Technology and its effects

Inside the screenage brain

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After an idea by Coralie Clark
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ECIS November Conference 2011

Current understanding …

The NEURO-PLASTIC brain

- changes throughout life
- can continue developing, even into old age
- may lose what we do not use
- can *sometimes* compensate for what is lost

TECHNOLOGY AND ITS EFFECTS – INSIDE THE SCREENAGE BRAIN

Technology is increasingly used inside and outside the classroom. Many welcome the trend. Many feel disquiet. One thing seems clear: technology is not going to go away.

In this session, current research and anecdotal evidence on the effects of technology use will be shared, with special focus on reading and learning. Participants are encouraged to share their concerns, approaches and solutions.

Watson : screenage…

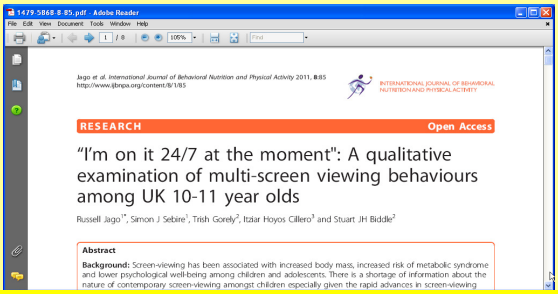
- Children as young as 5 spend an average 6 hours every day in front of a screen.
- In the UK, between ages 10 and 11, average child spends 900 hours at school, 1,300 hours with family, 2,000 hours in front of a screen.
- In the US, 8 to 18 year-olds spend an average 11 hours a day in front of a screen (television, computer, cellphone, iPod) – often two or more screens simultaneously.

What we used to think...

The BRAIN ...

- developed through childhood and into puberty
- stopped developing in late teens
- then began dying, losing cells, unstoppable and irreplaceable

Multi-screen viewing (UK)



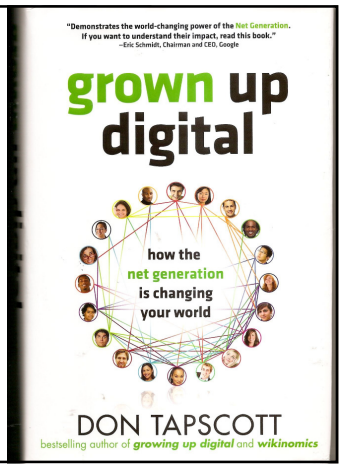
Russell Jago, Simon J Sebire, Trish Gorely, Itziar Cillero, Stuart JH Biddle *International Journal of Behavioral Nutrition and Physical Activity* 2011, 8:85 (3 August 2011). <http://www.ijbnpa.org/content/pdf/1479-5868-8-85.pdf>

Multi-screen multi-tasking
(Tapscott, p. 44)

Visiting his son at Amherst College, MA:

- 5 in one room, each with a laptop,
- Watching 3 televisions, set to sports, news, sitcom
- Talking, playing a game they had just invented
- Something comes up on one of the 3 tvs – they race (on laptops) to be the first to answer
- During any of the all this activity, one might cell-phone or SMS a friend

10,000 survey respondents and interviews



W*O*W*!

Picture: HubbleSite Picture Gallery : Mars Image Centered Near Location of Pathfinder Landing Site <http://imgsrc.hubblesite.org/hu/db/images/hs-1999-27-b-full_jpg.jpg>

Story: Don Tapscott, Grown up digital: how the net generation is changing your world, p. 20

NetGen (Tapscott)

- comfortable with technology
- speed round web pages
- ever moving on to the next link / next tab
- multitasking
  - plugged into iPods,
  - making notes on a cell phone
  - texting a friend
  - …..

Alan Kay

Technology is "technology only for people who are born before it was invented."

