

SUMNERONE · EDUCATION

# The Case for Print

*What neuroscience, national policy, and a generation of reading research tell us about how learning actually happens.*

---

**Published by SumnerOne**

*Keeping learning and communication flowing for over 70 years.*

[sumnerone.com/education](https://sumnerone.com/education)

## A Country Changed Its Mind

---

A decade ago, Sweden was building one of the most digital-first school systems in the world. Tablets in preschools. Screens in classrooms. A national bet that more technology would mean more learning.

Then the country took an honest look at the results. On the international PIRLS assessment, Sweden's fourth-grade reading score fell from 555 in 2016 to 544 in 2021. By the latest measures, just under a quarter of Swedish students aged fifteen and sixteen were failing to reach basic reading comprehension. The numbers prompted hard questions about whether classrooms had leaned too far into digital tools at the expense of focused reading and teacher expertise.

1 in 4

Swedish students aged 15 and 16 were not reaching basic reading comprehension, a decline that helped prompt a national rethink.

BBC News (2026)

The Karolinska Institute, one of Europe's most respected medical research bodies, was direct about what it saw.

*There is clear scientific evidence that digital tools impair rather than enhance student learning.* — Karolinska Institute

So Sweden recalibrated. The government moved to reinvest in printed textbooks and reading materials and to make sure students had physical learning materials in hand, alongside the digital tools they already used. As Schools Minister Lotta Edholm put it, “physical books are important for student learning.”

This was not nostalgia. Sweden remains among the most digitally sophisticated countries on earth, and technology and EdTech groups have argued that pulling back too far risks leaving students short on digital skills. The government's conclusion was narrower than “screens are bad.” It was that print does some kinds of learning better, and a system that goes all-digital gives that up without meaning to. Other Nordic education systems have been watching closely.

The Swedish story matters because it answers the question hanging over every conversation about screens in schools: what happens when a whole country tests the all-digital hypothesis and looks honestly at the results? It invests in print again, on purpose.

## It Is Already Happening Here

---

Sweden is not alone, and this is no longer only a European story. Across the United States, school districts that went all-in on devices are now recalibrating, often after looking at their own data.

In April 2026, the Los Angeles Unified School District, the second-largest in the country, voted unanimously to limit student screen time, eliminate device use for the youngest learners, and encourage paper-and-pen assignments. Board member Nick Melvoin framed it plainly: the district had never reset its relationship with technology after the pandemic, and the goal now was to recalibrate rather than abandon.

Reporting by The Wall Street Journal in 2026 documented the same shift in districts of every size. A Massachusetts district moved to block open video streaming after a parent's analysis showed how much classroom time was going to noneducational sites. A district in Oregon restricted access for its youngest grades after a parent survey found strong support for removing it from school devices. A North Carolina superintendent, after an audit found distracted screen time was costing students weeks of instruction, introduced technology-free days and began phasing out one-to-one devices in elementary grades.

Up to 31

instructional days per student per year lost to distracted screen time, by one North Carolina district's own audit.

The Wall Street Journal (2026)

None of these leaders abandoned technology. Each did what Sweden did: looked at the evidence in front of them and decided that some learning belongs on paper. That is the pattern worth noticing. The institutions closest to students are moving toward intentional balance, not away from it.

## The Screen Inferiority Effect

---

Sweden's experience reflects something researchers have documented for years: a consistent, measurable pattern in which students comprehend and retain less when they read on screens than when they read the same material on paper.

Researchers call it the “screen inferiority effect.” The name is careful. It does not mean screens are bad. It means that for specific, high-stakes cognitive tasks, the kind that require sustained attention and deep processing, paper tends to outperform digital.

The evidence base is substantial. A 2024 meta-analysis led by Lidia Altamura and colleagues combined 49 studies with more than 161,000 participants comparing reading comprehension on paper and on handheld digital devices. Across that body of work, reading on paper held a consistent advantage, and the effect was more pronounced for younger readers who are still building their reading skills.

**161,000+**

students across 49 studies, in the largest meta-analysis to date comparing reading comprehension on paper and on handheld screens.

