Paper v Digital

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Press Reports versus Current Research

- 2 articles in Scientific American© by Ferris Jabr

- 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](http://healthland.time.com/2012/03/14/do-e-books-impair-memory/#ixzz23Jz6W4zQ)

- Relied on work of 12-15 years ago that examined learning from computer screens (old cathode-ray tube monitors) and paper

- Together with research on attitudes and preferences for books and computers between 1998 and 2009

- Purpose here is to
  - Report evidence of learning from modern screens (computer and tablet) versus print
  - Report findings from a survey started in the past 2 week – preliminary data analyses of preferences for print versus digital
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
Our Early Findings


- No difference in accuracy, reading from screens was slower
- Difference in the way in which knowledge was retrieved
  - Development of conceptual (rather than factual) knowledge took longer with computer-based material
  - This had implications for computer use rather than books in learning
- Interpretation then:
  - As materials closely matched and participants all ‘high computer users’
  - Difference might be due to cognitive interference caused by the monitor characteristics of refresh rates, fluctuating luminance, contrast levels
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)
In terms of basic and direct comparison between screen and print presentation:

- There appear to be no significant differences in amount and ‘quality’ of factual and conceptual knowledge that can be learned.

Potential other influences:

- Individual differences in motivation are key factors in our learning.
- This might be influenced in preferences for information to be available in different format to suit learning styles.
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 were 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
Current Views

Kate Garland & Fiorentina Sterkaj, University Campus Suffolk

Questionnaire – opportunity sampling 18th - 24th October

128 participants
- 29 male (22.7%), 99 female (77.3%)
- 82 students (64.1%), 21 Academic (16.4%), 25 Others (19.5%)
- Age range 16-67 years, mean age 30.41 years

Questions
- Experience and use of print and electronic media
- Single question about choice of material for learning
- 5 scales for preference of print ‘to’ digital for different materials
- Room for reasons for preference
- 2 separate, open-ended questions
  - What do you like/dislike about printed material?
  - What do you like/dislike about digital material?
Choice of Format – Learn Most Easily

![Bar chart showing the number of responses for different formats: all printed, all digital, digital easy print, no preference, other.]

Dr Kate Garland: Oct 2014
Reading Information of Passing Interest, or Browsing Looking for Items of Interest
Information that Will be Retained for Later Use (Factual Type Material)
Information that Will be Retained for Later Use (Complex Material)
Information That Needs to be Checked/Proof Read

![Bar graph showing number of responses for print and digital formats.](chart.png)
Information That Needs to Be Learned
Purpose Determines Our Preference

- When reading information for ‘passing interest’ (factual, fiction) and/or enjoyment
  - Convenient, quick access – digital preferred
- For information that is retained for later use
  - Materials extensively used (particularly for complex topics) would be better in pre-prepared, printed format
  - Format accepted digitally if it can be printed (whole or part) for ongoing reference and use
- 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

Most 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
- Electronic material provides easy print options and/or integration with main word processing applications for individual editing