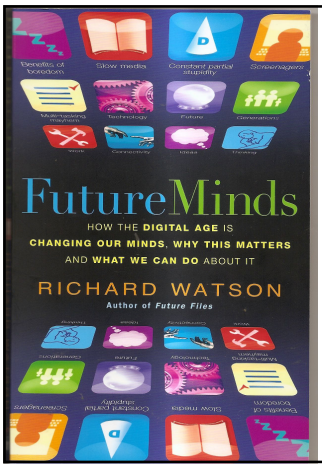
cited by Don Tapscott, p. 19

Tapscott : the dark side – myths? 1

- They're dumber than we were at their age.
- They're screenagers, Net-addicted, losing their social skills, and they have no time for sports or healthy activities.
- They have no shame.
- Because their parents have coddled them, they are adrift in the world and afraid to choose a path.

Tapscott : the dark side – myths? 2

- They steal.
- They're bullying their friends online.
- They're violent.
- They have no work ethic and will be bad employees.
- This is the latest narcissistic "me" generation.
- They don't give a damn.



Interpretation of many many research studies – in the lab

Tapscott : the eight Net Gen norms

- Freedom
- Customization
- Scrutiny
- Integrity
- Collaboration
- Entertainment
- Speed
- Innovation

Watson : 10 ways screenagers are thinking differently (1)

- Screenagers prefer multitasking, parallel processing, and personalized exeriences, read text in a non-linear fashion, and prefer images over words.
- Memory is something found on a hard drive. If they need information they Google it.
- The ability to create, personalize, and distribute information easily is creating more of a focus on the self.

Screenagers

- Teens are impatient, soon bored, quick to move from one window to another
- Do not read deeply, cannot read long passages
- Sometimes do not see the information they seek, even when it's there

Nielsen (2005)

Watson : 10 ways screenagers are thinking differently (2)

- Screenagers frequently use digital devices to avoid confrontation and commitment.
- Virtualization is removing the necessity for direct human contact…
- The reset generation thinks that if something goes wrong they can always press a button and start again.
- The digital generation demands sensory-laden environments, instant response, and frequent praise and reward.

Watson : 10 ways screenagers are thinking differently (3)

- Screenagers live in the now and everything is just gr8, although they may be less literate and numerate than their forebears.
- The screenage brain is hyper-alert to multiple streams of information, although attention and understanding can be shallow.
- The screenage brain is agile but is often ignorant of wider context and culture.

Technology and the Screenage Brain
John Royce, with Coralie Clark

Madeleine Brindley. Free vitamins given in bid to halt rise of rickets in Cardiff. *South Wales Echo*, Aug 22 201, *Wales online*. http://www.walesonline.co.uk/cardiffonline/cardiff-news/2011/08/22/free-vitamins-given-in-bid-to-halt-rise-of-rickets-in-cardiff-91466-

http://www.telegraph.co.uk/news/uknews/8696167/Children-being-taught-how-to-climb-trees.html

Talking points

- What examples?
  - What you know / have read / have seen?
- What fears?
- What hopes?

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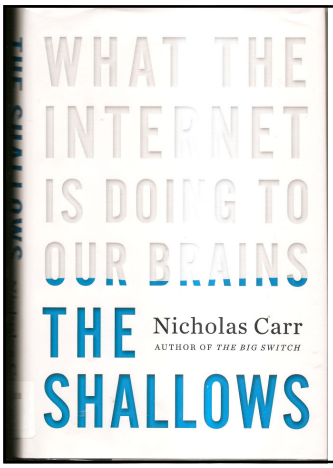
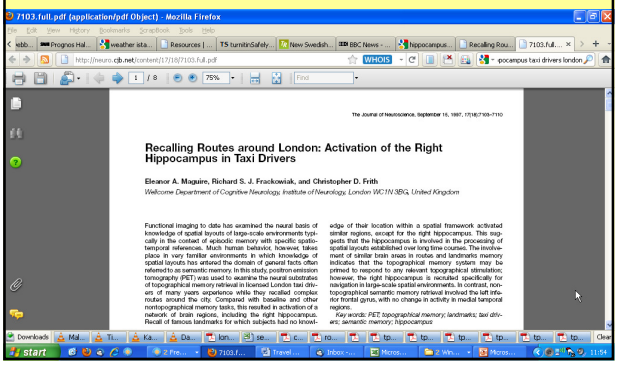
Madeleine Brindley. Free vitamins given in bid to halt rise of rickets in Cardiff. *South Wales Echo*, Aug 22 201, *Wales online*. http://www.walesonline.co.uk/cardiffonline/cardiff-news/2011/08/22/free-vitamins-given-in-bid-to-halt-rise-of-rickets-in-cardiff-91466-

