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Brain Plasticity:
The Impact of the Electronic Environment
in Law & Learning and Implications for Teaching

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Submitted to
Professor Penny A. Hazelton
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I. Introduction

In his 2008 article, *Is Google Making Us Stupid?*¹ and follow-up book, *The Shallows*² author Nicholas Carr articulates his concerns about the effects of the Internet³ on his personal ability to read, think, and concentrate. Though his theories are controversial and provoke skepticism, Carr is not alone in his observations. His question of whether Google is making us stupid has prompted an exciting and interesting dialogue that ponders the boundaries of our intellectual fate.⁴ He writes:

And what the Net seems to be doing is chipping away my capacity for concentration and contemplation. Whether I'm online or not, my mind now expects to take in information the way the Net distributes it: in a swiftly moving stream of particles. Once I was a scuba diver in the sea of words. Now I zip along the surface like a guy on a Jet Ski.⁵

What Carr describes as a sea of words is perhaps better characterized as a deep sea of information and technology, upon which we can only skim the surface. The Internet is so expansive in fact, we have outgrown four billion Internet addresses (IPv4), prompting a move to a next generation address system (IPv6) to accommodate the Internet's rapid current and future growth.⁶

But, the vast information on the Internet does have a rival: the human brain. Within approximately three pounds are an estimated hundred billion nerve cells.⁷ Like the Internet, the human brain is capable of storing vast amounts of

¹ Nicholas Carr, *Is Google Making Us Stupid?* ATLANTIC MONTHLY, July-Aug. 2008, at 56, available at <http://www.theatlantic.com/magazine/archive/2008/07/is-google-making-us-stupid/6868/>.

² NICHOLAS CARR, *THE SHALLOWS: WHAT THE INTERNET IS DOING TO OUR BRAINS* 6-7 (2010). *The Shallows* was a 2011 Pulitzer Prize finalist for the non-fiction category. *2011 Finalists*, PULITZER.ORG, <http://www.pulitzer.org/finalists/2011> (last visited May 8, 2011).

³ The Internet is defined as a global computer network providing a variety of information and communication facilities, consisting of interconnected networks using standardized communication protocols. *Internet Definition*, Oxford Dictionaries (2010), available at <http://www.oxforddictionaries.com>.

⁴ For interesting commentaries on the subject see *IS THE INTERNET CHANGING THE WAY YOU THINK?* (John Brockman ed., 2011); Janna Quitney Anderson & Lee Rainie, *The Future of the Internet*, PEW INTERNET & AM. LIFE PROJECT (Feb. 19, 2010), <http://www.pewInternet.org/~media/Files/Reports/2010/Future%20of%20Internet%202010%20-%20AAAS%20paper.pdf>; NICK BILTON, *I LIVE IN THE FUTURE & HERE'S HOW IT WORKS: WHY YOUR WORLD, WORK, AND BRAIN ARE BEING CREATIVELY DISRUPTED* 237 (2010).

⁵ Carr, *supra* note 2, at 6-7 (2010).

⁶ *IPv6 Fact Sheet*, ICANN, <http://www.icann.org/en/factsheets/factsheet-ipv6-03feb11-en.pdf> (last visited May 5, 2011). Formed in 1998, the Internet Corporation for Assigned Names and Numbers (ICANN) is a not-for-profit public-benefit corporation tasked with coordinating and managing the Internet's unique identifiers. Every computer or device requires a unique identifier to connect to the Internet.

⁷ GARY SMALL & GIGI VORGAN, *IBRAIN: SURVIVING THE TECHNOLOGICAL ALTERATION OF THE MODERN MIND* 5 (2008).

information with a sophisticated system of connections and retrieval mechanisms. With advances in technology over the last few decades, scientists have discovered that the brain can change itself, defined as brain plasticity or neuroplasticity, with both positive and negative effects.⁸ Because of our brain's adaptability and the "high-tech brain evolution"⁹ that has ensued, a conversation among stakeholders, scientists, educators, authors, thinkers, and critics is taking place. Is the digital revolution and our reliance on technology changing us, and if so, in what ways? Is it changing our ability to think, read, concentrate, be empathetic, be patient, or even carry on a face-to-face conversation? Or is the Internet's global connectedness creating a more engaged society?

Carr argues that through our use of technology we are replacing our ability to think and read deeply with a superficial and shallow understanding of our world's information. Under such a scenario, the implications for the legal profession could be profound. From the Law School Admission Test and the rigorous curriculum of law school, to bar admission and legal practice, our ability to critically read, think, and analyze forms the foundation of understanding and applying the law. If we and the generations that follow are literally rewiring our brains through our technological activities and experiences, will there be negative consequences? Conversely, perhaps the profession of law is uniquely suited to benefit from just the kind of adaptation Carr describes. Our ability to consume, critically evaluate, filter, and synthesize information also is essential to our legal learning foundation. Does the Internet-style scanning, skimming, and "screen reading"¹⁰ actually enable us to substantially improve our performance?

This paper introduces the human brain's amazing ability to adapt and form connections that allow us to do a great number of things – including our ability to read at all. It touches upon the debate surrounding traditional versus Internet-style information gathering and reading styles, and the impacts on a variety of fronts, from multitasking to claims of reduced attention spans. It considers whether the study of law is unique within this conversation. Finally this paper highlights educator implications, synthesizes commentary and previous research on managing multitasking and implementing reading strategies, and concludes with thoughts for future research opportunities.

II. The Amazing, Adaptable Brain

What is the concept of brain plasticity? The brain and spinal cord make up our central nervous system.¹¹ The peripheral nervous system transmits information between the central nervous system and the rest of our body. The central nervous system and the peripheral nervous system together are our

⁸ NORMAN DOIDGE, *THE BRAIN THAT CHANGES ITSELF*, at xx (2007).

⁹ Small & Vorgan, *supra* note 7, at 5.

¹⁰ For excellent essays discussing screen reading see Mark Bauerlein, *Online Literacy is a Lesser Kind*, *CHRON. HIGHER EDUC.*, Sept. 19, 2008, at B10; Kevin Kelly, *Reading in a Whole New Way*, *SMITHSONIAN*, Aug. 2010, <http://www.smithsonianmag.com/specialsections/40th-anniversary/Reading-in-a-Whole-New-Way.html>.

¹¹ *Central Nervous System Definition*, *DICTIONARY.COM*, <http://dictionary.reference.com/browse/central+nervous+system> (last visited May 1, 2011).

nervous system, which coordinates all our physical and mental activity.¹² Within our nervous system are nerve cells called neurons.¹³ Neurons send and receive electrical impulses, connected by a synapse.¹⁴ The wiring of the human brain consists of 10^{11} neurons connected by 10^{15} synapses.¹⁵ Within neuroscience, neuroplasticity is the brain's ability to change and reorganize by forming new neural connections in response to an individual's activities, situations, or environment changes.¹⁶ As new connections are being formed, others are being "pruned away."¹⁷

Both Carr in *The Shallows* and Norman Doidge in his book, *The Brain That Changes Itself*, trace the history of scientists' understanding of the brain. Doidge explains that scientists thought that once our brain aged past the "critical period"¹⁸ of childhood, it was not capable of change, only decline.¹⁹ Though the idea of plasticity was first raised in the 19th century, it was during the 1960's and 1970's that scientists began to take a closer look at the concept.²⁰ Carr and Doidge recount an early study, published in 1969, by a team of scientists led by Paul Bach-y-Rita on sensory substitution. The study described a visual substitution system apparatus whereby six blind people were trained to substitute their vision sense with their tactile sense, enabling them to recognize and distinguish objects. The brain rewired its neural connections, in essence allowing these people to "see."²¹

¹² *Nervous System Definition*, DICTIONARY.COM, <http://dictionary.reference.com/browse/nervous+system> (last visited May 1, 2011).

¹³ *Neuron Definition*, DICTIONARY.COM, <http://dictionary.reference.com/browse/nervous+system> (last visited May 1, 2011).

¹⁴ *Synapse Definition*, DICTIONARY.COM, <http://dictionary.reference.com/browse/nervous+system> (last visited May 1, 2011).

¹⁵ Dmitri B. Chklovskii, Bartlett W. Mel, & Karel Svoboda, *Cortical Rewiring and Information Storage*, 431 NATURE 782 (2004), available at <http://chklovskii.cshl.edu/ChklovskiiMelSvoboda04.pdf>.

¹⁶ *Neuroplasticity Definition*, DICTIONARY.COM, <http://dictionary.reference.com/browse/neuroplasticity> (last visited May 1, 2011).

¹⁷ Theresa Hawley & Meghan Gunner, *Starting Smart: How Early Experiences Affect Brain Development*, OUNCE OF PREVENTION FUND & ZERO TO THREE 3 (2d. ed., 2000), <http://main.zerotothree.org/site/DocServer/startingsmart.pdf?docID=2422>.

¹⁸ The critical period is defined as, "a restricted developmental period during which the nervous system is particularly sensitive to the effects of experience." One example of the importance of the critical period includes the development of the visual system. NEUROSCIENCE g-4, 533(Dale Purves et al. eds., 2d ed. 2001).

¹⁹ Doidge, *supra* note 8, at xvii.

²⁰ Carr, *supra* note 2, at 21-22. Carr notes that William James in PRINCIPLES OF PSYCHOLOGY (1890) wrote, "the nervous tissue seems endowed with a very extraordinary degree of plasticity." Sigmund Freud wrote in an unpublished manuscript, *Project for a Scientific Psychology* (1894) that the brain could change from personal experiences.

²¹ Paul Bach-y-Rita et al., *Vision Substitution by Tactile Image Projection*, 221(5184) NATURE 963 (Mar. 8, 1969). Bach-y-Rita and other scientists continue to study sensory substitution, such as devices that allow one to see by connecting impulses between the tongue and the brain, *see, e.g.*, Sandra Blakeslee, *Therapies Push Injured Brains and Spinal Cords Into New Paths*, N.Y. TIMES, Aug. 28, 2001, at F6; Michael D. Williams et al., *The Use of a Tactile-Vision Sensory Substitution System as an Augmentative Tool for Individuals with Visual Impairments*, 105 J. VISUAL IMPAIRMENT & BLINDNESS 45 (2011).

