

Attending to reading in a digital age

By Naomi S. Baron

The digital revolution has done much to reshape the ways in which students read, write, and access information in school. Once-handwritten essays are now word-processed. Encyclopedias have yielded to online searches. One-size-fits-all teaching is tilting toward personalized learning. And a growing number of assignments ask students to read on digital screens rather than in print.

Yet how much do we actually know about the educational implications of this emphasis on using digital media? In particular, when it comes to reading, do screens make it easier or harder for students to pay careful attention to words and the ideas behind them, or is there no difference from print?

Over the past decade, researchers in various countries have been comparing how much readers comprehend and remember when they read in each medium. In nearly all cases, there was essentially no difference between the testing scenarios. (See Baron, Calixte, & Havewala, 2017 for a review.) However, such findings need to be taken with a grain of salt. These studies have typically focused on captive research subjects, mostly college students who commonly are paid to participate in an experiment, or who participate in order to fill a course requirement. Ask them to read passages and then answer SAT-style comprehension questions, and they tend to do so reasonably carefully, whether they read on a screen or on paper. Under those conditions, it's not surprising that their performance would be consistent across platforms.

But the devil may lie in the details. When researchers have altered the testing conditions or the types of questions they ask, discrepancies have appeared, suggesting that the medium does in fact matter. For example, Ackerman and Goldsmith (2011) observed that when participants could choose how much time to spend on digital versus print reading, they devoted less to reading onscreen and had lower comprehension scores. Schugar et al. (2011) found that participants reported using fewer study strategies (such as highlighting, note-taking, or bookmarking) when reading digitally. Kaufman and Flanagan (2016) noted that

when reading in print, study participants did better answering abstract questions that required inferential reasoning; by contrast, participants scored better reading digitally when answering concrete questions. Researchers at the University of Reading (Dyson & Haselgrove, 2000) observed that reading comprehension declined when students were scrolling as they read, rather than focusing on stationary chunks of text.

What about research with younger children? Schugar and Schugar found that middle grades students comprehended more when reading print than when using eBooks on an iPad (Paul, 2014) — interactive features of the digital platform apparently distracted readers from the textual content. However, the same researchers observed that among K-6 readers, eBooks generated a higher level of engagement (Schugar et al., 2013). Working with high school students in Norway, Anne Mangen and her colleagues (2013) concluded that print yielded better comprehension scores. Mangen argues that print makes it easier for students to create cognitive maps of the entire passage they are reading.

For educators, though, the real question is not how students perform in experiments. More important is what they do when reading on their own: Do they take as much time reading in both media? Do they read as carefully? In short, in their everyday lives, how much and what sort of attention do they pay to what they are reading?

Questions about reading in a digital age

History is strewn with examples of people worrying that new technologies will undermine older skills. In the late 5th century BC, when the spread of writing was challenging an earlier oral tradition, Plato expressed concern (in the *Phaedrus*) that “trust in writing ... will discourage the use of [our] own memory.”

Writing has proven an invaluable technology. Digital media have as well. These new tools make it possible for millions of people to have access to texts that would otherwise be beyond their reach, financially or physically. Computer-driven devices enable us to expand our scope of educational and recreational experience to include audio and visual materials, often on demand. But as with writing, it’s an empirical

question what the pros and cons are of the old and the new. Writing is a vital cultural tool, but there is little doubt it discourages memory skills.

When we think about the educational implications of digital reading, we need to study the issue with open minds, not make presuppositions about advantages and disadvantages.

To help forward this exploration, my own research has been tackling three intertwined questions about reading in a digital age. First, what do readers tell us directly about their print versus digital reading habits? Second, what else do readers reveal about their attitudes toward reading in hardcopy (that is, print) versus onscreen, and what can we infer about how well they pay attention when reading in each medium? The third question is more broad-stroked: In the current technological climate, are we changing the very notion of what it means to read?

I've been investigating these questions for about a half-dozen years, beginning with some pilot studies in the U.S. (Baron, 2013) and continuing with surveys (between 2013 and 2015) of more than 400 university students from the U.S., Japan, Germany, Slovakia, and India. Participants were enrolled in classes taught by my colleagues, or they were classmates of one of my research assistants. Everyone was between age 18 and 26 (mean age: 21). About two-thirds were female and one-third male. (For study details, see Baron, Calixte, & Havewala, 2017.) Though my study participants were university students, I suspect that most issues at play are relevant for younger readers who have mastered the skills we would expect of middle-school students and above. Use of digital technologies is now ubiquitous among both adolescents and young adults, and teachers at all levels are increasingly assigning eBooks (or online articles) rather than print.

The study consisted of three sets of questions. In the first set, students were asked

- how much time they spent reading in print versus onscreen
- whether cost was a factor in their choice of reading platform
- in which medium they were more likely to reread
- whether text length influenced their platform choice
- how likely they were to multitask when reading in each medium
- in which medium they felt they concentrated best

In the next set, I asked what students liked most — and least — about reading in each medium. Finally, I gave participants the opportunity to offer any additional comments.