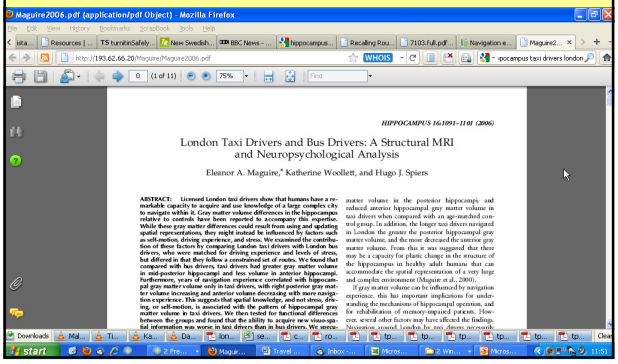


Interpretation of many many research studies – in the lab

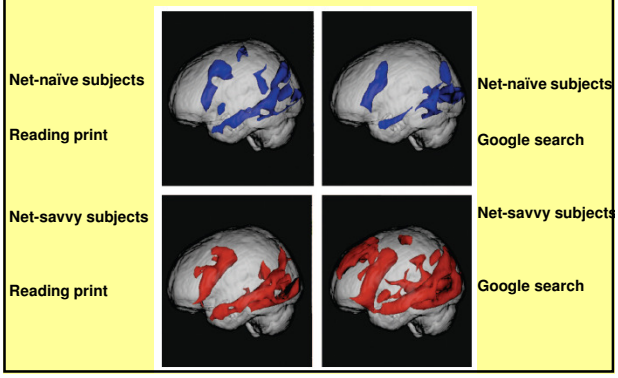
http://neuro.cjb.net/content/17/18/7103.full.pdf



http://193.62.66.20/Maguire/Maguire2006.pdf



Small, G. *et al.* (2009, Feb). Your brain on Google: patterns of cerebral activation during internet searching.

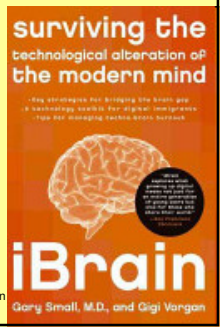


http://onlinelibrary.wiley.com/doi/10.1002/hipo.10087/abstract

5 hours training later…

Small : 'If our brains are so sensitive to just an hour a day of computer exposure, what happens when we spend more time [online]?'

Quoted by Nicholas Carr, *The shallows (p121)*



Technology and the Screenage Brain
John Royce, with Coralie Clark

Get lost!

When is the last time YOU
got lost in a book?

Digital text, hypertext & multitasking

An ever-growing number of studies suggest that our brains **cannot** successfully multitask – especially when handling non-automatic tasks.

Nicholas Carr, *The shallows, p. 90*

"'All reading,' writes Anne Mangen … is 'multi-sensory.' There's a 'crucial link' between 'the sensory-motor experience of the materiality' of a written work and the 'cognitive processing of the text content.' (Mangen, 2008)

(continued…)

Crenshaw's challenge (2011)

Multitasking is worse than a lie

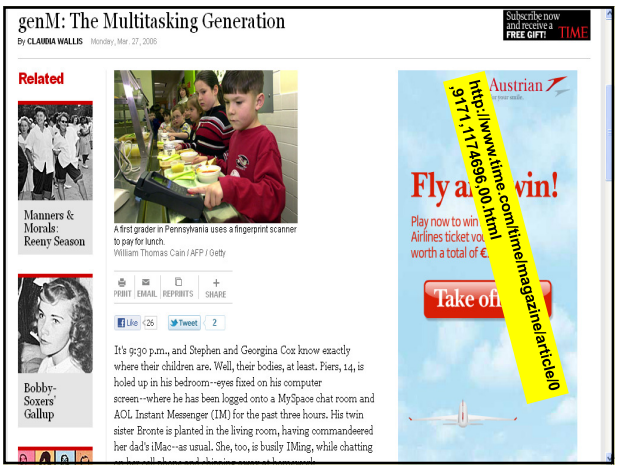
1 2 345 252627

Crenshaw, D. (2011). Think you're good at multitasking? Take this test.