Over the last few decades, neuroscientists have begun to explore the implications of human brain plasticity, now measurable through advances in brain imaging technologies. Studies are rich with multiple examples of plasticity's potential to improve the quality of life for those challenged with issues from dyslexia to recovering from stroke. Brain scans show, for example, that London taxi drivers accustomed to driving among twists and turns are believed to have a more highly developed hippocampus (evidenced by gray matter volume differences), an area of the brain believed to be responsible for spatial learning and memory.²² Other studies discuss brain area differences among musicians, athletes, and medical students.²³ An attorney's use of language, for example, is thought to result in strong left brain hemisphere connections, hypothesized as an area of the brain believed to process language.²⁴

Through the use of imaging techniques, such as magnetic resonance imaging (MRI) and functional magnetic resonance imaging (fMRI), scientists now have a "window on brain structure" that enables observation of real-time brain activity.²⁵ Functional MRI is a tool used to measure blood flow in the brain.²⁶ When neurons are active, brain activity increases, resulting in increased blood flow which is then captured on color images indicating where in the brain the activity is taking place.²⁷ Neuroscientists then hypothesize and develop theories as to how activities and experiences are impacting our neural connections and which areas of the brain may be implicated.

Brain plasticity in infants and young children is well established. Doidge explains that the difference between critical period plasticity and adult plasticity is that during the critical period, the brain is far more susceptible to change, whereas adult plasticity change is possible with focused, close attention.²⁸ We are born with a maximum of neurons.²⁹ A young brain produces more synapses than it needs; an eight month infant may have 1,000 trillion synapses.³⁰ Neural connections are formed between synapses that are used, and those that are not are "pruned" away; this is the "use it or lose it" hypothesis of brain plasticity.³¹ Although the number of neurons is reduced through pruning, it is believed that the remaining connections are faster and more efficient.³² It is the vast number of

²² RICHARD RESTAK, THINK SMART 13 (2009); Eleanor A. Maguire et al., *Navigation-Related Structural Change in the Hippocampi of Taxi Drivers*, 97(8) PNAS 4398 (Apr. 11, 2000), available at <http://www.pnas.org/content/97/8/4398.full.pdf+html>; Eleanor A. Maguire et al., *London Taxi Drivers and Bus Drivers: A Structural MRI and Neuropsychological Analysis*, 16 HIPPOCAMPUS 1091 (2006).

²³ R. Douglas Fields, *Imaging Learning: The Search for a Memory Trace*, 17 NEUROSCIENTIST 185, 187 (2011).

²⁴ Restak, *supra* note 22, at 19.

²⁵ *Id.* at 14.

²⁶ Russell A. Poldrack, *Neuroimaging: Separating the Promise from the Pipe Dreams*, DANA FOUND. (May 27, 2009), <http://www.dana.org/news/cerebrum/detail.aspx?id=22220>.

²⁷ Restak, *supra* note 22, at 14.

²⁸ Doidge, *supra* note 8 at 68, 78.

²⁹ Restak, *supra* note 22, at 9.

³⁰ Hawley & Gunner, *supra* note 17, at 3.

³¹ *Id.*

³² Restak, *supra* note 22, at 10.

connections available in the young brain that enable children to learn more quickly and efficiently, such as the young child's ability to learn languages. Research has shown that by 12 months old, even the ability of infants to distinguish foreign language sounds begins to decline, while the "well-pruned" adult brain must exert great effort and commitment to acquire a new language.³³

Because infant brains are so susceptible to changes during this critical period, both positive and negative, the effects of media on young children are of particular concern. The American Academy of Pediatrics (AAP) recommends that for children younger than two years of age, television and video viewing should be avoided.³⁴ In its policy statement, the AAP discusses previous research that reveals that no study has found early media viewing beneficial. Instead, several studies have shown that those under 18-months old may suffer language development delays from television exposure, and at least one study has shown that exposure to infant videos may delay language development.³⁵ Another study examined the effects of television exposure on children ages one and three.³⁶ Researchers reviewed parental reports of their children's television watching which found that the average one year old child watched 2.2 hours per day, and the average three year old watched 3.6 hours per day. The study determined that early television exposure is associated with attention problems at age seven. These are but a few examples of the potential negative effects of brain plasticity in young children.

Neuroscientists believe that the neural circuits within our brains are "inherently competitive" and that "there will always be a competitive 'winner' and 'loser.'"³⁷ It is hypothesized that the "use it or lose it" principle of brain plasticity is what allows such miraculous changes in our brains to happen.³⁸ Doidge writes, "[t]here is an endless war going on in our brains. If we stop exercising our mental skills, we do not just forget them: the brain map space for those skills is turned over to the skills we practice instead."³⁹ Neuroscientists summarize these concepts as, "neurons that fire together wire together" and "neurons out of sync fail to link."⁴⁰ Connections that are challenged and actively maintained become more robust, while those that are ignored are believed to essentially fade away.⁴¹

³³ Small & Vorgan, *supra* note 7, at 8.

³⁴ Victor C. Strasburger et al., *Policy Statement – Media Education*, 126 PEDIATRICS 1012, 1014 (Nov. 2010) available at <http://aappolicy.aappublications.org/cgi/reprint/pediatrics;126/5/1012.pdf>.

³⁵ *Id.*

³⁶ Dimitri A. Christakis et al., *Early Television Exposure and Subsequent Attentional Problems in Children*, 113 PEDIATRICS 708 (Apr. 2004) available at <http://pediatrics.aappublications.org/cgi/reprint/113/4/708>.

³⁷ Henry W. Mahncke et al., *Memory Enhancement in Healthy Older Adults Using a Brain Plasticity-Based Training Program: A Randomized, Controlled Study*, 103(33) PNAS 12523 (Aug. 15, 2006), available at <http://www.pnas.org/content/103/33/12523.full.pdf>.

³⁸ Doidge, *supra* note 8 at 59.

³⁹ *Id.*

⁴⁰ Doidge, *supra* note 8, at 63-64 and Carr, *supra* note 2, at 27. The "fire together" principle, also known as Hebb's rule, is attributed to the ideas of psychologist Donald O. Hebb.

⁴¹ Restak, *supra* note 22, at 9.

As we age, we are calling upon our ability to perform skills and abilities we have already mastered, further solidifying these connections.⁴² For example, Doidge writes that this idea of competitive plasticity is what makes it more difficult for adults to learn a new language as compared to children, and also why it is difficult for adults to “unlearn” bad habits.⁴³ Doidge refers to this as “the plastic paradox” phenomenon, noting, “[o]nce a particular plastic change occurs in the brain and becomes well established, it can prevent other changes from occurring.”⁴⁴ Researchers are working to identify those conditions under which it is believed changes in the adult brain are most likely to occur. These include, for example, learning new and challenging activities through focused attention and practice.⁴⁵ Whether these changes remain once the focused activity is discontinued is an area of continuing scientific study.⁴⁶

As some caution, it is this competitive nature of plasticity which may be laying the groundwork for uncertain consequences as we shift to a wholly technological environment. A May 2010 survey revealed that 79% of U.S. adults use the Internet as compared to 47% a decade earlier.⁴⁷ As to be expected, the most active age group using the Internet in the U.S. are those ages 18-33 (Millennial generation) at 95%, but nearly a third of adults (30%) over age 74 also are on the Internet.⁴⁸ Many of us may no longer recall, or perhaps have even experienced, a life without instant and easily accessible connectivity. We use it for a variety of reasons, whether to find health information (83%), for fun (72%), to buy products (72%), or to seek information on Wikipedia (53%).⁴⁹

A 2010 national survey of more than 2000 children in the United States determined that children and teens ages eight to 18 spend an average of seven hours, 38 minutes engaged in media, and, because they are often using more than one form of media at the same time, the total time spent engaged in media content was equivalent to 10 hours, 45 minutes.⁵⁰ Teens are so engaged with their devices at least four out of five teens sleep with their mobile devices on or near the bed, with teen girls ages 14-17 averaging more than 3,000 messages a month.⁵¹ Such pervasive use of media also is believed to have an impact on other activities, from

⁴² Doidge, *supra* note 8, at 67.

⁴³ *Id.* at 60.

⁴⁴ *Id.* at xx.

⁴⁵ *Id.* at 67.

⁴⁶ See Fields, *supra* note 23.

⁴⁷ *Trend Data*, PEW INTERNET & AM. LIFE PROJECT (Sept. 2010), <http://www.pewInternet.org/Trend-Data/Online-Activites-Total.aspx>; Kristen Purcell, *Information 2.0 and Beyond: Where Are We, Where Are We Going?* PEW INTERNET & AM. LIFE PROJECT (Mar. 29, 2011), <http://www.pewInternet.org/Presentations/2011/Mar/APLIC.aspx>.

⁴⁸ Kathryn Zickhur, *Generations 2010*, PEW INTERNET & AM. LIFE PROJECT (Dec. 16, 2010), http://pewInternet.org/~media/Files/Reports/2010/PIP_Generations_and_Tech10.pdf.

⁴⁹ *Trend Data*, PEW INTERNET & AM. LIFE PROJECT (Sept. 2010), <http://www.pewInternet.org/Trend-Data/Online-Activites-Total.aspx>.

⁵⁰ Victoria J. Rideout et al., *Generation M2: Media in the Lives of 8- to 18-year Olds*, KAISER FAMILY FOUND. 2 (Jan. 2010), <http://www.kff.org/entmedia/upload/8010.pdf>.

⁵¹ Amanda Lenhart et al., *Teens and Mobile Phones*, PEW INTERNET & AM. LIFE PROJECT 31, 73 (Apr. 20, 2010), <http://www.pewInternet.org/~media/Files/Reports/2010/PIP-Teens-and-Mobile-2010-with-topline.pdf>.

family time to exercise. Thus, a broad population is practicing technological engagement, strengthening these particular neural circuits day in and day out.

III. Then and Now: Brain Plasticity at Work

One example of brain plasticity at work is our ability to read. “We were never born to read,” writes professor and author Maryanne Wolf in the *Proust and the Squid*, “[r]eading can be learned only because of the brain’s plastic design, and when reading takes place, that individual brain is forever changed.”⁵² Wolf explains that having no genetic disposition or preprogrammed reading circuit, each of us must learn to read in the same way our ancestors did thousands of years ago.⁵³ She describes three principles of brain organization that make reading possible.⁵⁴ The first is the process of connecting older brain structures, such as those for vision and language, to newly formed reading circuits. The second principle involves the brain’s capacity to develop areas of specialization and representation. For example, the lawyer’s brain likely differs from that of an architect; one develops a specialization in language, while the other develops a specialization in spatial relationships.⁵⁵ Third is the reading brain’s ability to do these things automatically, believed to be accomplished with practice.