Print versus digital reading habits

Here are the main takeaways of what students in the study reported in the first set of questions about their reading habits:

Time reading in print versus onscreen

Overall, participants reported spending about two-thirds of their time reading in print, both for schoolwork and pleasure. There was considerable variation across countries, with the Japanese doing the most reading onscreen. In considering these numbers, especially for academic reading, we need to keep in mind that sometimes reading assignments are only available in one medium or the other, so students are not making independent choices.

Cost

More than four-fifths of the participants said that if cost were the same, they would choose to read in print rather than onscreen. This finding was particularly strong for academic reading, and especially high in Germany (94%). Cost is the reason that students (and, for that matter, K-12 school systems) often cite for selecting digital rather than print textbooks. It's therefore telling that if you ask digital millennials their preference if cost is removed from the equation, print is commonly preferred.

Rereading

Not everyone in the study reread — either for schoolwork or for pleasure. Among those who did, six out of ten indicated they were more likely to reread print. Fewer than two out of ten choose digital, while the rest said both media were equally likely. Rereading is relevant to the issue of attention, since a second reading offers opportunities for review or reflection.

Text length

When the amount of text is short, participants displayed mixed preferences, both when reading academic works or for pleasure. However, with longer texts, more

than 86% preferred print for schoolwork and 78% when reading for pleasure. Preference for reading longer works in print has been reported in multiple studies. As Farinosi et al. (2016) observed, “If the text requires strategic reading, such as papers, essays, books, the paper version is preferred” (p. 417).

Multitasking

Students reported being more likely to multitask when reading onscreen than in print. Responses from the U.S. participants were particularly stark, with 85% indicating they multitasked when reading digitally, compared with 26% for print. The detrimental cognitive effects of multitasking are well known (e.g., Carrier et al., 2015). We can reasonably infer that students who multitask while reading are less likely to be paying close attention to the text than those who don't.

Concentration

The most dramatic finding for this set of questions came in response to the query about the platform on which students felt they concentrated best. Selecting from print, computer, tablet, eReader, or mobile phone, 92% said it was easiest to concentrate when reading print.

Paying attention to reading

Responses to the first set of questions hinted at the kinds of open-ended comments that appeared in sets two and three. Set two contained four questions:

- What do you like most about reading in hardcopy?
- What do you like least about reading in hardcopy?
- What do you like most about reading onscreen?
- What do you like least about reading onscreen?

Set three requested additional comments, which almost 130 students provided. A detailed coding system was designed for the four questions in set two, while the additional comments were analyzed more informally.

The open-ended data offered a fascinating window onto young adults' likes and dislikes about the two reading platforms. They praised the physicality of print but grumbled that it was not easily searchable. They complained that reading onscreen gave them eyestrain but enjoyed its convenience.

They also had telling comments about the cognitive consequences of reading in hardcopy versus onscreen. Of all the “like least” comments about reading digitally, 21% were cognitive in nature. Nearly all these comments talked about perceived distraction or lack of concentration. Students in the U.S. were especially vocal: Nearly 43% of their “like least” comments about reading digitally concerned distraction or lack of concentration. Not surprisingly, when responding to the question of what they “liked most” when reading in print, respondents offered such comments as “It’s easier to focus” and “feel like the content sticks in the head more easily.”

The additional comments section yielded more observations about cognitive consequences of reading in print versus onscreen. Two examples: “reading in hardcopy makes me focus more on what I am reading,” and “I feel like I understand it more [when reading in print].”

There were also remarks regarding how long it takes to read the same length text on the two platforms. One student wrote, “It takes more time to read the same number of pages in print comparing to digital,” suggesting that the mindset she brings to reading print involves greater (and more time-consuming) attention than the one she brings to reading digitally. In fact, in an earlier pilot study, one student wrote this about what she “liked least” about reading hardcopy: “It takes me longer because I read more carefully.”

Unexpectedly, several students commented that they found reading in print to be boring. In response to the question of what they “liked least” about reading in print, one participant complained that “It becomes boring sometimes,” while another wrote, “it takes time to sit down and focus on the material.” Coincidentally, the suggestion that print (unlike digital reading) is boring recently surfaced in a different context at my university. A group of freshmen were being surveyed about a course in which they were enrolled that introduced them to college life. While some of the course readings were online, others were in print. When asked to comment on the materials, several students reported that reading print is boring.

Common sense suggests that if a priori, students judge that text appearing in print will be boring, they likely approach it with reduced enthusiasm. Diminished interest sometimes translates into skimming rather than reading carefully, and sometimes into not doing the assigned reading at all.

Is the nature of reading changing?