http://www.youtube.com/watch?v=HHQv1Kdpl-8

Nicholas Carr, *The shallows, p. 90*

"The shift from paper to screen doesn't just change the way we navigate a piece of writing. It also influences the degree of attention we devote to it and our immersion in it."


genM: The Multitasking Generation

By CLAUDIA WALLIS Monday, Mar. 27, 2006

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It's 9:30 p.m., and Stephen and Georgina Cox know exactly where their children are. Well, their bodies, at least. Piers, 14, is holed up in his bedroom--eyes fixed on his computer screen--where he has been logged onto a MySpace chat room and AOL Instant Messenger (IM) for the past three hours. His twin sister Bronte is planted in the living room, having commandeered her dad's iMac--as usual. She, too, is busily IMing, while chatting

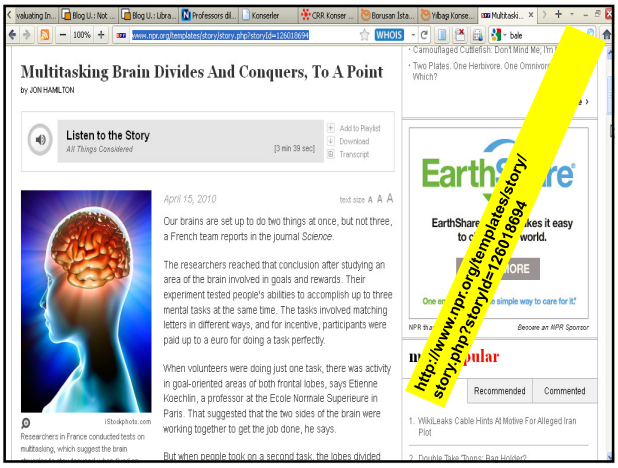
genM: The Multitasking Generation

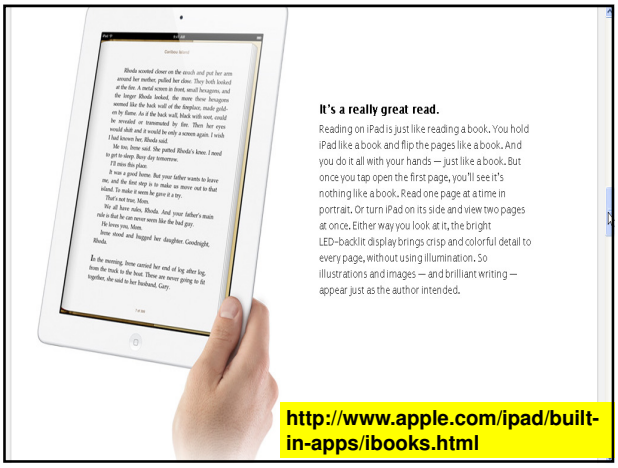
"… the ability to multiprocess has its limits, even among young adults. When people try to perform two or more related tasks either at the same time or alternating rapidly between them, errors go way up, and it takes far longer--often double the time or more--to get the jobs done than if they were done sequentially, says David E. Meyer, director of the Brain, Cognition and Action Laboratory at the University of Michigan…"

Wallis (2006)