For thousands of years, we have both welcomed and cautioned against changes in our environments, whether the invention is the railway,⁵⁶ the printing press, the radio, the television, or the iPad. The authors’ Wolf and Carr analogize the current concerns of our technological transition to those echoed by Socrates. In *Phaedrus*, Plato, a student of Socrates, recounts concerns about society transitioning from an oral tradition to writing and reading traditions.⁵⁷ Wolf articulates Socrates’ warnings against reading and writing, wherein he feared that unguided literacy would result in only superficial understanding and not true knowledge.⁵⁸

A number of authors are weighing in with opinions about the potential effects of Internet-style information gathering and reading behaviors. Now, there is a concern that our ability for deep, slow, critical reading is being replaced – or never developed at all - by Internet-style information gathering and reading, and through the process of brain plasticity, we are replacing and pruning-away our deep-reading neural connections with Internet-style neural connections. Carr argues that it is not so much the medium that is at stake, for example, replacing a book in print for a more technologically advanced model, as one can read deeply on the Internet or simply skim a book. Rather, Carr shares his personal observation that deep reading is a struggle for him and in attempting to explain

⁵² MARYANNE WOLF, *PROUST AND THE SQUID* 3, 5 (2007).

⁵³ *Id.* at 11.

⁵⁴ *Id.* at 12 - 15.

⁵⁵ Restak, *supra* note 22, at 19.

⁵⁶ For a discussion of the fear that surrounded the coming of rail transportation see NICK BILTON, *I LIVE IN THE FUTURE & HERE'S HOW IT WORKS: WHY YOUR WORLD, WORK, AND BRAIN ARE BEING CREATIVELY DISRUPTED* 48- 49 (2010).

⁵⁷ Carr, *supra* note 2, at 55.

⁵⁸ Wolf, *supra* note 52, at 74.

why, argues that the Internet's format encourages a certain *type* of reading. It doesn't reward deep reading he explains; rather it rewards abrupt reading, "[w]hen we go online, we enter an environment that promotes cursory reading, hurried and distracted thinking, and superficial learning . . . The Internet is an interruption system. It seizes our attention only to scramble it."⁵⁹ Herein is the debate: whether, through brain plasticity, the Internet-style information gathering and reading that we practice day in and out is our new normal, squeezing out the deep reading neural circuits we worked so hard to achieve.

A. Internet-style Information Gathering and Screen Reading

Internet-style information gathering and screen reading is characterized by a user browsing among webpages, scanning or skimming web content, vertical and horizontal scrolling through web content, and hyperlinking to other webpages. Studies show that reading on the Internet is unlike traditional print reading, and to some, it is no longer even considered reading, rather as previously mentioned it is more appropriately described as screen reading. In a frequently cited 1997 report by Jakob Nielsen, *How Users Read on the Web*, he begins the report by writing simply, "[t]hey don't."⁶⁰ Researchers describe Internet reading as a "snatch and grab philosophy" that is unlike reading in print.⁶¹

In his research, Nielsen found that among high-literacy Internet users, 79% always scanned web pages as opposed to reading them with only 16% of web users reading the content word for word.⁶² Scanning is defined as "[to] look quickly but not very thoroughly" while skimming is "[to] read quickly or cursorily so as to note only the important points."⁶³ Generally, skimming is only a pre-reading, preparatory technique.⁶⁴ Some of the concerns raised about Internet-style reading is that skimming and scanning are becoming our *primary* means of reading, "[o]nce a means to an end, scanning is becoming an end in itself – our preferred way of gathering and making sense of information of all sorts."⁶⁵

When a user decides to stay on a website, research shows the content is evaluated very quickly. In eye-tracking web usability studies, research reveals that when web users scan content, what emerges is a rough "F" pattern when viewed

⁵⁹ Nicholas Carr, *The Web Shatters Focus, Rewires Brains*, WIRED, May. 24, 2010, http://www.wired.com/magazine/2010/05/ff_nicholas_carr/all/1.

⁶⁰ Jakob Nielsen, *How Users Read on the Web*, USEIT.COM (Oct. 1, 1997), <http://www.useit.com/alertbox/9710a.html>.

⁶¹ Julie Coiro, *Exploring Literacy on the Internet*, 56 READING TCHR. 458 (2003) (citing W. Sutherland Smith, *Weaving the Literary Web: Changes in Reading from Page to Screen*, 55 THE READING TCHR. 662 (2002)).

⁶² Nielsen notes differences between high literacy and lower literacy readers. While high literacy readers typically scan and skim web text, lower literacy readers "plow" through the text. Jakob Nielsen, *Lower-Literacy Users: Writing for a Broad Consumer Audience*, USEIT.COM (MAR. 14, 2005), <http://www.useit.com/alertbox/20050314.html>.

⁶³ *Scanning Definition & Skimming Definition*, Oxford Dictionaries (2010), available at <http://www.oxforddictionaries.com>.

⁶⁴ Debra Moss Curtis & Judith R. Karp, *In a Case, In a Book, They Will Not Take a Second Look! Critical Reading in the Legal Writing Classroom*, 41 WILLAMETTE L. REV. 293, 299 (2005).

⁶⁵ Carr, *supra* note 2, at 138.

as a heat map.⁶⁶ In one study, 232 users were recorded as they looked at thousands of web pages. Findings indicated that users typically read horizontally, from left to right, across the top of the content area, then moving down and repeating this reading movement a second time. Then, users often scan down vertically.⁶⁷

Nielsen proposes four reasons why Internet users scan instead of read. First, computer-based reading often causes eye fatigue, and is found to be up to 25% slower than reading from paper, although screen resolution improvements on computer screens and e-readers are leading to improvement in this area.⁶⁸ Second, users need to feel productive while on the Internet, and are compelled “to move on and click on things.” Users typically have time to read no more than 28% of the words on an average page.⁶⁹ Users also do not want to waste effort and limited time on pages with information that is irrelevant and not credible. Analogous to food seeking strategies in the wild, the theory of “information foraging” describes this concept of weeding through information and quickly making choices that maximize return.⁷⁰ In her discussion of information foraging theory as applied to law students, Jones notes, “[w]here information is abundant, and it is for law students, access to more information is not the problem. Rather, the problem is efficient allocation to the right information.”⁷¹

Internet scrolling is the process of “moving displayed text or graphics up, down, or across a computer screen” for viewing.⁷² During the Internet’s early years, users did not scroll, rather, they only evaluated the information within the screen’s visible area.⁷³ Now, users are acclimated to the scrolling function but will spend 80% of their time on a page reviewing information in the screen’s visible area, “above the fold” and only 20% below the fold.⁷⁴ Nielsen reports that Internet users are more likely to read below the fold if they can continuously scroll down, as opposed to having to click through to more pages.⁷⁵ While vertical scrolling is

⁶⁶ Jakob Nielsen, *F-Shaped Pattern for Reading Web Content*, USEIT.COM (Apr. 17, 2006), http://www.useit.com/alertbox/reading_pattern.html.

⁶⁷ Nielsen, *supra* note 66.

⁶⁸ Jakob Nielsen, *iPad and Kindle Reading Speeds*, USEIT.COM (July 2, 2010), <http://www.useit.com/alertbox/ipad-kindle-reading.html>.

⁶⁹ Jakob Nielsen, *How Little Do Users Read?*, USEIT.COM (May 6, 2008), <http://www.useit.com/alertbox/percent-text-read.html>.

⁷⁰ Peter Pirolli & Stuart Card, *Information Foraging*, 106 PSYCH. REV. 643 (1999); Jakob Nielsen, *Information Foraging: Why Google Makes People Leave Your Site Faster*, USEIT.COM (June 30, 2003), <http://www.useit.com/alertbox/20030630.html>; Julie M. Jones, *Not Just Key Numbers and Keywords Anymore: How User Interface Design Affects Legal Research*, 101 LAW LIBR. J. 7, 10 (2009).

⁷¹ Julie M. Jones, *Not Just Key Numbers and Keywords Anymore: How User Interface Design Affects Legal Research*, 101 LAW LIBR. J. 7, 10 (2009).

⁷² *Scrolling Definition*, Oxford Dictionaries (2010), available at <http://www.oxforddictionaries.com>.

⁷³ Jakob Nielsen, *Scrolling and Attention*, USEIT.COM (Mar. 22, 2010), <http://www.useit.com/alertbox/scrolling-attention.html>.

⁷⁴ *Id.*

⁷⁵ *Id.*

the expected method to navigate a web page, research reveals “users hate horizontal scrolling.”⁷⁶

Scrolling may impact reading comprehension especially among readers with lower working memory capacity. Working memory is described as the resources we use to encode, activate, store, and manipulate information while performing cognitive tasks.⁷⁷ Across two studies, researchers tested comprehension using a scrolling and non-scrolling condition.⁷⁸ In the scrolling condition participants read the text in one single page. In the non-scrolling condition participants read the text in 13 separate pages. Both conditions included subheadings. Participants then wrote an essay on the text topic. Findings indicated scrolling had a negative effect on comprehension, and the effects were more pronounced among participants found to have lower working memory.⁷⁹ Researchers proposed possible reasons for their results. Among readers with lower working memory capacity, scrolling may increase cognitive demands. These readers may become lost or lose attention, and without page breaks, may not be able to summarize or engage in the necessary “wrap-up” processes for comprehension.⁸⁰

Following hypertext links is another characteristic of Internet-style reading. Readers expect to interact and engage with the text simply by following through to links of interest. Hyperlinks engage a decision making process that may lead to excessive cognitive load and impaired learning.⁸¹ Research reveals that readers with prior knowledge and higher working memory capacity are less impacted by hypertext features than readers with lower working memory and lower prior knowledge.⁸²

At least one study found that Internet searching is more stimulating to the brain than traditional reading.⁸³ Researchers conducted functional magnetic resonance imaging (fMRI) on 24 people ages 55-78. Subjects were divided into groups according to Internet search experience, either minimal (“Net Naive”) or extensive (“Net Savvy”). In one test condition subjects read text on a computer screen to simulate book reading. In the other condition subjects performed an Internet search task. Functional MRI differences were noted between the two conditions. For the text reading condition, brain activation was demonstrated in regions believed to control language, reading, memory, and visual abilities, and was similar among both the Net Naive and the Net Savvy. However among subjects in the Internet search condition, the Net Savvy subjects showed

⁷⁶ Jakob Nielsen, *Scrolling and Scrollbars*, USEIT.COM (July 11, 2005), <http://www.useit.com/alertbox/20050711.html>

⁷⁷ Diana DeStefano & Jo-Anne LeFevre, *Cognitive Load in Hypertext Reading: A Review*, 23 COMPUTERS IN HUMAN BEHAV. 1616, 1617 (2007).

