

Turning the Page: What Research Indicates about Print vs. Digital Reading

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The use of digital devices for reading has surged in schools over the past twenty-five years. Nearly every US school now uses digital devices for reading development, amounting to billions of dollars in annual investment.

It is understandable why so many schools have bought into digital learning technology. Tools like tablets and eBooks have many potential advantages for readers. They can increase readers' exposure to recent content, enhance their engagement through interactive features, and improve accessibility (e.g., text-to-speech, adjustable font sizes, and high contrast modes).

With so many benefits, digital devices are often thought to be superior to printed materials. But are they?

To answer this question, my research team and I analysed 74 studies in two meta-analyses. On the whole, we found that the use of digital devices shows a small negative relationship with reading outcomes. Evidence is somewhat mixed on whether negative reading outcomes are stronger for students of different age groups. We also find results suggesting that reading on handheld digital devices produces smaller negative effects than reading on computers does.

The Benefits of Print Reading

Researchers have shown that young readers who read frequently enhance their literacy skills, and that routine reading motivates readers to pursue more challenging texts over time. This dynamic relationship among literacy skills, engagement, and language learning is sometimes referred to as the "virtuous circle of reading". The

question of whether digital tools promote positive reading outcomes is an important one because there is a long literature on the benefits of reading with print materials. The same benefits for reading in print might not translate to digital devices.

For example, in an experimental study in 2022, my research team and I gave study participants the same text but in different formats – either on a tablet or printed on paper. Results showed that readers comprehended and retained slightly less information when reading on digital screens compared to reading with printed materials. My colleagues and I decided to see if the results of this study were consistent with other similar studies by doing a meta-analysis.



Image by Freepik

Habitual digital reading and reading comprehension

In 2023, my colleagues and I released a meta-analysis of 25 correlational studies published between 2000 and 2022. These studies tested the relationship between reading comprehension and the self-reported frequency of leisure reading with digital devices (such as laptops, tablets, and e-books). In aggregate, there were 470,000 participants from at least three dozen countries represented in our analysis. Our overall findings indicated a small negative

relationship (r = -0.06) between the use of digital devices for leisure reading and reading comprehension.

Our results varied by age groups. During elementary and middle school years, we saw stronger (although still small) negative associations, but during high school and university, we found a small positive relationship between leisure reading on digital devices and reading comprehension. We theorized that this difference may be because younger readers find it harder to process information on screens, are more distracted by digital features, and feel greater physical discomfort when using screens for prolonger periods. For young children, we estimate that those who spend ten hours reading print books or magazines in their free time will exhibit six to eight times higher levels of reading comprehension than young children who spend the same amount of time reading on digital devices.

I would also note that some caution is warranted when interpreting our results. The studies that we analysed are based on self-report questions about reading habits (e.g., How much time do you spend on leisure reading from the Internet sources you mentioned?") that may subject to certain response biases.

Digging deeper into print vs digital reading

In 2024, my colleagues and I published a second meta-analysis combining the results of 49 studies that compared reading comprehension differences for print and digital handheld formats (e.g., tablets and e-readers). From this analysis, 30 studies compared different people (161,469 participants) using various reading formats while 19 studies compared the same people (1,379 participants) when using different formats. Our findings for both between-participant (k=38, g=−0.113) and within-participant (k= 21, g=−0.103) research designs showed a small overall negative effect for digital handheld reading when compared to reading on paper.

Even though we observed a "screen inferiority effect", the effect that we observed is approximately half of those reported in studies that include research findings measuring reading on computers. When compared to computers, handheld devices like e-readers might cut

down on distractions and enable physical interaction that is closer to what occurs when an individual is reading with print materials. This situation could explain the smaller negative effect of handheld devices.

So why are digital devices less effective?

One of the most influential theoretical accounts for the negative effects of digital reading is the shallowing hypothesis. The shallowing hypothesis assumes that typical interactions with digital devices involve rapid engagement with short texts. These short episodes may foster a mindset that places emphasis on browsing as much information as possible without much in-depth focus. When people read on digital devices, these devices may cause them to be less efficient in allocating cognitive resources when reading. This problem could be challenging for texts that demand readers to self-regulate their reading processing.

By contrast, the expectations that we have for printed materials could be different. Studies on media preference indicate that we prefer to read printed books because we feel able to concentrate and read them in a more attentive manner. Our brains may find it difficult to engage in deep reading with digital devices because we do not normally use them for this purpose.

In our meta-analysis of leisure digital reading habits, we tried to differentiate among types of digital reading. We created two categories – one for digital reading that focused on reading linear informative texts and another for those that focused more on communicative purposes (e.g., social media and instant messaging). Surprisingly though, we did not find differences between these categories. One potential explanation is that reading pixelated digital text may impose a higher cognitive load compared to reading printed material. Some experiments suggest that screens may require more mental resources to process information effectively because of pixelation and gaps between pixels that need to be resolved by the brain.

Another possible explanation is that digital content on the Internet is more likely to be fragmented, decontextualized, and inaccurate, which can hinder the development of comprehension skills. Language used in digital texts often mirrors conversational speech rather than adhering to formal vocabulary and grammar rules. Such informality is uncommon with print content because print materials must usually undergo editorial review before being published and commercialized. For these reasons, digital texts might limit readers' exposure to advanced syntactic structures that enrich vocabulary and comprehension.

Implications for Schools

Screens will certainly continue to be an integral part of children's daily lives. Instead of eliminating screens in schools altogether, we should focus on understanding how our use of digital devices can influence cognitive processes and how digital features can help or disrupt reading comprehension. For instance, the use of digital screens for locating and reading about research for a class project might make sense in some cases, but for reading comprehension activities, print materials are probably going to be more beneficial.

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Suggested Citation. Altamura, L. (2024). Turning the page: What research indicates about print vs. digital reading**.** *Oklahoma Education Journal, 2*(4), 18-22