



Listen. Speak. Read. Write. Think!



# Paper and Pen

*What the Research Says*

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Founder and Director of the Institute for Excellence in Writing



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# Reading: Paper vs. Screen

Why paper books are better than eBooks 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.

Source: Lisa Guernsey  
New America Foundation's Early Childhood Initiative



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# Reading: Paper vs. Screen

Interactive eBooks on tablets result in lower comprehension.

- Children skip whole pages, looking for animation.
- Interactive features are gimmicks and distractions.
- These may overwhelm limited working memory.
- Children lose the thread of the narrative.

Comprehension is better with traditional books.

Source: Jordan Schugar and Heather Schugar, West Chester University of Pennsylvania  
“Teaching With Interactive Picture E-Books in Grades K–6.” *The Reading Teacher*, Vol. 66, Issue 8, May 2013



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# Reading: Paper vs. Screen

Advantages of eBooks include lower cost, convenience, and built-in dictionaries.

However, 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”

Source: Naomi S. Barron

Executive Director of the Center for Teaching, Research, and Learning at American University



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# Reading: Paper vs. Screen

Study: 72 Norwegian 10<sup>th</sup> graders, 4-page document

Comprehension of paper text was “significantly better” than PDF on a computer screen.

## Possible causes

- Scrolling has a negative effect on concentration.
- Screen lacks fixity of text, making mental maps (and therefore recall) more difficult.
- Visual ergonomics

Source: Anne Mangen, et al.

“Reading Linear Texts on Paper versus Computer Screen: Effects on Reading Comprehension.”  
*International Journal of Education Research*, #58, 2013



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# Reading: Paper vs. Screen

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)

Source: Anne Mangen  
Stavanger University  
Presented at a conference 2014 as reported in *The Guardian*



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# Reading: Paper vs. Screen

“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.”

Source: Marilyn Jager-Adams (2013)  
Cognitive psychologist and literacy expert  
Brown University



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# Reading: Paper vs. Screen

Study: 12 healthy young adults, two-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

Source: Chang, et al.

“Evening Use of Light-Emitting eReaders Negatively Affects Sleep, Circadian Timing, and Next-Morning Alertness.” *Proceedings of the National Academy of Sciences*, Vol 112, #4





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# Reading: Paper vs. Screen

Study: College students prefer real books.

- No difference was found in preference of previous eBooks users.
- Students will pay for paper copy of free eBooks.
- Students are not likely to use special eBook features.

Source: Woody, et al.

“E-books or Textbooks: Students Prefer Textbooks.” *Computers & Education*, Vol 55, Issue 3, November 2010



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# Writing: Typing vs. Handwriting

Study: Laptops in classrooms hinder learning (for all).

- Laptop multitasking participants scored lower on comprehension of material presented during lecture.
- Participants in view of multitaskers also scored lower.

Source: Sana, et al.

“Laptop Multitasking Hinders Classroom Learning for Both Users and Nearby Peers.”  
*Computers and Education*, March 2013



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# Writing: Typing vs. Handwriting

Three studies: Taking notes on paper is more effective than note-taking on laptops.

Even when distractions removed (games, Internet),

- laptop note-takers score lower on conceptual questions.
- paper note-takers write less, listen more.
- laptop notes tend to be verbatim.
- paper notes are more “rephrased” therefore internalized.

Source: Pam Mueller (Princeton) and Daniel Oppenheimer (UCLA)

“The Pen Is Mightier than the Keyboard: Advantages of Longhand over Laptop Note Taking.”

*Psychological Science*, June 2014



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# Writing: Typing vs. Handwriting

“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.”

Source: Paul Bloom (Yale psychologist and a skeptic about the Mueller-Oppenheimer study)



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# Writing: Typing vs. Handwriting

Study: 36 adult females, words read out loud to them

- Memory of words better when written vs. typed
- Free-recall of words higher in writers (~15%)

Source: Mangen, et al.,

“Handwriting versus Keyboard Writing: Effect on Word Recall.” *Journal of Writing Research*, 2015



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# Writing: Typing vs. Handwriting

Study: 5-year, overlapping cohort, longitudinal study

- Writing letters by hand speeds up recognition.
- Children gr. 2-5 write more words and ideas on paper.
- Handwriting improves self-control.
- Handwriting causes more and different neural activity.

