The Shallows

- *What the Internet Is Doing to Our Brains*
- by Nicholas Carr
- To be published in June 2010 by W.W. Norton & Co.
- Notes by Douglas W. Green, EdD from a book review by the editors of Wired Magazine in the June 2010 issue, pages 112-118.

Gary Small's Research - 2007

- Small used whole-brain MRI to see the difference between people who were experienced Internet surfers and those who were not. The surfers had far more extensive brain activity while surfing, especially in the areas of the prefrontal cortex associated with problem solving and decision making. This suggested that the distinctive neural pathways of experienced Web users developed because of their Internet use. After novice users spent an hour a day online, their brain activity resembled that of veteran users. The key question: Is more brain activity better activity?

Cognitive Problems of Hypertext

- It looks like when we go online, we enter an environment that promotes cursory reading, hurried and distracted thinking, and superficial learning. Even as the Internet grants us easy access to vast amounts of information, it is turning us into shallower thinkers, literally changing the structure of our brain. By the end of the 1980's, research was painting a picture of the cognitive effects of hypertext. Navigating linked documents entails a lot of mental calisthenics - evaluating hyperlinks, deciding whether to click, adjusting to different formants that are extraneous to the process of reading. Because it disrupts concentration, such activity weakens comprehension.

Linear text beats hypertext.

- Research continues to show that people who read linear text comprehend more, remember more, and learn more than those who read text peppered with links. The links add time and confusion to the reading process. Comprehension seems to decline as the number of links increases whether or not people click on them. When a link appears, your brain has to make a choice to click or not, which is distracting. Also, jumping between digital documents impedes understanding. Recent research suggests that surrounding links with images, videos, and ads could be even worse.

The short term memory bottleneck

- The passage from working memory to long-term memory forms a bottleneck in our brain. Long-term memory has a great capacity. Working memory can only hold a small amount and it is fragile. A break in our attention can sweep its contents from our mind. On the Net, we face many information sources at once, so we do not face a continuous, coherent stream. Information flowing into our working memory is our ***cognitive load***. When the load exceeds our mind's ability to process and store it, we can't translate the new material into conceptual knowledge.

The great interruption

- The Internet is an interruption system. It seizes our attention only to scramble it. Studies show that we read faster and less throughly as soon as we go online. Add checking email every five to ten minutes and it only gets worse. Every time we shift our attention, the brain has to reorient itself, further taxing our mental resources. Switching between just two tasks can add substantially to our cognitive load. On the Internet, where we often juggle several tasks, the switching costs pile ever higher.

Craving the new

- The stream of new information plays to our natural tendency to overemphasize the immediate. We crave the new even when we know it's trivial. We even ask the Internet to interrupt us in ever more varied ways. We willingly accept the loss of concentration and focus in return for a wealth of compelling, or at least diverting, information. Some people rarely stop to think that it might make more sense to tune out the interruptions.

The big trade off

- By surfing a lot, one develops mental functions like eye-hand coordination, reflex response, and the processing of visual cues. It strengthens brain functions related to fast-paced problem-solving, particularly when it requires spotting patterns in a welter of data. Scanning and assessing the trustworthiness of Web page in seconds is a useful trait. As the brain is highly plastic, when we adapt to a new cultural phenomenon, including the use of a new medium, we end up with a different brain. When you exercise circuits devoted to skimming and multitasking, you ignore those used to think deeply.

Dr. Doug's Take Away

- While I can hardly wait to read Carr's book, the Wired article does a good job of helping us understand what Internet use can do to, and perhaps for, our brain. The message I get, which isn't directly stated here, is that we need a balance between surfing sites with lots of hyperlinks and visual distractions, and reading text that contains no links or unrelated material. Physical books and magazines fall into this category as do many online documents like the one you are reading now. There should be a big lesson for educators here as well.