The biggest challenge to reading attentively on digital platforms is that we largely use digital devices for quick action: Look up an address, send a Facebook status update, grab the news headlines (but not the meat of the article), multitask between online shopping and writing an essay. When we go to read something substantive on a laptop or eReader, tablet or mobile phone, our now-habitualized instincts tell us to move things along.

Coupled with this mindset is an evolving sense that writing is for the here-and-now, not the long haul. Since written communication first emerged (in different places, under different circumstances, at different times), one of its consistent attributes has been that it is a durable form of communication, one we can reread or refer to. Today, a nexus of forces is making writing seem more ephemeral.

A recent Pew Research Center study of news-reading habits (Mitchell et al., 2016) reported that among 18-29 year-olds, 50% said they often got news online, compared with only 5% by reading print newspapers. While some of us save print news clippings, few archive their online versions. When it comes to school textbooks that students need to procure themselves, vast numbers of students choose to rent (whether digitally or in print), meaning that at the end of the semester, the book is out of sight and not available for future consultation. True, students in K-12 have long been giving back their print books at the end of the year, and college students have commonly sold books they don't wish to keep. But my conversations now with students who are dedicated readers indicate they don't see their college years as the time to start building a personal library.

What about public or school libraries? Increasingly, budgets are being shifted from print to digital materials. The three primary motivations are space, cost, and convenience. To grow the collection, you don't need to build another wing. Digital is (commonly) less expensive. And users can access the collection any time of day and anywhere in the world. You just need an internet connection.

All true. But there are consequences. One I experience personally. When I access a library book digitally, I find myself "using" it, not reading it. I make a quick foray to find, for instance, the reference I need for an article I'm writing, and then I exit. Had I held the physical book in my hand, it might have taken me longer to find the reference, but I probably would have ended up reading entire paragraphs or chapters. Microsoft researcher Abigail Sellen has made a related observation. In studying how people perceive material they read (or store) online, she says they "think of using an e-book, not owning an e-book" (cited in Jabr, 2013).

Savvy students are aware of how the FIND function lets them zero in on a specific word or phrase so as to answer a question they have been asked to write about, blithely dismissing the obligation to actually read the full text they were assigned. Using, not reading. The more we swap out physical books for digital ones, the easier we make it for students to swoop down and cherry-pick, rather than work their way through an argument or story.

Finally, contemporary digital technology is altering the role of reading in education. Film strips of old have been replaced by far more engaging (and educationally-enriching) TED Talks and YouTubes, podcasts and audio books. The potential of these digital media is extraordinary, both because of their educational richness and the democratic access they provide. Yet at the same time, we should be figuring out the right curricular balance of video, audio, and textual materials.

Implications for educators

The most important lesson I have learned from my research on reading in print versus digitally is the value of asking users themselves what they like and don't like — and why — about reading in each medium. Students are acutely aware of the

cognitive tradeoffs that many perceive themselves to be making when reading on one platform rather than the other. The issue is not that digital reading necessarily leads us to pay less attention. Rather, it is that digital technologies make it easy (and in a sense encourage us) to approach text with a different mindset than the one most of us have been trained to use while reading print.

We need to be asking ourselves how the digital mindset is reshaping our students' (and our own) understanding of what it means to read. Since online technology is tailor-made for searching for information, rather than analyzing complex ideas, will the meaning of 'reading' become "finding information" rather than "contemplating and understanding"? Moreover, if print is increasingly seen as boring (compared with digital text), will our attention spans while reading print generally diminish?

Conceivably, we might progressively abandon careful reading in favor of what has been called 'hyper reading' – in the words of Katherine Hayles (2012), reading that aims "to conserve attention by quickly identifying relevant information, so that only relatively few portions of a given text are actually read" (p. 12). To be fair, even academics seem to be taking less time per scholarly article, particularly online articles, than they used to (Tenopir et al., 2009). When it comes to using websites, studies indicate (Nielsen, 2008) that on average, people are likely reading less than 30% of the words.

The issue of sustained attention extends beyond reading onscreen to other digital media. Patricia Greenfield (2009) has observed that while television, video games, and the internet may foster visual intelligence, "the cost seems to be deep processing: mindful knowledge acquisition, inductive analysis, critical thinking, imagination, and reflection."

Returning to the physical properties of print: If fewer young adults are building their own book collections, and if libraries are increasingly going digital, will writing no longer be seen as a durable medium? Yes, we could always look something up again on a digital device, but do we? If audio and video are gradually supplanting text as sources of education and personal enrichment, how should we think about the future role of text as a vehicle of cultural dissemination?

Digital technology is still in its relative infancy. We know it can be an incredibly useful educational tool, but we need much more research before we can draw firm conclusions about its positive and negative features. In the case of reading, our first task is to make ourselves aware of the impact technology potentially has on the way we wrap our minds around the written word when encountered in hardcopy versus onscreen. Our second task is to embed that understanding in our larger thinking about the role of writing as a means of communicating and thinking.

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