Source: Berninger, et. al. University of Washington, Dept. of Education

“Early Development of Language by Hand: Composing, Reading, Listening, and Speaking Connections; Three Letter-Writing Modes; and Fast Mapping in Spelling.” *Developmental Neuropsychology*, Vol 29, #1, 2006



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# Writing: Typing vs. Handwriting

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

Source: Anne Mangen and Jean-Luc Velay

“Digitizing Literacy: Reflections on the Haptics of Writing.” *Advances in Haptics*, Ch. 20



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# Writing: Typing vs. Handwriting

Karin James (Indiana University), multiple studies:

- Prereading 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.

Source: James and Engelhardt

“The Effects of Handwriting Experience on the Functional Brain Development in Pre-Literate Children.” *Trends in Neuroscience* (2013)





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# Handwriting: Printing vs. Cursive

Modern attitude says

- cursive should not be taught.
- few people use it now.
- there is little research to show positive effect on other learning.
- Common Core is well-constructed with no cursive.
- cursive instruction takes away from more important areas of learning.

Source: Morgan Polikoff

Asst. Professor of Education at University of Southern California as reported at  
[www.nytimes.com/roomfordebate/2013/04/30](http://www.nytimes.com/roomfordebate/2013/04/30)



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# Handwriting: Printing vs. Cursive

Cursive should be taught because

- it builds sensory-motor coordination.
- it develops the brain better than printing.
- learning to write in cursive allows a person to read it.
- cursive letters are more distinct and easier to recognize.
- cursive writing prevents letter reversals which helps with dyslexia.
- students acquire a sense of accomplishment, pride, and individuality as their cursive develops.

Source: William Klemm, Ph.D. at [www.psychologytoday.com](http://www.psychologytoday.com) (Aug. 5, 2013)



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# Handwriting: Printing vs. Cursive

Writing in cursive uses a different part of the brain.

In stroke victims or those with alexia (impaired reading), some lose the ability to read print but retain the ability to read and/or write in cursive.

Source: Berninger, et. al. University of Washington, Dept. of Education  
“Early Development of Language by Hand: Composing, Reading, Listening, and Speaking Connections; Three Letter-Writing Modes; and Fast Mapping in Spelling.” *Developmental Neuropsychology*, Vol 29, #1, 2006



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# Handwriting: Printing vs. Cursive

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.

Source: Anne Mangen and Jean-Luc Velay

“Digitizing Literacy: Reflections on the Haptics of Writing.” *Advances in Haptics*, Ch. 20



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# Handwriting: Printing vs. Cursive

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).

Source: Miami-Dade County Public Schools.

“Should Cursive Handwriting Still Be Taught in Schools?” Citing multiple studies.

[drs.dadeschools.net](http://drs.dadeschools.net)



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# Handwriting: Printing vs. Cursive

## Cursive as Treatment for ADHD

- “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

Source: Jeanette Farmer, *Retrain the Brain*  
[www.retrainthebrain.com](http://www.retrainthebrain.com)



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# Handwriting: Printing vs. Cursive

## Arguments 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.

Source: Sam Blumenfeld,

“The Benefits of Cursive Writing.” *Practical Homeschooling* #63, 2005



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# Pencil vs. Pen

## My Observations

- Pencils are neurologically, tactilely, emotionally disturbing.
- Pencils contribute to “Tired Hand Disease.”
- Erasing is a waste of time.
- Erasing disrupts flow of thought.





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# Pencil vs. Pen

Obscure research:

Results of switching 1<sup>st</sup> grade students to pen:

- less grip tightness
- faster writing speed
- papers less smudged
- no erasing encouraged better thinking

Source: Shirley Tawney.

“An Analysis of the Ball Point Pen versus the Pencil as a Beginning Writing Instrument.” (Part of Master’s Thesis) *NCTE Journal*, Jan. 1967



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# Thoughts Regarding Technology

*The Flickering Mind: The False Promise of Technology in the Classroom and How Learning Can Be Saved.* (2003) by Todd Oppenheimer

- 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?



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# Thoughts Regarding Technology

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.”

Source: Vigdor and Ladd  
“Scaling the Digital Divide” (June 2010)  
[today.duke.edu/2010/06/divide.html](http://today.duke.edu/2010/06/divide.html)

Still true today. “Computers do not improve pupil results . . .”

Source: BBC.com, September 15, 2015.



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# Thoughts Regarding Technology

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?