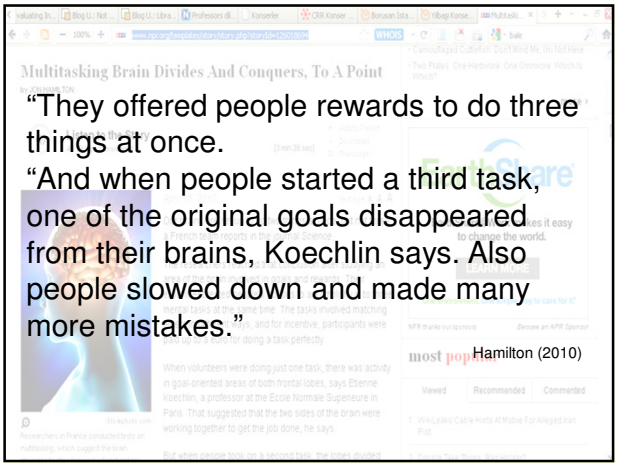
Multi-Tasking Adversely Affects Brain's Learning

http://www.sciencedaily.com/releases/2006/07/060726083302.htm





http://www.apple.com/ipad/built-in-apps/ibooks.html



"They offered people rewards to do three things at once.
"And when people started a third task, one of the original goals disappeared from their brains, Koechlin says. Also people slowed down and made many more mistakes."

Hamilton (2010)

"Just like reading a book"?

Mangen (2008) – points to studies (10, all published in the last 10 years) which show that we read digital text "in a shallower, less focused way."

"We tend to scan text on screen. Such a reading mode is highly vulnerable to distractions, particularly when these distractions are as easily available as a click with the mouse."

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Hypertext

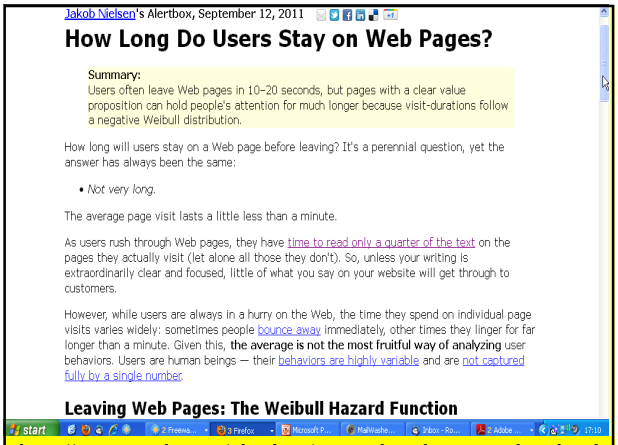
"The most basic feature of hypertext, of course, is its *nonlinear structure* …

"… information within a hypertext may be retrieved in a sequence specified by each user."

Shapiro & Niederhauser (2004)

The Web is **all** about hyperlinks

Freefoto.com. *Spider's web. <http://www.freefoto.com/download/01-17-2/Spiders-Web>*



Jakob Nielsen's Alertbox, September 12, 2011

How Long Do Users Stay on Web Pages?

Summary:
Users often leave Web pages in 10–20 seconds, but pages with a clear value proposition can hold people's attention for much longer because visit-durations follow a negative Weibull distribution.

How long will users stay on a Web page before leaving? It's a perennial question, yet the answer has always been the same:

- *Not very long.*

The average page visit lasts a little less than a minute.

As users rush through Web pages, they have time to read only a quarter of the text on the pages they actually visit (let alone all those they don't). So, unless your writing is extraordinarily clear and focused, little of what you say on your website will get through to customers.

However, while users are always in a hurry on the Web, the time they spend on individual page visits varies widely: sometimes people bounce away immediately, other times they linger for far longer than a minute. Given this, **the average is not the most fruitful way of analyzing** user behaviors. Users are human beings — their behaviors are highly variable and are not captured fully by a single number.

Leaving Web Pages: The Weibull Hazard Function

http://www.useit.com/alertbox/page-abandonment-time.html

Screen reading

- Text with fewer hyperlinks is better remembered and understood than text with many hyperlinks
- Text-only screen readers scored better than those with text and audiovisual material
- CNN study
  - Group 1 suffered distraction / lacked concentration
  - Group 2 remembered more, understood more.

– DeStefano and LeFevre (2005)
– Rockwell and Singleton (2007)
– Bergen and others (2005)

Hypertext

"Specifically, the learner must now monitor to a greater extent whether he or she understands what has been read, determine whether information must be sought to close information gaps, and decide where to look for that information in the text. In short, **there are greater *metacognitive demands* on the reader during HAL."**

Shapiro & Niederhauser (2004)

Some do read more, electronically

"My reading habits have indeed changed and, if anything, I'm reading more than ever… I can read serially on the run -flipping between books as mood or need dictates- with hundreds of books in hand … I'm buying books just as frequently, but they're eBooks."