⁷⁸ Christopher A. Sanchez & Jennifer Wiley, *To Scroll or Not to Scroll: Scrolling, Working Memory Capacity, and Comprehending Complex Texts*, 51 HUMAN FACTORS 730 (Oct. 2009).

⁷⁹ *Id.* at 731.

⁸⁰ *Id.* at 737.

⁸¹ DeStefano & LeFevre, *supra* note 77, at 1616.

⁸² *Id.*

⁸³ Gary Small et al., *Your Brain on Google: Patterns of Cerebral Activation During Internet Searching*, 17 AM. J. OF GERIATRIC PSYCHIATRY 116, 125 (2009).

significant increases in signal intensity in additional regions of the brain believed to control decision making, complex reasoning, and vision. The researchers suggested that Internet searching, even for experienced users, remains a “novel and stimulating process,” lending support to the theory that the type of repetitive activity and attention the Internet requires impacts our brain’s neural circuits.⁸⁴

B. Deep, slow, or critical reading

In contrast to the often quick and exciting world of Internet-style reading is a deep, slow, or critical reading style typically associated with reading in print. Wolf describes deep reading as “the array of sophisticated processes that propel comprehension and that include inferential and deductive reasoning, analogical skills, critical analysis, reflection, and insight.”⁸⁵ Slow reading is described as “reading at a reflective pace” and “practices that reduce the rate of reading to increase comprehension and pleasure.”⁸⁶ Critical reading is described simply as “thinking while reading.”⁸⁷ For Wolf, one of the most important aspects of deep reading is its ability to allow us time to think for ourselves, and to think beyond the text.⁸⁸ She describes this as the Proustian principle, the idea of reading as a method to go beyond an author’s thoughts and words to form our own.⁸⁹ Through our concentrated and reflective engagement with the written word, the breadth and depth of reading transforms and transports us.

Ubiquitous technology and the speed it encourages seem to weigh heavy in many aspects of our lives, whether it involves enjoying the pleasures of food, books, or our everyday activities. Many reject the idea of such a frenzied lifestyle, and several formal and informal slow movements are taking place globally. For example, in 1989 Slow Food International was founded to counter a fast food lifestyle and the loss of food traditions that accompanies it.⁹⁰ CittaSlow, “Slow Cities,” began in 1999 as a way for people to retain and reclaim community traditions and culture.⁹¹ A call for slow reading also is taking place. In a 2007 article by Lindsay Waters, the Harvard University Press’ executive editor for humanities, he calls for a reading revolution to counter our adherence to a “punch-clock” frame of mind when it comes to reading:

What I am asking myself to do is to step out of the grid of time, to experience works of literature anew. What I am asking you to do is

⁸⁴ Small, *supra* note 83, at 125.

⁸⁵ Maryanne Wolf & Mirit Barzillai, *The Importance of Deep Reading*, EDUC. LEADERSHIP, Mar. 2009, at 33.

⁸⁶ JOHN MIEDEMA, SLOW READING 1, 63 (2009).

⁸⁷ Debra Moss Curtis & Judith R. Karp, *In a Case, On the Screen, Do They Remember What They’ve Seen? Critical Electronic Reading in the Law Classroom*, 30 HAMLINE L. REV. 247, 275 (2007).

⁸⁸ Wolf, *supra* note 52, at 225.

⁸⁹ Wolf, & Barzillai, *supra* note 85, at 34.

⁹⁰ *About Us*, SLOW FOOD, http://slowfood.com/international/1/about-us?-session=query_session:1813005B0c5b30D179XMU2B24082 (last visited May 5, 2011).

⁹¹ *About CittaSlow Organization*, CITTASLOW INT’L, <http://www.cittaslow.net/> (last visited May 5, 2011).

to slow reading down, to preserve and expand the experience of reading - at any level, be it in elementary schools, high schools, colleges, or graduate seminars. What I am asking for is a revolution in reading.⁹²

Authors discussing slow reading recognize that there are negative perceptions surrounding it, but distinguish it from the involuntary or laborious reading that was the hallmark of an earlier time when no spaces separated words.⁹³ Rather, slow reading is voluntary reading, the type of reading that is done for the purpose of “savoring it, for enjoying the infinite ways a sentence can unfold – and for returning to passages that sustain and inspire us.”⁹⁴ According to the National Endowment for the Arts November 2007 report, reading for pleasure is strongly correlated with academic achievement. The report found that adolescents who read for pleasure daily or weekly scored better on reading tests than those that read less frequently.⁹⁵

Thomas Newkirk, professor of English at the University of New Hampshire, discusses time-honored strategies that enable a reader to experience the pleasure of slow reading. He believes that readers should own or possess an author’s words through memorizing, paying particular attention to passages that are meaningful to us as readers.⁹⁶ Indeed, Wolf writes that one of Socrates’ primary concerns with the promulgation of the written word was its potential to replace oration and memorization as a means of knowledge acquisition.⁹⁷ Proponents of deep reading, such as Mark Bauerlein, professor of English at Emory University, are advocating for a more balanced approach in our learning environments. Bauerlein proposes slow reading and slow writing spaces as countermeasures to technological inundations, writing, “[d]igital technology has become an imperial force, and it should meet more antagonists.”⁹⁸

Many authors and readers share the viewpoint that deep or slow reading, with its potential to suspend time and free us from our hurried lives, also provides us with an opportunity to reflect and contemplate. Carr extends this belief, arguing that along with a loss of contemplation, the Internet is having a negative impact on our emotions, such as our ability for empathy and compassion.⁹⁹ Not all share this concern. In response to the proposition that empathy is more developed among those who read novels author Adam Gopnik makes this observation in his essay for *The New Yorker*, “if reading a lot of novels gave you exceptional

⁹² Lindsay Waters, *Time for Reading*, CHRON. HIGHER EDUC., Feb. 9, 2007, at B6, B8.

⁹³ Carr, *supra* note 2, at 61.

⁹⁴ Thomas Newkirk, *The Case for Slow Reading*, EDUC. LEADERSHIP, Mar. 2010, at 6, 9.

⁹⁵ NAT’L ENDOWMENT FOR THE ARTS, TO READ OR NOT TO READ: A QUESTION OF NAT’L CONSEQUENCE 14 (Nov. 2007), available at <http://www.nea.gov/research/ToRead.pdf>.

⁹⁶ Newkirk, *supra* note 94, at 9.

⁹⁷ Wolf, *supra* note 52, at 75.

⁹⁸ Mark Bauerlein, *Online Literacy is a Lesser Kind*, CHRON. HIGHER EDUC., Sept. 19, 2008, at B10.

⁹⁹ Carr, *supra* note 2, at 220-221.

empathy university English departments should be filled with the most compassionate and generous-minded of souls, and, so far, they are not.”¹⁰⁰

Thus, among those who are questioning the potential effects of Internet-style information gathering and reading behaviors lies a parallel worry, that our current ability for deep, slow, or critical reading is slowly being replaced, or in plasticity terms, pruned. Some fear these deep reading abilities will not be developed at all in future generations. Given the historical barriers to sustained screen reading – eye strain, comfort, speed – it is no wonder that deep-style reading has taken a backseat to the skimming, scanning, and convenience strategies the Internet promotes.

C. Shifts in Reading Habits

Several now-familiar national reports on reading over the last decade indicate it is on the decline. The July 2004 report of the National Endowment for the Arts, *Reading at Risk: A Survey of Literary Reading in America*, reveals that less than half of the adult population reads literature, such as fiction, poetry, and drama, and the declines were especially apparent among young adults.¹⁰¹ The report’s findings indicate that in 2002, 46.7% of the adult population was reading literature, down from 56.9% in 1982.¹⁰²

The November 2007 report of the National Endowment for the Arts, *To Read or Not To Read*, also revealed a number of startling trends. Findings indicated that while 54% of nine-year olds read for fun every day, this number declined to 30% at age 11, and to 22% by age 17.¹⁰³ Among college freshmen 65% read for pleasure for less than an hour per week, or not at all.¹⁰⁴ Among college seniors, in a given week one in three students read nothing at all for pleasure.¹⁰⁵ Among 15 to 24 year olds, this group spends only seven to 10 minutes a day reading voluntarily, as compared to the two to two and a half hours spent watching television every day.¹⁰⁶ Nearly half of all Americans ages 18 to 24 read no books for pleasure.¹⁰⁷

Legal educators are mindful of such trends and there is optimism on the reading front specific to law students. In a 2006 information literacy survey of 740 incoming law students from seven schools, 48.9% reported that they enjoyed

¹⁰⁰ Adam Gopnik, *The Information: How the Internet Gets Inside Us*, NEW YORKER, Feb. 14, 2011, http://www.newyorker.com/arts/critics/atlarge/2011/02/14/110214crat_atlarge_gopnik#ixzz1IXF5dA4O.

¹⁰¹ NAT’L ENDOWMENT FOR THE ARTS, *READING AT RISK: A SURVEY OF LITERARY READING IN AMERICA ix* (July 2004) available at <http://www.nea.gov/pub/ReadingAtRisk.pdf>.

¹⁰² *Id.*

¹⁰³ NAT’L ENDOWMENT FOR THE ARTS, *TO READ OR NOT TO READ*, *supra* note 95, at 29.

¹⁰⁴ *Id.* at 9.

¹⁰⁵ *Id.*

¹⁰⁶ *Id.* at 9-10.

