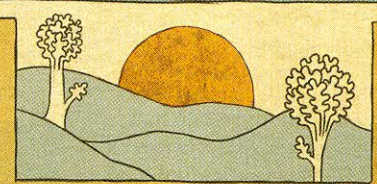


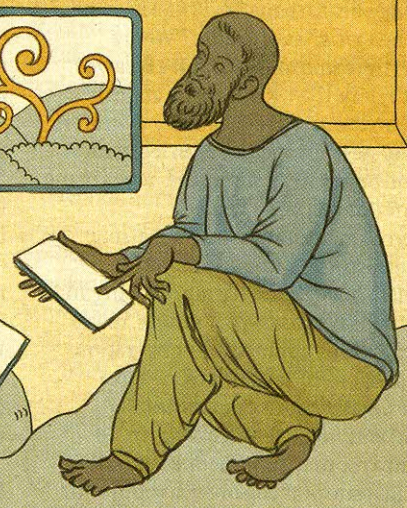
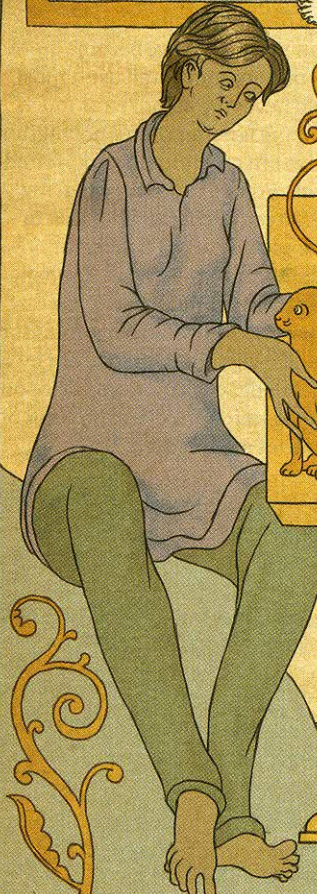
The

ARTISTS



on the

SCREEN



Digital technology is transforming the way we read and ^{write} write. Does it matter, asks Tiffany O'Callaghan?

WE READ more than ever – three times as much as we did in 1980, according to one study. But we're reading differently. Take a look around a train carriage full of commuters nowadays and you'll probably see more people perusing text on phones and tablets than in newspapers and books.

We're writing differently, too. Not so long ago people at meetings and lectures scribbled away furiously with their pens as they took notes. Today, talks and presentations are accompanied by the manic click-clack of laptop keyboards.

Hurrah, some say. Our smartphones and tablets are expanding our worlds. We now have access to vast libraries literally at our fingertips. Good riddance to shoulder-wrenching textbooks, teetering towers of dusty papers, leaky pens and cramped hands.

Others, though, worry that the benefits of digital technology come at a cost. Is all that skimming, scrolling and flicking around electronic screens dulling our capacity for sustained attention and deeper reading? Is there something special about pen-on-paper that typing fails to reproduce?

There is no going back, of course. Digital screens are here to be superseded. But if they do affect the way we read and write, we need to know so we can maximise the benefits and minimise any downsides. And we need to know sooner rather than later. In many schools, there is already a growing focus on typing, sometimes at the cost of teaching handwriting skills. Will these children be better or worse off as adults?

³¹ There is a **long history** of dire, and often misplaced
³² or even made up, warnings about new technologies.
³³ Around **2500 years** ago, Socrates decried the arrival
³⁴ of writing, saying it would erode memories and give
³⁵ the illusion of knowledge rather than the **real** thing.
³⁶ In the 1970s, the big worry was the use of calculators
³⁷ in schools. Now there's **concern** about the changes in
³⁸ our reading and writing habits – and with reason, some
³⁹ studies suggest.

About a year ago, Pam Mueller, a PhD student at Princeton University, forgot to take her laptop to a lecture and had to resort to old-fashioned pen and paper. "I felt like I got so much more out of the lecture that day," she says.

RICHARD MILNE/CORBIS

She mentioned this to her supervisor Daniel Oppenheimer, now at the University of California, Los Angeles. A few days later, as Oppenheimer was typing away frantically in a meeting, he suddenly realised that although he was recording nearly everything people said, he had almost no idea what they were talking about. So the two psychologists decided to do a series of experiments comparing taking notes by hand with typing on a laptop.