Moon (2010).

Some do read more, electronically

'But the biggest impact has been in encouraging children to swap books. Bluetooth technology allows the handheld readers to connect to each other, so pupils can "beam" books they think are "sick", or cool, to as many as six others at a time.

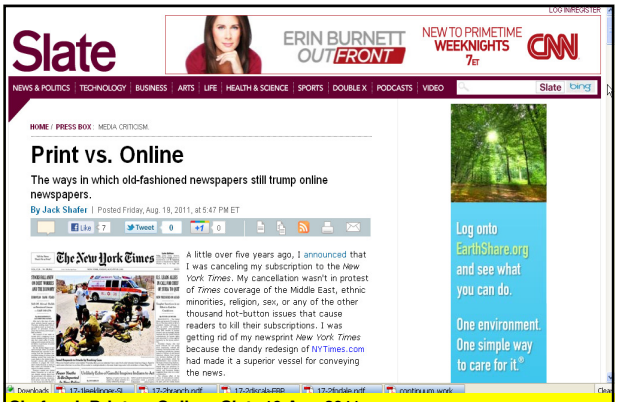
'Normally you can only get them to do two or three book reviews in a half- term, but now they are beaming books across to their friends, they are reading a lot more," says Mr Welton.'

Morrison (2009)

Santana's study (2011)
comprehension and memory

- Review of the literature, includes....
  - print readers remember more than online readers.
    - Adam et al (2007) – Eyetrack study
  - text only or text and still pictures are remembered better than stories with video clips
    - Pipps et al (2009) : online news

And many more studies with similar findings



Shafer, J. Print vs Online. *Slate* 19 Aug 2011. <http://www.slate.com/articles/news_and_politics/press_box/2011/08/print_vs_online.single.html>

Santana's study (2011)
Medium Matters

Santana et al's own study concluded:

"print readers … remember significantly more news stories than online news."

Print vs. Online

"While it's a joy to carry 25 editions of *The New Yorker* and whole libraries of books on an iPad, for real reading satisfaction I still reach for the print editions.

"I still find it difficult to finish any newspaper story longer than 1,000 words on a computer screen. I either find a copy of the newspaper or, failing that, print it out."

Shafer (2011).

Generational differences?

	Group A	Group B
TEXT 1	Screen first	Print first
TEXT 2	Print first	Screen first

Comprehension : no significant difference

Reading speed : screen readers read 10% faster than print readers

Kaye (2011) testing 14 – 17 year-old students

A passing thought …

WHAT are the implications for IB e-marking?

Nicholas Carr, *The shallows, p. 122/3*

Notes Johnson's study which suggests that computer use 'provides more intense mental stimulation than does book reading.'

(Similar finding to Gary Small's Google study, cited earlier)

Brain research – addiction?

- When kids do something they like, the brain receives a blast of dopamine in the prefrontal cortex.
- Too much dopamine can reduce ability to reason.
- "Electronic euphoria thus creates fewer possibilities and less opportunity to develop an original mind.

Watson (p.2), citing Susan Greenfield's research

Nicholas Carr, *The shallows, p.122/3*

"It is the very fact that book reading 'understimulates the senses' that makes the activity so intellectually rewarding. By allowing us to filter out distractions, to quiet the problem solving functions of the frontal lobes, deep reading becomes a form of deep thinking."

Watson on reading

"Reading on a computer screen is fast and is suited to foraging for facts. In contrast, reading on paper is reflective and is better suited to trying to understand an overall argument or concept." (p.3.)

"Deep thinking … can't be done in a hurry or an environment full of interruptions or hyperlinks. It can't be done in 140 characters. It can't be done in multitasking mayhem." (p.4.)

Thinking points

We're not going to stop technology.