Altamura et al. (2024)

A separate 2023 meta-analysis in the Review of Educational Research, by Altamura, Vargas, and Salmerón, looked at the question from another angle: the relationship between leisure digital reading habits and reading comprehension. Drawing on data from roughly 470,000 participants, it found that digital leisure reading carried only a small association with comprehension, far weaker than the well-established benefit of print reading. For primary and early-secondary students, the relationship was negative.

Perhaps the most useful finding for educators is what researchers call the “calibration gap.” Readers on screens tend to believe they have understood material better than they actually have. They feel confident, so they stop early. Paper readers judge their own comprehension more accurately, which means they are more likely to slow down and re-read when the material gets hard. Under time pressure, on a timed assignment or a standardized test, that gap tends to widen.

## What the Research Suggests About Attention

---

The print advantage is not only about habit. It appears to be tied to how we process and locate information.

A printed page gives a reader a stable physical place for each idea. The fixed position of text on a spread, and the simple act of turning pages, help the brain build a mental map of where information lives in a document. Reading specialists, including Anne Mangen, whose 2013 study found that students comprehended linear texts better on paper than on screen, have pointed to these spatial and physical anchors as part of the explanation.

Scrolling works against that map. When text moves continuously under the eye, the spatial cues that help a reader remember where something appeared are weakened. Reading-medium researchers have consistently found that scrolling and continuous digital text are among the conditions most associated with weaker comprehension.

There is also what researchers call the “shallowing hypothesis.” Because most of our daily screen time involves quick, fragmented interactions, we can default to skimming and scanning rather than careful, analytical reading. Maryanne Wolf, in *Reader, Come Home*, and Naomi Baron, in *How We Read Now*, both describe how digital habits can quietly erode the deep, sustained reading that real comprehension depends on. As Nicholas Carr argued in *The Shallows*, the medium we read in shapes the kind of attention we bring to it.

## What Screens Do to the Developing Brain

---

The comprehension research tells us how reading medium affects understanding. A separate line of research asks a deeper question: what heavy screen exposure does to a child's brain while it is still forming. The findings are worth an educator's attention.

In a 2019 study published in *JAMA Pediatrics*, researchers used brain imaging to examine preschool-aged children and found that more screen-based media use was associated with lower structural integrity in the white-matter tracts that support language, executive function, and emerging literacy skills. These are the physical pathways a young brain relies on to learn to read.

A related 2019 study from the same research group, published in *Trends in Neuroscience and Education*, compared young children's brain activity during screen exposure against listening to a story. After screen exposure, the children showed EEG patterns resembling those associated with attention difficulties, along with weaker visual attention. The medium was shaping attention itself, not only what the children understood.

The contrast matters because the reverse is also true. Earlier imaging work by the same Cincinnati Children's Hospital team found that when young children are read to from books, a region of the brain that integrates visual and language input becomes more active. Shared reading appears to build the very networks that support comprehension. Screen-heavy routines appear to do the opposite.

These are studies of early childhood and general screen exposure, not classroom reading comprehension, so they answer a different question than the meta-analyses above. Taken together, though, they point the same direction. The developing brain is built for the focused, physical experience of a book, and it responds to that experience in measurable ways.

## The Students Who Need It Most

---

For students with learning differences, the medium of instruction is not a preference. It is a matter of access.

Students with ADHD are more affected by digital-only reading than their peers. Research by Ben-Yehudah and Brann found that students with ADHD comprehend text comparably to other students when reading in print, but fall behind when reading the same material on screen, particularly with longer texts that demand sustained attention. A stable printed surface gives these students a concrete anchor that helps offset the self-regulation challenges screens can amplify.

The effect is not limited to students who carry a diagnosis. A study at the University of Stavanger involving more than 1,100 Norwegian ten-year-olds found that students scored significantly better on comprehension tests when reading from paper. The most striking detail: high-performing girls, the students usually most resilient to a change in format, showed the largest drop when the test moved to a screen. Digital fluency does not guarantee learning fluency, even among strong students.

**1,100+**

ten-year-olds scored significantly better on comprehension when reading on paper, with the steepest drop among high-performing girls when the test moved to a screen.

Støle, Mangen & Schwippert (2020)

This is where equity comes in. Digital tools provide essential accommodations, including text-to-speech, magnification, and adjustable contrast and color. The evidence supports using both mediums deliberately rather than going all-digital. Use digital tools for accessibility,

decoding support, and interactive feedback. Use physical materials for deep processing, annotation, and long-term retention. The students who need the most support are often the ones most affected when print disappears from the classroom.