They found that students who took notes by hand generally understood the content of a lecture better and remembered more. **Mueller thinks that mindlessly** typing away may record more material at the cost of paying attention. Because we write much more slowly than we can type, longhand note-taking forces people to work through the ideas as they listen and choose which concepts to jot down.

Are typewritten notes at least better for studying? When students were asked to review their notes and take a test a week after a lecture, the longhand note takers still did better. "It suggests that if you didn't understand it the first time, looking back over it later isn't going to help much," Mueller says.

She thinks it's the way students tend to use laptops that's problematic, rather than the laptops themselves. Using software that limits typing speed, or a stylus and tablet, might erase the difference, Mueller suggests.

Even before her study came out earlier this year, there was a growing movement towards banning laptops in lecture halls and classrooms. The main argument is simple:



Tiffany O'Callaghan

Digital devices are distracting.

When you've got a laptop open in front of you, it's very tempting to browse the web, check email or watch the latest viral video. Unsurprisingly, this kind of multitasking has been shown to degrade performance – and not just for you, but for those around you who get distracted by your on-screen flitting.

Distraction is not just an issue in classrooms. It might help explain why many studies suggest that >

e-reading results in poorer comprehension. Even if you are so engrossed in a novel that you're not tempted to check Facebook instead, alerts can still pop up on the screen and divert you. And some books now come with built-in distractions, in the form of (🔊) embedded videos and web links.

In electronic textbooks, such features are supposed to help students learn, of course. But some studies suggest they can distract them instead. [Clicking on too many links](#) can make students lose the thread of what it is they are trying to learn.

Even without distractions, we seem to get less from reading on a screen. In the days of flickering monitors, screen quality may have been a factor. But modern displays are steady, the resolution can even be higher than cheap print and the size of text can be adjusted to whatever suits you. And while some argue that the glare from glossy backlit screens still makes them harder on the eye, displays on e-ink readers are increasingly comparable to old-fashioned print. And yet reading on them is not the same.

In an as-yet-unpublished study, Anne Mangen at the Reading Centre at the University of Stavanger in Norway asked volunteers to read a mystery story either on a Kindle DX – which has an e-ink display – or in booklet form. “Those who read it on paper were better at reconstructing the plot than those who read it on the Kindle,” she says. They were also nearly twice as good at putting 14 plot events in the right sequence.

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Don't Allow

OK

Why should this be so? In part, Mangen and others suggest, this may have to do with how well we can keep track of where we are as we read. In a paper book or magazine, there are plenty of physical clues to help us. You might recall, for instance, that a certain passage was about a third of the way into the book, halfway down a right-hand page. But when using an e-reader, you do not have that physical sense of how long a book is and how far through you are, and the position of text on a page isn't usually fixed.

If so, it might help to try recreate the look and feel of a real book – with large margins that show better how many pages have been read and remain to read, for example. But the trend at the moment is away from such skeuomorphic designs.

Notes:

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And do these findings matter? When it comes to reading for pleasure, after all, some might argue that what counts is emotional engagement rather than how well we recall each plot turn afterwards. No difference in emotional response was found in the Kindle/booklet study. In another study, though, Mangen asked 145 university students to read a story about a tragic event either in a booklet or on an iPad. When told it was a true story, those who read it on an iPad were less likely to experience heightened empathy or “transportation” – a sense of getting lost in the world of the story.

**TYPING RATHER THAN WRITING BY HAND
MAY ALTER THE WAY WE THINK**

This study and others suggest that we get more from print. Mangen, however, cautions about leaping to broad conclusions based on small studies involving specific formats. And the big question is not whether we get more from reading a particular piece in print instead of on a digital device. It is whether habitually reading on a screen colours our experience of reading in general, whatever the format.

Many worry that our current culture of online reading – with ads flashing in the margins, hyperlinks pulling us away halfway through a story and so on – is undermining our capacity for the sustained attention necessary for deep reading, the kind required to navigate the twists and turns of complex literary fiction, for instance. Such worries have already spurred the formation of a “slow reading” movement.