- What to do? / what have you already done?
- What to do, using 21st century tools rather than (or as well as) the tools we would prefer to use?
- Stopgap techniques for avoiding distraction

Nicholas Carr, *The shallows*

Details Christof van Nimwegen's various studies, which suggest that

- when people are given help (by the software) they may become less able, become more reliant on the software.
- When not given help, they learn the rules - and the learning lasts…

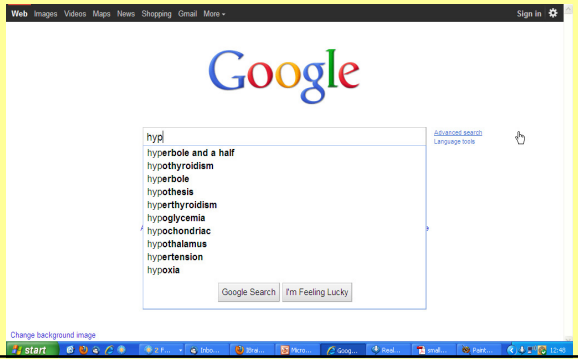
User-friendly software might NOT be in our best interests.

Nicholas Carr, *The shallows*

Leads on to thoughts of James Evans' research into citations, and the dangers of the googlification of knowledge – the same resources are increasingly cited because they are increasingly cited

BUT scholars are also making fewer citations, relying more on less

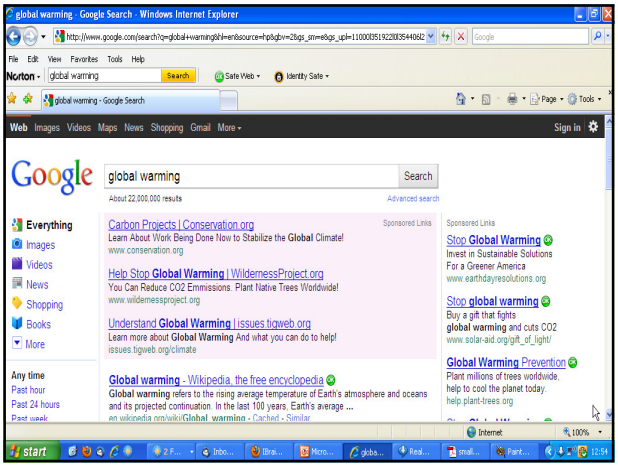
Is Google making us more reliant?



The Googlification of knowledge

- Semantic search
- Data and identity theft
- Digital footprints
- Targeted advertising
- Googlified knowledge

- Choice, serendipity, analysis, …?



Nicholas Carr, *The shallows, p. 180*

quotes Clive Thompson: "I've almost given up making an effort to remember anything because I can instantly retrieve the information online."

Clive Thompson, "Your Outboard Brain Knows All," *Wired*, October 2007.

Nicholas Carr, *The shallows, p. 181*

quotes Don Tapscott, "Why should we spend hours in schools memorizing long passages or historical facts when you can look them up in an instant?"

Don Tapscott, *Grown up digital…* p. 115

KNOWLEDGE IS POWER

Nicholas Carr, *The shallows, p. 180*

quotes David Brooks: "I had thought the magic of the information age was that it allowed us to know more, but then I realized the magic of the information age is that it allows us to know less."

David Brooks, "The Outsourced Brain," *New York Times* October 26, 2007.

LACK OF KNOWLEDGE IS

?

attrib. Francis Bacon

KNOWLEDGE IS

Technology and its effects

Inside the screenage brain

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ECIS November Conference 2011

The handout can be downloaded from
http://read2live.com/ecis-screenage.html

References

Carr, N. (2010). *The shallows: what the internet is doing to our brains.* New York: Norton.