¹⁰⁷ *Id.* at 14.

reading, and 30% reported they were avid readers.¹⁰⁸ More than 50% of respondents reported reading for pleasure.¹⁰⁹

Carr makes a compelling case that our Internet habits are impacting our ability to be sustained readers, and that our ability to pay attention is suffering because of it. He provides a number of examples to illustrate his viewpoint that the unbundling of content, tweaking of newspaper and magazine content and layouts to mimic websites, and shorter articles are in direct response to consumers' minimal attention and desire for information bytes that better reflect easily consumed Internet-style information. There is some evidence that seems to indicate a rise in popularity for pared-down content. For example, Twitter reports 175 million registered users writing 95 million tweets – short bursts of written information limited to 140 characters – every day.¹¹⁰

As further evidence, Carr notes that music albums are now split apart and sold as single digital downloads, packaged as cell phone ringtones, and embedded into video games, while magazines such as *Rolling Stone*, now reject the type of “sprawling, adventurous features” for which it is historically known.¹¹¹ In 2002 an editor of a magazine geared toward nearly 11 million young men was quoted as saying, “[o]ur readers ... are busier today than they will ever be in their lives; they have shorter attention spans than any previous generation; they are chronically over-stimulated and easily bored.”¹¹²

Boredom with lengthy material is not limited to magazine features. In 2004, Judge Richard Posner wrote an article *Against the Law Reviews* in which he comments, “too many articles are too long, too dull, and too heavily annotated ... many interdisciplinary articles are published that have no merit at all.”¹¹³ Shortly thereafter, Harvard Law Review conducted a survey of U.S. law school professors. Among the 780 law school faculty responses, 85% indicated that law review articles were either too long (53.5%) or somewhat too long (33.1%), prompting Harvard and ten other law schools to promulgate a joint statement on article length stating a strong preference for articles under 25,000 words.¹¹⁴ The statement noted that less lengthy articles would improve legal scholarship quality, improve editing, and result in easier to read articles.¹¹⁵ Prior to this joint statement, Harvard Law Review indicated a preference for submissions under 100 pages of double spaced text, including footnotes.¹¹⁶

¹⁰⁸ Ian Gallacher, *Who Are Those Guys? The Results of a Survey Studying the Information Literacy of Incoming Law Students*, 44 CAL. W. L. REV. 151, 163 (2007).

¹⁰⁹ *Id.* at 165.

¹¹⁰ *What is Twitter?* TWITTER.COM, <http://business.twitter.com/basics/what-is-twitter> (last visited May 5, 2011).

¹¹¹ Carr, *supra* note 2, at 94.

¹¹² Michael Scherer, *Does Size Matter?* COLUM. JOURNALISM REV., Nov.-Dec. 2002, at 32, 33. Quoting Keith Blanchard, editor of *Maxim* magazine.

¹¹³ Richard A. Posner, *Against the Law Reviews*, LEGAL AFFAIRS, Nov.-Dec. 2004, http://www.legalaffairs.org/issues/November-December-2004/review_posner_novdec04.msp.

¹¹⁴ *Law Review Usage Survey Results*, HARVARDLAWREVIEW.ORG (July 2005), http://www.harvardlawreview.org/law_review_usage_survey_results.pdf.

¹¹⁵ *Joint Statement Regarding Articles Length*, HARVARDLAWREVIEW.ORG, http://www.harvardlawreview.org/PDF/articles_length_policy.pdf (last visited May 5, 2011).

¹¹⁶ A preference for a 100 page submission limit appeared at least as early as Vol. 103.

Are such trends reflecting pandering to an impatient mind and self-fulfilling prophecies? Or are they simply reflecting a call for higher quality and more interesting material? Many argue it is the latter, rejecting the notion of a limited attention span as “urban legend.”¹¹⁷ A 2002 article examined whether changes in magazine and newspaper story format and length was in response to a less interested and less attentive consumer. The article’s author discusses more plausible explanations, such as consumers simply having far more choices than they did in the past. Many publications have increased the number of stories while decreasing the length of each to appeal to a larger mass of consumers.¹¹⁸ In response to claims that the magazine medium is dead, five major magazine companies began a campaign of their own in 2010. The ad agency Y&R NY created, “Magazines: The Power of Print” to “challenge misperceptions about the medium’s relevancy and longevity, and reinforce magazines’ important cultural role.”¹¹⁹ According to recent research from the Association of Magazine Media, 93% of U.S. adults read magazines and 96% of magazine readers are under the age of 35.¹²⁰ Among current magazine subscribers, 87% of readers interested in reading magazines on a digital device still want a printed copy.¹²¹ Furthermore, according to statistics from the National Directory of Magazines, the number of magazines offered on topics from health to home increased substantially between 1988 and 2008, increasing from 13,541 to 20,590.¹²² Despite trends indicating that average reading scores have declined in adults of virtually all education levels,¹²³ others argue the Internet is resulting in more reading and writing. For example, author Kevin Kelly notes that 1.5 million blog posts and 12 billion texts are written daily.¹²⁴

In between magazine articles and novels is a growing trend in reading length and format, referred to as long-form journalism, which is enjoying a renaissance on mobile devices and e-readers. The website *Longreads.com* launched in April 2009 to promote long-form journalism by posting daily links to stories. From a drop-down menu, readers can search from a growing list of articles and select from time and length criteria. For example, length categories range from “<15 minutes (<3,750 words) to >60 minutes (>15,000 words).”¹²⁵

¹¹⁷ Scherer, *supra* note 112, at 33.

¹¹⁸ *Id.*

¹¹⁹ *Magazine Publishers Unite & Unveil Industry-Wide Ad Campaign Promoting Strength Of - And Consumer Commitment to - Magazines*, TIMEINC.COM (Mar. 10, 2010), <http://www.timeinc.com/pressroom/detail.php?id=releases/03012010.php>.

¹²⁰ *The Magazine Handbook 2011-2011*, MAGAZINE.ORG/HANDBOOK, 7, <http://www.magazine.org/ASSETS/5EAC524003A54698B5F6EE2A9099157A/2010-11-MPA-Handbook.pdf> (last visited May 5, 2011).

¹²¹ *Id.* at 20.

¹²² *Number of Magazine Titles 1988-2008*, MAGAZINE.ORG, http://www.magazine.org/ASME/EDITORIAL_TRENDS/1093.aspx (last visited May 5, 2011).

¹²³ NAT’L ENDOWMENT FOR THE ARTS, *READING AT RISK*, *supra* note 101.

¹²⁴ Kevin Kelly, *Reading in a Whole New Way*, SMITHSONIAN, Aug. 2010, <http://www.smithsonianmag.com/specialsections/40th-anniversary/Reading-in-a-Whole-New-Way.html>.

¹²⁵ LONGREADS, <http://longreads.com/> (last visited May 5, 2011).

The site indicates its purpose is to identify content “meant not just for scanning but for reading, savoring and digesting.”¹²⁶

In August 2010, the website Longform.org launched as a platform for long-form non-fiction. Describing its articles as those “[c]urated from across the web that are too long and too interesting to be read on a web browser,” it encourages readers to use bookmarking tools such as *Instapaper* and *Read It Later* to facilitate a more enjoyable reading experience.¹²⁷ In January 2011, *The Atavist* launched as a digital publishing platform for long-form edited and fact checked original non-fiction and narratives for a nominal price.¹²⁸ Embedded within its site is a YouTube promotional video explaining its features, specifically how *Atavist*-published stories differ from a typical screen reading experience. Its tagline “Getting Lost. In a Good Way” appeals to readers wishing to get lost in a story’s content, as opposed to literally getting lost in difficult to navigate digital text. Stories feature “digital extras,” for example, photographs, maps, embedded videos, and interactive timelines specifically related to a story’s content. A reader may choose to follow through to these extras for a more interactive experience, or simply ignore them. One article indicates *The Atavist* mobile app has been downloaded 40,000 times in its short history.¹²⁹ Amazon’s Kindle Singles, which describes itself as “Compelling Ideas Expressed at Their Natural Length,” launched in January 2011.¹³⁰ It accepts stories between 5,000 and 30,000 words that are “well researched, well argued, and well-illustrated.”¹³¹

D. Technology Induced Multitasking

While we have always divided our attention, multiple devices and constant connectivity have led to new forms of technology multitasking. We talk on our mobile phone, while looking at email, sending texts, and taking photographs. We use the Internet to jump from task to task. We do these things seemingly simultaneously with one or more devices, prompting researchers to adopt the term “media multitasking” to reflect these behaviors.¹³² Multitasking is described as doing two or more parallel tasks.¹³³ Neuroscience studies show that our ability to carry out multitasking behavior is believed to take place in a particular area of our

¹²⁶ Mark Armstrong, *Now Live: Longreads.com*, (Oct. 26, 2010), <http://markarms.tumblr.com/post/1405989886/now-live-longreads-com-and-why-the-future-of-online>.

¹²⁷ *About*, LONGFORM, <http://longform.org/about/> (last visited May 5, 2011).

¹²⁸ *About the Atavist*, THE ATAVIST, <http://atavist.net/> (last visited May 5, 2011).

¹²⁹ David Carr, *Long-Form Journalism Finds a Home*, N.Y. TIMES, Mar. 28, 2011, http://www.nytimes.com/2011/03/28/business/media/28carr.html?_r=1&sq=atavist&st=Search&adxnnl=1&scp=1&adxnnlx=1301371939-M0J9vsaMI2T1nJOk260n0g.

¹³⁰ Jenna Wortham, *Shorter E-Books for Smaller Devices*, N.Y. TIMES, Feb. 11, 2011, <http://www.nytimes.com/2011/02/13/business/13ping.html>.

¹³¹ *Kindle Singles*, AMAZON.COM, <http://www.amazon.com/b?ie=UTF8&node=2486013011> (last visited May 5, 2011).

¹³² Ulla G. Foehr, *Media Multitasking Among American Youth: Prevalence, Predictors and Pairings*, KAISER FAMILY FOUND. (Dec. 2006), <http://www.kff.org/entmedia/upload/7592.pdf>

¹³³ Terry Judd & Gregor Kennedy, *Measurement and Evidence of Computer-Based Task Switching and Multitasking by ‘Net Generation’ Students*, 56 COMPUTERS & EDUC. 625, 625 (Apr. 2011).

brain, the prefrontal cortex.¹³⁴ Research tells us that although we believe we are carrying out multiple tasks at the same time, in reality a decision-making “bottleneck” forms.¹³⁵ This bottleneck prevents the brain from executing two decision making processes at once. Rather, decisions are processed in sequence with time in between tasks.¹³⁶ When decisions are not required, for example, listening to background music while eating, no decision-making bottleneck forms.¹³⁷

Researchers hypothesize that fast Internet-style information gathering and reading encourages multitasking that zaps our focused attention, and our time. It is believed this interferes with our ability to learn and retain information by impeding the transfer of the new information we have learned from our short term memory to long term memory.¹³⁸ On multitasking, University of Michigan professor David Meyer is quoted as saying, “for tasks that are at all complicated, no matter how good you have become at multitasking, you're still going to suffer hits against your performance. You will be worse compared to if you were actually concentrating from start to finish on the task.”¹³⁹ The end result is that while we may be doing many things, without the sustained attention important for learning, we are not necessarily doing them well. The more we multitask, the worse the outcome is. In a research study on student subjects defined as heavy media multitaskers (19 students) versus light media multitaskers (22 students), the heavy media multitaskers exhibited greater difficulties in three primary areas: filtering relevant information from irrelevant information, managing short-term memory, and switching between tasks.¹⁴⁰

Continuous engagement with technology is believed to place our brains in a heightened state of stress and tension as we wait to receive the next email, text, or IM.¹⁴¹ We crave the novelty.¹⁴² As stated by one researcher, “[t]he mind is

¹³⁴ Etienne Koechlin et al., *Exploring the Role of the Anterior Prefrontal Cortex in Human Cognition*, 399 (6732) NATURE 148 (May 13, 1999); Press Release, NINDS, Multitasking Behaviors Mapped to the Prefrontal Context (May 12, 1999), http://www.ninds.nih.gov/news_and_events/news_articles/pressrelease_prefrontal_cortex_051299.htm.