## Color as a Cognitive Tool

---

If print is the medium, color is one of the tools that can make it work harder, when it is used with intent.

Color is not only about making materials look nice. Used deliberately, it can act as a cognitive cue that guides attention and supports memory. A colored element on a plain background stands out, and things that stand out are more likely to be remembered, a pattern psychologists call the Von Restorff effect. A 2013 review in the *Malaysian Journal of Medical Sciences* by Dzulkifli and Mustafar traced how color can strengthen memory by drawing attention and adding emotional salience to what a learner sees. A 2018 review presented at the Adult Education Research Conference reached a similar conclusion about color's role in learning.

In practice, a 2022 study in *Heliyon* examined seven techniques for improving memory retention in academic settings. Color-coding of important text segments ranked first, and the medical students in the study identified it as their most effective method for remembering information.

Color is one cue among many, and its benefit depends on using it purposefully rather than decoratively. But the practical point for any institution that prints is straightforward. When a color-coded study guide, using one color for key formulas, another for concepts, another for examples, is reproduced in full color rather than downgraded to grayscale to save money, the intended cue is preserved. Every time budget pressure pushes color output to grayscale, the institution is making a small learning decision, not only a cost decision. The question worth asking is whether the savings are worth the trade-off.

## Digital for Speed. Print for Stakes.

---

None of this argues for abandoning technology. Screens are excellent at what screens do well: fast updates, scheduling and communication, formative quizzes with instant feedback, interactive simulations, and quick introductions to new ideas.

The argument is for calibration. The right medium for the right task.

When the goal is deep comprehension, a core textbook chapter, a dense set of instructions, an expository reading assignment, print is the stronger choice. When the goal is access, a student

with an IEP who needs a large-print workbook, a color-coded study guide, or a printed exam booklet, print is essential. When the goal is high-stakes assessment, where focus and accurate self-judgment shape the outcome, paper tends to win.

The framework is simple: digital handles speed, print handles stakes. Schools that adopt this lens do not need to walk back their technology investments. They need to make more intentional choices about which moments call for a screen and which call for a page.

Sweden did not abandon technology. It recalibrated. The most digitally advanced country in Europe looked at the evidence and decided physical textbooks belong in the mix. That is not a step backward. It is a step toward precision.

## What This Means for Your Students

---

The research gathered here, spanning meta-analyses of hundreds of thousands of students, classroom studies, and a national policy reversal, points in one direction. When learning is the goal, print is not a relic. It is a tool with specific, measurable advantages that digital formats do not fully replicate.

Students today are navigating an unprecedented level of screen saturation, and they are forming reading habits shaped by scrolling and fragmented attention. The students who need the most support, those with ADHD, dyslexia, and other learning differences, are affected most when print disappears from instruction.

The question facing every institution is not whether to use technology. It is whether you are choosing the right medium when the stakes are highest, when a student needs to truly understand, retain, and apply what they have learned.

---

**When it matters most, put it in their hands.**

---

## About SumnerOne

---

SumnerOne is a family-led company that has been keeping work flowing for over 70 years. We serve schools, universities, and organizations across the Midwest, connecting print, IT, and service under one partnership so the people who depend on your institution can be reached, supported, and protected.

We manage print fleets, secure networks, automate document workflows, and keep the communication tools your teams rely on running the way they should. When your environment spans front-office productivity and high-volume production, we support both, because a printer in the front office and a press on the production floor are part of the same operation.

Through our national subsidiary, Production Print Solutions, we extend that capability to large-scale, multi-vendor production environments across 30 major markets, with vendor-neutral service that selects technology based on your output needs.

We believe the science in this paper matters. Not because it sells equipment, but because it changes the conversation about what students need and how institutions can deliver it.

If this paper raised questions about your own environment, we would welcome the conversation.

