

Paper v Digital

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The
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'Why the Brain Prefers Paper' (by Ferris Jabr)

Article in Scientific American© (Nov, 2013, pp. 35-39)

- Followed from an earlier report by the same author
 - 'The Reading Brain in the Digital Age: The Science of Paper versus Screens' <http://www.scientificamerican.com/article/reading-paper-screens/> (11/4/13)
- And from an article in Time© by Maia Szalavitz (3/12)
 - 'Do E-Books make it harder to remember what you just read?' <http://healthland.time.com/2012/03/14/do-e-books-impair-memory/#ixzz23Jz6W4zQ>
- These and associated articles have presented various views on the benefits of paper and digital, but have frequently relied on dated or more 'favourable' evidence to create their arguments
- The intention here is to give an overview of research and to present my interpretation of any differences between media and how this may be relevant today

Early Comparative Research

- Cathode ray tube (CRT) monitors versus paper, typically:
 - CRT slower than paper
 - CRT less accurate than paper
 - CRT given lower preference than paper
- However:
 - Studies did not match the materials across the two media
 - Participants were often lacking in computer 'literacy' and familiarity
 - Tasks were brief and basic (e.g. read a passage and proof read)
- My research set out to address the above issues:
 - Closely matched materials (identical content, size, layout, and fonts, colours as close as possible)
 - Experienced computer users
 - Course of learning material, multiple sessions over 10 months

My Early Findings

Garland, K. J. & Noyes, J. M. (2004). CRT monitors: Do they interfere with learning? *Behaviour & Information Technology*, 23, 43-52.

- No difference in accuracy, but
- Reading from screens was slower, and
- Difference in the way in which knowledge was retrieved
 - Development of conceptual (rather than factual) knowledge took longer with computer-based material
 - Suggested repeated exposure and rehearsal of computer-based information was necessary to equate knowledge application with that achievable from hard copy alternatives
- Interpretation:
 - Difference might be due to cognitive interference caused by the monitor characteristics of refresh rates, fluctuating luminance, and contrast levels

Relevance of Early Findings

No relevance today due to:

■ Changes in technology:

- Various flat screens now used where the quality of presentation is more directly comparable to print
- These also eliminate or reduce the possible reasons for differing memory retrieval suggested due to CRT monitor characteristics

■ Familiarity of technology:

- Although experienced users for study, this was 13-14 years ago
- Users of today have a more 'natural' experience – many have grown up with computers
- For those that have not, many will have levels of experience much higher than my participants (particularly for learning and use of information)

What then might still be a factor? Preference/attitude...

Books & Computers: Published Studies

- Changes in learning expectations and confidence toward computers: A study of five successive years of undergraduates.
- Paper-based versus computer-based assessment: Is workload another test mode effect?
- The effects of mandatory and optional use on students' ratings of a computer-based learning package.
- Students' attitudes toward books and computers.
- Attitudes and confidence towards computers and books as learning tools: A cross-sectional study of student cohorts.
- Explaining students' attitudes towards books and computers.

Summary of Attitude Findings (to 2009)

- Computers and computer-based learning are accepted and viewed favourably
- Attitudes to computers became more positive over time
- However, this increase was not at the expense of books: books remained popular
- Sources of any declared differences in preference:
 - Various practical aspects
 - Lack of confidence, familiarity, training
 - A number of 'less tangible issues'
- Specific comments:
 - Books allow greater thought, imagination, initiative
 - Computers are more transient, too abstract
 - Books are more personal, tangible, human, more appealing, like the feel and look

Tablet versus Flat Screen versus Book

- Recent findings – updated version of the 2004 research
- Two separate, although similar, studies conducted
 - Comparing learning from short courses through the three media
 - As closely matched as physically possible
- Economics course, participants allocated to one medium:
 - No difference in accuracy
 - No difference in manner of memory retrieval
- History course, participants completed on all media:
 - No difference in accuracy
 - No difference in manner of memory retrieval
- Suggests that modern digital is equivalent to paper in terms of learning (quantity and quality)

What Now is Important?

- Comparative 'quality', learning potential, and attitudes are now reasonably equivalent
- However, there are some 'aesthetic issues' perhaps still remaining
- So there is still a question to be asked:

What, if anything, now needs to be considered when deciding on providing material in paper or digital format?

The Purpose – How We Need to Use

- When reading information for 'passing interest' (factual, fiction) and/or enjoyment
 - Convenient, quick access – digital will be expected and probably readily accepted
- For information that is retained for later use
 - Format accepted digitally if it can be printed (whole or part) for ongoing reference and use
 - Materials extensively used (particularly for complex topics) would be better in pre-prepared, printed format
- For learning
 - When 'studying' we rarely use a single source
 - Materials do need to be available in print, to flick through, easily annotate – to accommodate our physical needs
 - But these can and are used frequently in conjunction with digital material rather than in isolation (i.e. it is not one or the other)

Paper or Digital?

Suggest decision should be based on:

- The purpose of the material
- The requirements of the end-user

- Some materials would benefit from both media being available, for example:
 - Purchase of hardcopy permits electronic download of full text
 - Purchase part in hardcopy, with additional material available electronically