¹³⁵ Paul E. Dux et al., *Isolation of a Central Bottleneck of Information Processing with Time-Resolved fMRI*, 52 NEURON 1109 (Dec. 21, 2006), available at http://www.psy.vanderbilt.edu/faculty/marois/Publications/Dux_et_al-2006.pdf

¹³⁶ *Id.*

¹³⁷ Restak, *supra* note 22, at 199-200.

¹³⁸ Judd & Kennedy, *supra* note 133, at 626.

¹³⁹ Jon Hamilton, *Multitasking Teens May be Muddling Their Brain*, NPR, Oct. 9, 2008, <http://www.npr.org/templates/story/story.php?storyId=95524385>.

¹⁴⁰ Eyal Ophir, Clifford Nass & Anthony D. Wagner, *Cognitive Control in Media Multitaskers*, 106(37) PNAS 15583(Sept. 15, 2009), available at <http://www.pnas.org/content/early/2009/08/21/0903620106.full.pdf+html>; Clifford Nass, *Thinking About Multitasking: It's What Journalists Need to Do*, NIEMAN REP., Summer 2010, at 11. Researchers developed a questionnaire index to determine mean media; HMM were one more standard deviation above the mean, while LMM were one more standard deviation below the mean.

¹⁴¹ Gary Small, *Focus on One Thing*, N.Y. TIMES (June 7, 2010, 8:03 PM), <http://roomfordebate.blogs.nytimes.com/2010/06/07/first-steps-to-digital-detox/?ref=technology>

wired up to seek new information, and will automatically respond to a signal that something new is available (email, text, phone, tweet).”¹⁴³ Such a Pavlovian response to incoming messages is likened to that of playing a slot machine.¹⁴⁴ Among workers, overload from technology is a serious concern having a quantifiable impact on the U.S. economy. In 2008, the Information Overload Research Group (IORG) was formed to address issues surrounding overload as a barrier to productivity.¹⁴⁵ It cites findings published by one of its member companies, Basex, estimating the loss of worker productivity and innovation at a minimum of \$997 billion per year.¹⁴⁶ In a typical information worker’s day, only 12% of his or her time is spent thinking and reflecting, while 28% of the day is spent on unimportant tasks and refocusing one’s attention.¹⁴⁷

Employees at computer chip manufacturer Intel, an IORG member, were so inundated by email and other interruptions that the company tested strategies such as prohibiting the use of email for one day a week.¹⁴⁸ Researchers studying interruption have found, for example, that people switch simple activities on average every three minutes, and switch projects every ten and a half minutes.¹⁴⁹ An interesting study examined the disruption costs of interruption on workers, finding that interrupted work was actually performed faster. The researchers hypothesized that workers compensate for the interruptions by working faster, the cost of which was likely a heavier workload and more stress, time pressure, and effort exerted.¹⁵⁰

In comparison, a recent study examined the multitasking behaviors of university students in Australia. Researchers examined 6,619 computer log sessions among 526 first and second year medical students at a large university to determine the extent of multitasking on the Internet. Findings did not support the stereotype that the “net generation” are Internet “power users;” students did not

¹⁴² Russell Poldrack, *Novelty and Testing: When the Brain Learns and Why it Forgets*, NIEMAN REP., Summer 2010, at 9.

¹⁴³ Steven Yantis, *Email Can Wait*, N.Y. TIMES (June 7, 2010, 8:03 PM), <http://roomfordebate.blogs.nytimes.com/2010/06/07/first-steps-to-digital-detox/?ref=technology#steven>.

¹⁴⁴ Gloria Mark, *Change the Workplace Norm*, N.Y. TIMES (June 8, 2010, 11:30 AM), <http://roomfordebate.blogs.nytimes.com/2010/06/07/first-steps-to-digital-detox/?ref=technology#gloria>.

¹⁴⁵ *About IORG Research Group*, INFO. OVERLOAD RES. GRP., <http://iorgforum.org/> (last visited May 5, 2011).

¹⁴⁶ *Media Releases*, INFO. OVERLOAD RES. GRP., <http://iorgforum.org/about-iorg/media-releases/> (last visited May 6, 2011).

¹⁴⁷ Matt Richtel, *What Was I Working on Again?* N.Y. TIMES, June 14, 2008, <http://www.nytimes.com/imagepages/2008/06/14/business/14email.graphix.ready.html>.

¹⁴⁸ Matt Richtel, *Lost in E-Mail, Tech Firms Face Self-Made Beast*, N.Y. TIMES, June 14, 2008, <http://www.nytimes.com/2008/06/14/technology/14email.html?pagewanted=1>.

¹⁴⁹ Gloria Mark, *The Effects of Perpetual Distraction*, N.Y. TIMES (Oct. 14, 2009, 6:24 PM), <http://roomfordebate.blogs.nytimes.com/2009/10/14/does-the-brain-like-e-books/?scp=1&sq=%22gloria%20mark&st=cse#gloria>; Gloria Mark, *Current Research Projects*, http://www.ics.uci.edu/~gmark/Home_page/Research.html (last visited May 6, 2011).

¹⁵⁰ Gloria Mark et al., *The Cost of Interrupted Work: More Speed and Stress*, Proc. of the Assoc. for Computing Machinery CHI Confer. 107 (2008), available at <http://www.ics.uci.edu/~gmark/chi08-mark.pdf>.

engage in multitasking as often or heavily as expected.¹⁵¹ Multitasking and its impacts on learning and productivity will continue to receive attention from researchers. As one researcher noted, “[C]ompetition for a student’s attention is an old problem, but now the media are so portable and interesting and flexible that it’s even more tempting.”¹⁵²

IV. The Study of Law is Unique

Although reading and writing has not totally fallen by the wayside in our digital age, perhaps a shift is occurring in its breadth and depth. Tomorrow’s students may not fully appreciate that the skimming, scanning, and screen reading the Internet requires are but only a few of the strategies required for the study and practice of law. If through our use of technology we are potentially replacing our ability to think and read deeply with a more shallow understanding, the standards of the legal profession may eventually be at risk. From the Law School Admission Test (LSAT) and the rigorous curriculum of law school, to bar admission and legal practice, the ability to critically read and analyze informs every aspect of the legal profession.

For example, the Statement on Pre-Law Preparation prepared by the Pre-Law Committee of the ABA Section of Legal Education and Admissions to the Bar specifically states, among other skills, the importance of critical reading abilities:

Preparation for legal education should include substantial experience at close reading and critical analysis of complex textual material ... what is important is that law school should not be the first time that you are rigorously engaged in the enterprise of carefully reading and understanding, and critically analyzing, complex written material of substantial length.¹⁵³

Similarly, as to the Law School Admissions Test, the Statement notes:

The LSAT is designed to measure skills that are considered essential for success in law school: the reading and comprehension of complex texts with accuracy and insight; the organization and management of information and the ability to draw reasonable inferences from it; the ability to think critically; and the analysis and evaluation of the reasoning and arguments of others.¹⁵⁴

¹⁵¹ Judd & Kennedy, *supra* note 133, at 625.

¹⁵² Melissa Ludtke, *Watching the Human Brain Process Information*, NIEMAN REP., Summer 2010, at 13,14.

¹⁵³ ABA & LSAC, OFFICIAL GUIDE TO ABA-APPROVED LAW SCHOOLS 4 (2011 ed., 2010), available at <http://www.lsac.org/jd/Think/prelaw-preparation.asp> (last visited May 6, 2011).

¹⁵⁴ *Id.* at 9, available at <http://www.lsac.org/JD/LSAT/about-the-LSAT.asp>.

The study of law *is* different. Our tools are language and words. While Google's indexing spiders and algorithms will find some of the law for us, it will not tell us how to apply it to our case at hand. While the written word may be reduced to snippets and summaries in some mediums as Carr describes, the law by its very nature demands room and time for its contents. Our success depends on our ability to locate, read, analyze, interpret, and communicate it. If we are to believe the theories of brain plasticity, tomorrow's students will have developed excellent neural circuits for the much needed skills of searching and scanning, but will likely have to work harder than previous generations to develop less dominant skills, such as the ability to discern the relevancy of material, the ability to engage in critical reading, and the ability to move beyond surface information to reach a stage of critical analysis. There is no question that many students have a different set of skills than students from a decade ago. Research shows this population reads the news, but maybe not from a broadsheet newspaper; they write extensively and share their work with a larger community; and they have highly efficient methods for filtering through the barrage of information using, "a multistep process that involves grazing, a 'deep dive,' and a feedback loop."¹⁵⁵

Tomorrow's students are already very well prepared for certain aspects of legal training and practice. The ability to consume and quickly gather information is fundamental, and part of a skill set they have been practicing for years. However, these same students may require additional support to learn the expert reading strategies employed by successful law students. They also may be less familiar with reading literature for pleasure, and its ability to inform the practice of law. A brief discussion of each follows.