**[sumnerone.com/education](https://sumnerone.com/education)**

## Works Cited

---

- Altamura, L., Vargas, C., & Salmerón, L. (2025). Do new forms of reading pay off? A meta-analysis on the relationship between leisure digital reading habits and text comprehension. *Review of Educational Research*, 95(1), 53–88. (Prepublished December 2023.) Meta-analysis of leisure digital reading and comprehension drawing on data from roughly 470,000 participants.
- Baron, N. S. (2021). *How We Read Now: Strategic Choices for Print, Screen, and Audio*. Oxford University Press. Analysis of how reading medium affects concentration, comprehension, and the tendency to skim.
- BBC News. (2026). Back to books: Sweden's schools give up digital learning. Reporting on Sweden's reinvestment in printed textbooks, its PIRLS reading decline, and the Karolinska Institute statement on digital tools and student learning.
- Ben-Yehudah, G., & Brann, A. (2019). Pay attention to digital text: The impact of the media on text comprehension and self-monitoring in higher-education students with ADHD. *Research in Developmental Disabilities*, 89, 120–129. Students with ADHD comprehend comparably in print but struggle more with longer digital texts.
- Carr, N. (2020). *The Shallows: What the Internet Is Doing to Our Brains* (10th-anniversary edition). W. W. Norton. On how digital reading habits reshape attention and memory.
- Chang, B., Xu, R., & Watt, T. (2018). The Impact of Colors on Learning. Adult Education Research Conference. A review of how color can influence learners' cognition and emotion.
- Clinton, V. (2019). Reading from paper compared to screens: A systematic review and meta-analysis. *Journal of Research in Reading*, 42(2), 288–325. Confirms a paper advantage for comprehension, strongest for expository texts and under time pressure.
- Delgado, P., Vargas, C., Ackerman, R., & Salmerón, L. (2018). Don't throw away your printed books: A meta-analysis on the effects of reading media on reading comprehension. *Educational Research Review*, 25, 23–38. Landmark meta-analysis on the screen inferiority effect; the paper advantage grows under time constraints and with informational texts.
- Diachenko, I., Kalishchuk, S., Zhylin, M., Kyyko, A., & Volkova, Y. (2022). Color education: A study on methods of influence on memory. *Heliyon*, 8(11), e11607. Among seven techniques studied, color-coding of important text segments ranked first for memory retention.
- Dzulkifli, M. A., & Mustafar, M. F. (2013). The influence of colour on memory performance: A review. *Malaysian Journal of Medical Sciences*, 20(2), 3–9. Review of how color, attention, and emotional arousal interact to affect memory performance.
- Hutton, J. S., Dudley, J., Horowitz-Kraus, T., DeWitt, T., & Holland, S. K. (2019). Associations between screen-based media use and brain white matter integrity in preschool-aged children.

JAMA Pediatrics, 173(9), 853–865. Higher screen use was associated with lower integrity of white-matter tracts supporting language and literacy.

Mangen, A., Walgermo, B. R., & Brønnick, K. (2013). Reading linear texts on paper versus computer screen: Effects on reading comprehension. *International Journal of Educational Research*, 58, 61–68. Foundational study on spatial markers and the role of the physical page as a memory aid.

Singer, L. M., & Alexander, P. A. (2017). Reading across mediums: Effects of reading digital and print texts on comprehension and calibration. *The Journal of Experimental Education*, 85(1), 155–172. Documents the calibration gap between print and screen reading.

Støle, H., Mangen, A., & Schwippert, K. (2020). Assessing children’s reading comprehension on paper and screen: A mode-effect study. *Computers & Education*, 151, 103861. Study of more than 1,100 Norwegian ten-year-olds; the paper advantage was largest among high-performing girls.

Wolf, M. (2018). *Reader, Come Home: The Reading Brain in a Digital World*. HarperCollins. Neuroscience perspective on how shallow digital processing reshapes the developing reading brain.

The Wall Street Journal. (2026). How YouTube took over the American classroom. Reporting on the scale of YouTube use on school-issued devices and on districts moving to limit or block it. Examples of district recalibration referenced in this paper draw on this reporting and on public school board records.

Zivan, M., Bar, S., Jing, X., Hutton, J., Farah, R., & Horowitz-Kraus, T. (2019). Screen-exposure and altered brain activation related to attention in preschool children: An EEG study. *Trends in Neuroscience and Education*, 17, 100117. Screen exposure was associated with EEG patterns previously linked to attention difficulties.