Crenshaw, D. (2011). Think you're good at multitasking? Take this test. (Videoclip). Retrieved from http://www.youtube.com/watch?v=HHQv1KdpI-8

Gawith, G. (2001). Why read?: Beyond the cliches of reading and information literacy. *TheSchoolQuarterly.com NZ Information Literacy Archive : Information Literacy : definitions and discussion*. Retrieved from http://web.archive.org/web/20030104184835/www.theschoolquarterly.com/info_lit_archive/defn_discussion/01_gg_why_read.htm

References

Moon, B. (2010). Six months with an eBook reader: Yeah or meh? Retrieved from http://www.wired.com/geekdad/2010/03/six-months-with-an-ebook-reader-yeah-or-meh/

Morrison, M. (2009, February 20). Cover story - Broken spines. *TES Connect*. Retrieved from http://www.tes.co.uk/article.aspx

Nielsen, J. (2011, May 23). iPad usability: year one. *Alertbox*. Retrieved from http://www.useit.com/alertbox/ipad.html

References

Hamilton, J. (2010). Multitasking brain Divides and conquers, to a point. *NPR.org*. Retrieved from http://www.npr.org/templates/story/story.php?storyId=126018694

Kaye, J. (2011). Read all about it: does reading from a printed page versus a digital screen affect reading comprehension? Science Fair Project. California State Science Fair.

Kovach, B. and Rosenstiel, T. (2010). *Blur: how to know what's true in the age of information overload*. New York: Bloomsbury.

Mangen, A. (2008) "Hypertext fiction reading: haptics and immersion." *Journal of Research in Reading* Vol 31 (4), 404–419. Retrieved from http://faculty.winthrop.edu/kosterj/WRIT501/readings/mangenreadingonscreen.pdf

References

Nielsen, J. (2005, Jan. 31) Usability of websites for teenagers. Retrieved from http://www.useit.com/alertbox/teenagers.html

Rosen, C. (2008, Spring). The myth of multitasking. *The New Atlantis*, 105-110. Retrieved from http://www.thenewatlantis.com/docLib/20080605_TNA20Rosen.pdf

References

McTighe, J., & and Reeves, B., eds. (2001). Critical thinking. *Thinking and learning: What have we learned about good instruction? : School Improvement in Maryland*. Retrieved from http://www.mdk12.org/instruction/success_mspap/general/projectbetter/thinkingskills/ts-17-20.html

Mitchell, S. (2011, December). How much tech can children take? *PC Pro*, 46-49.

References

Santana, A., Livingstone, R. and Yoon, C. (2011). *Medium matters: newsreaders' recall and engagement with online and print newspapers*. (Conference paper) Retrieved from http://www.slate.com/content/dam/slate/archive/media/2011/08/66_mediummatters.pdf

Shafer, J. (2011, Aug. 19). Print vs online. *Slate*. Retrieved from http://www.slate.com/articles/news_and_politics/press_box/011/08/print_vs_online.single.html

References

Shapiro, A. & Niederhauser, D. (2004). Learning from hypertext: research issues and findings. In D. H. Jonassen (Ed.), *Handbook of research on educational communications and technology* (2nd ed, pp. 605–620). Mahwah, NJ: Erlbaum. Retrieved from http://www.aect.org/edtech/ed1/23.pdf

Small, G. *et al.* (2009, Feb). Your brain on Google: patterns of cerebral activation during internet searching. *American Journal of Geriatric Psychiatry, 116-126.* Retrieved from http://www.psychologytoday.com/files/attachments/5230/136.pdf

References

Smith, B. (1999). *Understanding the reading process.* Retrieved from http://academic.cuesta.edu/acasupp/as/302.htm

Spink, J. (1989). *Children as readers : A study.* London: Bingley/ Library Association.

Springer e-Book Pilot Project (2011). UC Libraries Academic e-Book Usage Survey. Retrieved from www.cdlib.org/services/uxdesign/docs/2011/academic_ebook_usage_survey.pdf

Stephens, W. (2010, June) Books are more than files: teens skeptical about eReading. *Voya,* 124-125.

References

Tapscott, D. (2009). *Grown up digital: how the net generation is changing your world.* New York: McGraw-Hill.

Wallis, C. (2006, March 19). GenM: the multi-tasking generation. *Time.* Retrieved from http://www.time.com/time/magazine/article/0,9171,1174696,00.html

Watson, R. (2010). *Future minds: how the digital age is changing our minds, why this matters and what we can do about it.* London: Nicholas Brealey.