In a 1954 article by University of Nebraska Law Librarian Richard C. Dahl, he notes, "[r]eading law' is a term which is rarely used by students nowadays in order to signify the study of law ... most law students could read better than they do and that a small amount of conscious effort aimed at improving one's reading would pay big dividends in the field of law."¹⁵⁶ Nearly six decades later, this statement still rings true. The literature discusses several reasons why the study of law requires more specialized reading skills and sophisticated training to reach the level of expert reader. First, unfamiliar legal terminology can be challenging for new students for a variety of reasons. Taylor et al. explains difficulty arises in understanding unfamiliar terms such as "mens rea," as well as more familiar words like "assault" which take on a very specific meaning in the legal context.¹⁵⁷ Further, students must understand how legal terms relate to each other.¹⁵⁸ Dewitz discusses three problems faced by new law students. These problems include lack of background knowledge about what they are reading, limited understanding of legal text organization and structure, and limited exposure to successful techniques used by expert legal readers.¹⁵⁹

¹⁵⁵ JOHN PALFREY & URS GASSER, BORN DIGITAL 241 (2008).

¹⁵⁶ Richard C. Dahl, *The Technique of Reading as Applied to Law*, 47 LAW. LIB. J 2, 2 (1954).

¹⁵⁷ Lynda Taylor et al., *Reading Is Critical*, 3 UTS L. REV. 128, 128 (2001).

¹⁵⁸ *Id.*

¹⁵⁹ Peter Dewitz, *Reading Law: Three Suggestions for Legal Education*, 27 U. L. REV. 657 (1995-1996).

Christensen expands upon the difficulties new law students encounter with reading strategies. She notes they may employ basic strategies, such as highlighting and underlining, but may not initially employ more advanced strategies.¹⁶⁰ A few of these strategies are described below.

New law students also become overwhelmed with the sheer volume of information they are required to read.¹⁶¹ McKinney describes two common scenarios that emerge. Students spend too much time reading every word of the material to the detriment of processing it, or, they simply skim the material and try to anticipate what a professor may cover in class.¹⁶² It is the latter scenario which is of concern to educators. Roach describes the threat of students' "passivity" in approaching legal studies:

Increased passivity could be most threatening to the demanding study and practice of law. If reading is not valued and complex writing is not learned and practiced, what will happen to the very ethos – and the work ethic – of legal research and study ... When students get so much of their information electronically, and when between one in three or one in four of the college graduates or graduate students may not be reading literature *at all* but instead are passively *receiving* all or most of their information, we may risk churning our increased numbers of highly passive, disengaged learners.¹⁶³

Other authors note that students may equate their Internet-style information gathering abilities as on par with possessing an ability to comprehend complex information.¹⁶⁴ This concern is exactly that discussed by Wolf as a concern of Socrates, that superficial understanding would be confused with real knowledge.¹⁶⁵

A number of studies discuss reading strategies employed by expert readers. These include, for example, problematizing, rhetorical, and default strategies. Explaining previous research by Deegan, Christensen describes problematizing as having a dialogue with the text. A reader may ask questions, make predictions, hypothesize about meaning, and connect to the text's purpose.¹⁶⁶ Dewitz explains that this strategy may involve, for example, looking back through a reading to ask why an event occurred, or to question the accuracy

¹⁶⁰ Leah M. Christensen, *Legal Reading and Success in Law School: An Empirical Study*, 30 SEATTLE U. L. REV. 603, 608 (2006-2007).

¹⁶¹ Ruth Ann McKinney, *How to Read Law Like and Expert*, 35 LAW STUDENT 36, 36 (2006-2007); Curtis & Karp, *supra* note 87, at 250.

¹⁶² McKinney, *supra* note 161, at 36.

¹⁶³ Cathleen Roach, *Is the Sky Falling? Ruminations on Incoming Law Student Preparedness (and Implications for the Profession) in the Wake of Recent National and Other Reports*, 11 LEGAL WRITING 295, 315 (2005).

¹⁶⁴ Curtis & Karp, *supra* note 87, at 250.

¹⁶⁵ Wolf, *supra* note 52, at 77.

¹⁶⁶ Christensen, *supra* note 160, at 609.

of an argument.¹⁶⁷ A reader employing a rhetorical strategy synthesizes the text while connecting it to one's experiences.¹⁶⁸ Basic "default" strategies often involve underlining, highlighting, paraphrasing, and note taking.¹⁶⁹

Christensen examined the prevalence of these reading techniques in a sample of 24 full-time first year law students. Students were divided into two groups, higher performing students (in the top 50% of their class after the first semester), and lower performing students (in the bottom 50% of their class after the first semester).¹⁷⁰ Students were instructed in a procedure called "think aloud," and following a practice test, read a 1,715 word Indiana Supreme Court opinion. In this procedure, subjects read text aloud, and state what they are thinking every few sentences. The think aloud is recorded, and results are analyzed and coded.

Christensen's qualitative observations noted four patterns among the higher performing students. First, the higher performing students related to the purpose of the reading more so than the lower performing students, for example by reading the facts of the case more closely and understanding the case's procedural posture.¹⁷¹ Second, the higher performing students established the context of the case by noting the court, the parties, the date of the opinion, and the subject matter of the case.¹⁷² Third, while most of the students experienced confusion about the case, the higher performing students tended to resolve their confusion by questioning the text and rereading before continuing.¹⁷³ In contrast, the lower performing group tended to make assumptions about the text and continue reading. Fourth, Christensen noted that the lower performing students relied far more frequently than the higher performing students on basic "default" reading strategies.¹⁷⁴ Higher performing students employed both problematizing and rhetorical strategies more often than default strategies.

Several studies have examined whether, and how well, students employ reading strategies with digital text. For example, Liu surveyed 113 participants on their electronic reading behaviors. Relative to default techniques, 54% self-reported always or frequently annotating in print as compared to 11% for electronic documents.¹⁷⁵ Zhang & Duke investigated whether readers use different Internet reading strategies for different purposes, including reading for locating specific information, reading for acquiring general knowledge, and reading for entertainment.¹⁷⁶ Twelve good readers were observed, and results indicated more than 50 strategies were employed, some of which were unique to Internet

¹⁶⁷ Dewitz, *supra* note 159 at 659.

¹⁶⁸ Christensen, *supra* note 160, at 610.

¹⁶⁹ *Id.* at 610.

¹⁷⁰ *Id.* at 608.

¹⁷¹ *Id.* at 634.

¹⁷² *Id.* at 637.

¹⁷³ *Id.* at 640.

¹⁷⁴ *Id.* at 644.

¹⁷⁵ Ziming Liu, *Reading Behavior in the Digital Environment*, 61 J. DOCUMENTATION 700, 708 (2005).

¹⁷⁶ Shenglan Zhang & Nell K. Duke, *Strategies for Internet Reading with Different Reading Purposes: A Descriptive Study of Twelve Good Internet Readers*, 40 J. LITERACY RESEARCH 128, 136-137 (2008).

reading.¹⁷⁷ Strategies included, for example, ignoring advertisements when reading for a specific purpose and for general knowledge, but not necessarily when reading for entertainment; skimming and scanning also were used for all three purposes.¹⁷⁸

While research indicates it is not the case among today's law students,¹⁷⁹ tomorrow's students may perhaps have less experience reading literature. In an article by Patricia Bryan, she discusses the benefits of law students engaging with literary text, "[r]eading and discussing literature reminds law students that emotional engagement and self-reflection are crucial elements for continued moral development; that intuition and empathy can inform, rather than disable, our ability to make right decisions."¹⁸⁰ Bryan traces the history of the law and literature movement to the beginning of the legal profession and its connection to the cultural, intellectual, and political role of lawyers in society at that time. She also references an essay by Justice Cardozo, *Law and Literature*. The 1925 essay published in the *Yale Review* extolls the virtues of judicial opinions made richer by our literary influences, which seems especially relevant now:

The opinion will need persuasive force, or the impressive virtue of sincerity and fire, or the mnemonic power of alliteration and antithesis, or the terseness and tang of the proverb and the maxim. Neglect the help of these allies, and it may never win its way. With traps and obstacles and hazards confronting us on every hand, only blindness or indifference will fail to turn in all humility, for guidance or for warning, to the study of examples.¹⁸¹

Indeed, one can read the opinions of the United States Supreme Court for references to classics such as Steinbeck's *The Grapes of Wrath*,¹⁸² Dickens' *The Adventures of Oliver Twist*,¹⁸³ and Melville's *Billy Budd*¹⁸⁴ and *Moby Dick*.¹⁸⁵ Think of all the great writing that has inspired, transported, and offered new perspectives on people, travels, and moments in history – all through reading.

V. Implications for Teaching: Techniques & Strategies

Every person's mind is built completely differently, totally unique from that of everyone else. Asking twenty students to read the same textbook at the same time is like expecting that group of

¹⁷⁷ *Id.* at 135, 154.

¹⁷⁸ *Id.* at 152.

¹⁷⁹ Gallacher, *supra* note 108.

¹⁸⁰ Patricia L. Bryan, *Reading Literature in Law School and Beyond*, N. C. STATE BAR J., Summer 2009, at 24, 25.

¹⁸¹ Justice Benjamin Cardozo, *Law and Literature*, 48 YALE L. J. 489, 492-493 (1938-1939).

¹⁸² *Adler v. Bd. of Educ. of the City of N.Y.*, 342 U.S. 485, 510 (1951) (Douglas, J., dissenting).

¹⁸³ *Cleary v. Bolger*, 371 U.S. 392, 407 (1962) (Douglas, J., dissenting).

¹⁸⁴ *Chandris Inc. et al. v. Latsis*, 515 U.S. 347, 388 (1994) (Stevens J., concurring).

¹⁸⁵ *Japan Whaling Assoc. et al. v. Am. Cetacean Soc'y et al.*, 478 U.S. 221, 478 (1985) (Marshall, J., dissenting).

students to be able to run a mile at the exact same speed or to have an equal ability to paint a still life. Our brains are simply not built that way.¹⁸⁶

Brain plasticity research tells us that our brains change in response to our activities and environments, and that these changes are unique to each individual. Many students already are accustomed to technologically-induced speed multitasking, and may not recognize that strategy is not necessarily ideal for all tasks, nor appreciate that interruptions can be detrimental to learning and productivity. They also may not fully realize that Internet-style information gathering and reading are quite different from the skills required for critical legal reading and analysis.

Depending upon our individual strengths and weaknesses, there are several techniques and strategies we can implement to take advantage of our brain's amazing ability to adapt. We can start now with two areas identified in the literature as issues for learners in a technological environment: minimizing interruptions that interfere with our ability to have extended periods of concentration, and developing or maintaining a foundation of deep reading ability. Finally, many studies describe the challenges associated with reading digital text. Observations about the more effective digital text interfaces available today are noted.

