school?
 - Is experience with technology in childhood necessary for success in the professional world?

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