Print and Paper The Facts

Print and paper play a key role in learning and literacy

When you think about learning, typically you envision students at their desks putting pencil to paper, or listening to a teacher in the front of the classroom. However, today there are a variety of tools that support learning and literacy.

Around the world at an increasingly rapid pace, new classroom learning methods and tools, including digital technology, are being adopted. Interestingly, current research reports that there are learning and retention limitations to engaging digital technology in the classroom and as a studying tool when compared to pencil and paper.

Two Sides has compiled some eye-opening facts about learning and literacy that demonstrate why print, paper and pencil remain highly effective learning tools. From handwriting, to reading, to comprehension and retention—print, paper and handwriting deliver proven benefits and continue to play an essential role in education and development.

- "Having a wide range of writing skills – from the basic production of letters, shapes and numbers to quality handwriting – has been positively linked to academic performance."[1]
- "…students who read texts in print scored significantly better on the reading comprehension test than students who read the texts digitally."[2]
- For young children, the development of handwriting is a complex task requiring the coordination of several cognitive, motoric and neuromotor processes and recent evidence suggests that writing by hand in the early years supports the development of reading skills.[3]
- "Fine motor writing skills in preschool were consistently stronger predictors of reading and math achievement than fine motor manipulation tasks."[4]
- "Elementary students who write by hand are found to write more quickly, produced longer pieces, and wrote more complete sentences than those who do not and handwriting strengthens fine motor skills in young students."[5]
- "When children composed text by hand, they not only consistently produced more words more quickly than they did on a keyboard, but expressed more ideas. And brain imaging in the oldest subjects suggested that the connection between writing and idea generation went even further. When these children were asked to come up with ideas for a composition, the ones with better handwriting exhibited greater neural activation in areas associated with working memory — and increased overall activation in the reading and writing networks."[6]
- Children "remembered more details from stories they read on paper than ones they read in e-books enhanced with interactive animations, videos and games."[7]
- "Millennials overwhelmingly said they prefer paper. In fact, 60 out of 66 students preferred paper to computer when studying. Even though it is thought that this generation of students may have adapted to new technology, nearly everyone expressed a preference for paper, usually saying they felt they performed better when reading on paper rather than a screen."[8]

- Laptops are commonplace in university classrooms and one of their drawbacks is that they offer distractions to note taking. Research on the effects of in-class laptop use on student learning showed that multitasking on a laptop poses a significant distraction to both users and fellow students and can be detrimental to comprehension of lecture content.[9]
- Studies that compare the efficiency and effectiveness of print vs. paperless reading typically agree that print has key advantages. Print readers:
  - "Read more quickly"[10]
  - "Experience less mental fatigue"[11]
  - "Report significantly lower levels of eye fatigue following reading"[12]
  - "Find it easier to concentrate"[13]
  - "Retain more of what they read"[14]
  - "Score better on reading comprehension tests"[15]
- Students frequently need to view more than one text at a time, both in class discussion and when studying. This is difficult to

Print and Paper The Facts

do with e-texts, because e-reading devices often do not allow more than one reading to be viewed on the screen at a time.[16]

- A 2012 survey by the Pew Research Center's Internet & American Life Project of 2,252 people age 16 and older found that 81 percent of parents believe it is "very important" that their child read print books, citing the importance of print's unique sensory and tactile experience.[17]
- "The tangibility of traditional print also provides a stronger emotional impact, allowing readers to interpret and internalize text through their own experiences and beliefs."[18]
- "Print text allows readers to mentally map information they read in relation to other information or 'landmarks' (e.g., a chapter, the left or right page, near the top or bottom of the page). Spatial maps have been shown to improve learning, retention and comprehension overall."[19]
- A survey of 128 adults by Dr. K. Garland at University Campus Sussex in 2014 showed that the decision to use digital or paper depended on the purpose of the reading material and the requirements of the end-user. Digital was preferred for reading information of passing interest or browsing looking for items of interest. When the information needed to be retained and learned for later use or required proof reading, paper was the preferred medium.[20]
- A study of college students at Oxford University found: "…reading on screen was conducive to a more superficial reading style… Attention span and reading sessions were shorter." Students reported that with e-texts they generally read short passages only and usually in a non-linear fashion. They also reported it required more effort to concentrate when reading on screen.[21]
- "In a comprehensive study of students at five major universities (Cornell University, Indiana University, University of Minnesota, University of Virginia and University of Wisconsin), most students expressed a preference for print textbooks, and generally had a negative experience with e-texts."[22]
- "54% of Wisconsin students reported print textbooks provided a better learning outcome than e-texts."[23]
- Negative aspects of e-texts included "poor readability, eyestrain, insufficient resolution for graphics, zooming and scrolling difficulties, difficulty annotating, not readable on some mobile devices, and a dislike of reading on a computer or other device."[24]
- "Minnesota faculty expressed the belief that e-texts did not enhance student outcomes. Some professors reported that their students actually read less than their counterparts reading a print textbook. As a result, faculty preferred printed texts for class instruction."[25]
- A new survey on usage of paper-based vs digital media showed that 88% of respondents understood, retained or used information better when they read print on paper rather than electronic devices. 81% indicated they are most relaxed when reading print on paper and the same proportion indicated that they prefer to read print on paper.[26]
- "Print-based texts are 'well suited to student needs' because highlighting and annotating can be performed right on the paper."[27] "Handwritten annotation helps students re-locate important points or citations for use in narrative development."[28]

1 Dinehart, 2014
2 Mangen et al., 2013*
3 James and Engelhardt, 2012*
4 Dinehart and Manfra. 2013. Early Education and Devel. 24(2): 138–161*
5 Zubrzycki, 2012
6 Berninger V.W., et al. 2006. Dev. Neuropsychol. 2006:29(1):61-92.*
7 Jabr, 2013
8 Subrahmanyam, 2013
9 Sana et al, 2013
10 Neilsen, 2010
11 Wastlund et al., 2005*
12 Jeong, 2012*
13 Jabr, 2013
14 Christensen, 2013
15 Jeong, 2012*
16 Trustees of Princeton University, 2010
17 Zickuhr, 2013
18 Millward Brown, 2013
19 Jabr, 2013
20 Garland, 2014
21 Keller, 2012*
22 American Forest & Paper Association, 2013
23 Internet2.edu, 2012
24 Internet2.edu, 2012
25 Internet2.edu, 2012
26 Two Sides, 2015
27 Jabr, 2013
28 Cull, 2011

*Full article available from journal only