Equally, there are concerns about whether typing rather than writing alters the way we handle and recall information. In other words, does it change the way we think? For young children, the answer seems to be yes. Learning letters by writing them by hand produces measurable changes in brain activity compared with typing them (see “In your write mind”, right). How much typing and reading on a screen matters for teenagers and adults, though, is far less clear.

These are difficult and nuanced questions to study, particularly given the rapid evolution of technology. But with educational authorities rushing to make major decisions, such as introducing tablets in classes

And despite huge advances in this area, adding notes to e-books remains tricky and not particularly satisfying

IN YOUR WRITE MIND

Reading is not an instinct. As children, we have to start from scratch. We wire our brains to read by gradually reinforcing links between the critical areas: those that recognise the visual form of letters, those that tell us what a word sounds like and how you physically say it, and so on.

Writing by hand helps to forge these brain connections. When we learn how to write, we recruit parts of the brain known as the motor cortices that control physical movements. When we read, those same areas are activated - suggesting we basically write words in our minds as we read them.

Cognitive neuroscientist Karin James of Indiana University in Bloomington has found that young children can recognise new letters more readily when they learn the letters by writing them, rather than by typing or tracing. James has also shown that some brain regions that light up when adults read also become active in children looking at letters they've learned to print by hand - but not in children who've learned letters by typing them.

This seems like strong evidence of the importance of handwriting, but James cautions that just because adults use certain circuitry to read

does not necessarily mean it's the only wiring that could work. "Our brains are clearly adaptable," she says. "It might be just fine to start typing - and for that you need a whole different brain network and learn how to read that way. We don't know yet."

For now though, most studies suggest handwriting has a critical role to play. Marieke Longcamp at Aix-Marseille University in France has shown that when adults learned unfamiliar characters based on the Bengali and Gujarati alphabets either by writing or typing, those who wrote out the letters remembered them better three weeks later.

And China might provide an example of what happens when typing starts to replace handwriting. There, rates of severe reading difficulties have soared since the 1990s - and this appears to be linked to children's increasing use of "pinyin" typing, a way of typing Chinese characters using a standard QWERTY keyboard.

Part of the problem is that typing does not instill the same understanding of character or letter forms as writing by hand. "If you show children just a single typical A, they're not going to be able to understand that another form of an A is the same thing," James says. The messy and

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inconsistent way that children (and many adults) tend to write, by contrast, may help them to cope with a wide variety of typefaces and letter forms.

Writing freehand, then, seems to be an important part of learning to read - but does the type of handwriting make a difference? Some schools have stopped teaching cursive or joined-up writing. In the US, for instance, it is

not part of the national curriculum adopted by 46 states, though it has been reinstated by some states in response to a public outcry. When it comes to learning to read, though, James has found that writing in cursive doesn't seem to add anything to the mix. "It seems like it's any kind of creation of a letter by hand that makes the difference," she says.

or banning laptops in lecture halls, answers are urgently needed. "It is unfortunate that so many strong positions are taken on such a shallow knowledge base," Mangen says. To try to answer the big questions, she is leading a major four-year initiative funded by the European Union. The Evolution of Reading in the Age of Digitisation (E-READ) project involves researchers from 25 countries, and will get under way later this month.

In the meantime, we also need to recognise that the changes in our reading and writing habits are being driven by more than just the physical aspects of reading on a screen or typing instead of writing by hand. A 2011 study by Betsy Sparrow at Columbia University in New York found that when people know they can look something up later, they are far less likely to remember it. What is more, they tend to recall how to find what they've been asked to learn,

rather than the information itself.

"We have changed our understanding of what we want our students to learn, or what we want ourselves to retain, because our technologies say, you can look it up," says Naomi Baron of American University in Washington DC, author of the forthcoming book *Words Onscreen: The fate of reading in a digital world*. "If there's a major storm and there's no electricity, your internet connection is out and the batteries on your computer and iPhone have run down - do you know anything?"

Socrates had a point when he claimed writing would change the nature of knowledge. And now, in the age of ever-present digital technology and instant internet access, one thing is perfectly clear: [the nature of knowledge is changing again.](#) ■

Tiffany O'Callaghan is senior opinion editor at *New Scientist*