A. Techniques to Minimize Interruptions and Distractions

“Concentration is no longer a given; it has to be strategized, fought for,” writes Sven Birkerts.¹⁸⁷ Because attention and concentration are required for legal reading and analysis, it is important to minimize those interruptions and distractions that prevent us from reaching a state of concentration. For those who are accustomed to Internet-style information gathering and technology multitasking, practicing focused attention is likely to be a change. Compiled from various published resources, a number of researchers have written about suggested techniques to minimize the negative effects of technological interruptions, all of which would require a minimum of effort to implement:

- “*Ultradian Sprints:*” Author Tony Schwartz, president of The Energy Project, recommends engaging in concentrated periods of attention of 90-120 minutes with “true breaks” in between that allow for periods of mental renewal. Breaks can be just a few minutes, as long as one takes the time to truly disengage from the work at hand, such as by listening to a song, talking to a colleague about something other than work, or taking a walk. He also writes about establishing rituals to ensure such concentrated interruption-free

¹⁸⁶ NICK BILTON, I LIVE IN THE FUTURE & HERE'S HOW IT WORKS: WHY YOUR WORLD, WORK, AND BRAIN ARE BEING CREATIVELY DISRUPTED 237 (2010).

¹⁸⁷ Sven Birkerts, *Reading in a Digital Age*, AM. SCHOLAR, Spring 2010, at 32, available at <http://www.theamericanscholar.org/reading-in-a-digital-age/>.

- periods. For example, establish a consistent routine that email will be processed at certain times of the day only, i.e. 10:15 a.m. and 2:30 p.m.¹⁸⁸
- *Quiet our devices*: Johns Hopkins University professor Steven Yantis recommends giving our brains space to think by turning off devices' alert mechanisms while we engage in activities that induce deeper thinking.¹⁸⁹ This thought is echoed by MIT professor Sherry Turkle, an advocate of loosening ourselves from the tether of technology. She writes, “[w]hen is downtime, when is stillness? The text-driven world of rapid response does not make self-reflection impossible, but does little to cultivate it.”¹⁹⁰
 - *Quiet our minds*: University of Texas professor Russell Poldrack recommends engaging in contemplative practices, such as yoga or meditation, and taking several-days long “technology vacations” to minimize the urge to constantly multitask.¹⁹¹
 - *Avoid Technology-Induced Procrastination*: Clifford Nass, a professor of communications and cognitive science at Stanford University, recommends assessing the reasons why we are multitasking, and identifying whether we are engaging in it for novelty, or as method of procrastination to avoid something we should be doing. If it is the latter, Nass writes we should simply, “tough it out and get back to work.”¹⁹²

B. Techniques to Develop or Maintain Deep Reading Abilities

The importance of developing and maintaining critical reading and thinking skills in the study and practice of law is especially important for any student entering law school with perhaps less preparation than current and previous generations.¹⁹³ Successful reading strategies are found to be correlated to law students' success in school.¹⁹⁴

A screening assessment tool should be considered for each incoming class to ascertain baseline information literacy levels and as a way to identify potentially at risk-students in need of additional support. Such data also could be used to track literacy trends among the law school student population as a way to monitor any statistically significant changes. A comprehensive survey of students' reading and learning habits, such as created and used by Gallacher, could be expanded to include further questions related to evolving technology habits.¹⁹⁵ Teaching

¹⁸⁸ Tony Schwartz, *Manage Your Energy, Not Your Time*, HARV. BUS. REV., Oct. 2007, at 63, 64, 68.

¹⁸⁹ Yantis, *supra* note 143.

¹⁹⁰ SHERRY TURKLE, *ALONE TOGETHER: WHY WE EXPECT MORE FROM TECHNOLOGY AND LESS FROM EACH OTHER* 172 (2011).

¹⁹¹ Russell Poldrack, *Addictive Signals*, N.Y. TIMES (June 8, 2010, 7:20 AM), <http://roomfordebate.blogs.nytimes.com/2010/06/07/first-steps-to-digital-detox/?ref=technology#russell>.

¹⁹² Clifford Nass, *Why Are You Multitasking?* N.Y. TIMES (June 8, 2010, 11:30 AM), <http://roomfordebate.blogs.nytimes.com/2010/06/07/first-steps-to-digital-detox/?ref=technology#clifford>.

¹⁹³ Roach, *supra* note 163, at 296-297.

¹⁹⁴ Christensen, *supra* note 160, at 646.

¹⁹⁵ Gallacher, *supra* note 108.

strategies can be tested and adapted depending on a student's skill and familiarity with digital text. A subsequent survey could be used at the end of each school year to ascertain whether and how student preferences and reading and learning habits change over time.

For example, queries could include whether and to what extent a student engages in other activities – emailing, texting, etc. while reading and for how long the student is able to remain engaged in the material without multitasking. Queries also could ascertain a student's specific preferences for reading medium and material, for example:

- Does the student have strong preferences for reading in print, on a computer, or a combination of both?
- Does the student also use a portable e-reader (such as today's iPad/Kindle/Nook, etc.), an e-reader application on a computer screen (such as the free Kindle app), or an e-reader on a mobile phone?
- Does the reading medium depend on the content? For example, does the student express a preference for one medium or another depending on whether the material is a monograph, a scholarly article, a news story, or a treatise?
- Does the student have a preference for reading a PDF, or continuous HTML scrolling text, and why?
- Does the student work using two or more computer screens? For example, reading from one, writing from the other?
- Does the student use annotating tools for digital text, or, take notes by hand?
- Does the student have any particular challenges when working with digital text?
- What is the student's experience working with electronic databases for scholarly research? How does she or he manage the research results?

Though outside the scope of this paper to cover in depth, there are many excellent resources detailing a variety of methods to achieve excellence in critical reading and analysis in law and other disciplines. In addition to the reading techniques noted by Christensen¹⁹⁶ and previously described, the literature discusses several strategies most often employed by expert readers. Employing these techniques may be helpful for beginning readers of legal text, as well as more experienced readers who perhaps have unintentionally developed an overreliance on Internet-style information gathering and reading, and are briefly summarized from the literature:

- *Teach students to identify the purpose of the reading before beginning:* Students should learn to identify why a particular reading is important and “connect to its purpose.”¹⁹⁷ In a study by Christensen, ten expert readers and ten novice readers were told to read a text for the purpose of preparing for a client interview. Among the expert readers, nine out of ten used the assigned

¹⁹⁶ Christensen, *supra* note 160, at 634.

¹⁹⁷ Leah M. Christensen, *The Paradox of Legal Expertise, A Study of Experts and Novices Reading the Law*, 2008 BYU EDUC. & L.J. 54, 70 (2008).

- purpose to read more effectively, as compared to four out of ten novice readers.¹⁹⁸ Of total reading time, expert readers spent 11.39% connecting to the purpose of the reading, as opposed to 4.49% for the novice readers.¹⁹⁹ Having an awareness of the purpose of the reading leads to more focused reading, and assists with identifying relevant information.²⁰⁰
- *Teach students to identify context and structure cues:* McKinney recommends identifying a material's cues and orienting structures including the table of contents, sections and subsections, and length.²⁰¹ Christensen notes that expert legal readers read the context of the case very closely, paying particular attention to the court, date, and type of decision before beginning to read an opinion.²⁰² Curtis & Karp discuss specific orienting steps a reader can take when preparing to read electronic text specifically, such as previewing and bookmarking hyperlinks to assist with maintaining the digital trail connection to the primary material.²⁰³
 - *Teach students to adjust reading style to the material at hand:* As far as pace and speed of reading, a number of authors note the importance of adjusting one's speed for the material at hand. Not all material requires deep or slow reading. As previously discussed, skimming and scanning are pre-reading techniques that should be employed to establish organization, length, context, and orienting structure.²⁰⁴ For law students, Christensen suggests that the "skim and skip" technique used by expert legal readers is most appropriate for a law student in his or her second and third year of law school, by which time he or she has gained some experience with legal reading and analysis.²⁰⁵
 - *Teach and model expert reading techniques:* Currie Oates recommends a number of strategies to improve reading skills. First, a new law student may need to be explicitly instructed in the differences between legal reading and non-legal reading.²⁰⁶ Modeling expert reading strategies, whether orally or in writing, is an additional technique.²⁰⁷ Lasso suggests teaching new law students how to read a case by providing specific written instruction (outline or checklist format) along with a tutorial.²⁰⁸
 - *Employ post-reading techniques:* Curtis & Karp recommend incorporating post-reading questions that encourage and facilitate an understanding of the

¹⁹⁸ *Id.* at 70.

¹⁹⁹ *Id.* at 66.

²⁰⁰ Curtis & Karp, *supra* note 87, at 279.

²⁰¹ McKinney, *supra* note 161.

²⁰² Christensen, *supra* note 197, at 67.

²⁰³ Curtis & Karp, *supra* note 87, at 279.

²⁰⁴ *Id.*

²⁰⁵ Christensen, *supra* note 197, at 86 fn. 140.

²⁰⁶ Currie Oates, *Leveling the Playing Field: Helping Students Succeed by Helping Them Learn to Read as Expert Lawyers*, 80 ST. JOHN'S L. REV. 228, 251 (2006).

²⁰⁷ *Id.* at 252.

²⁰⁸ Rogelio Lasso, *From the Paper Chase to the Digital Chase: Technology and the Challenge of Teaching 21st Century Law Students*, 43 SANTA CLARA L. REV. 1 (2002-2003). Lasso offers additional strategies at http://blogs.law.siu.edu/success/archives/case_briefing_tips/index.html (last visited May 6, 2011).

- material that moves students beyond simply summarizing.²⁰⁹ To improve reading recollection, Nielsen recommends reading text, doing a “free recall” test of what is remembered, followed by a re-reading.²¹⁰
- *Encourage reading for pleasure in law school and beyond:* As previously discussed, the benefits of reading literature are numerous. Reading for pleasure allows the brain to rest and think, and is a welcome respite from legal text reading and writing. The goal is to build up tolerance and pleasure for sustained reading which is easier to do when the material is interesting and engaging. Summer reading lists can be used to encourage reading for fun and leisure.

C. Managing Digital Text

While tomorrow’s students will be familiar with digital text, as novice readers of *legal* text they must become familiar with new terminology, new structures, and new context. While there are certainly format differences among printed works, readers can expect a stable and predictable structure. Most tables of contents are at the front of a work; most indexes at the back. One can generally make assumptions about a work (length, depth, time necessary to read it) simply by looking at its physical dimensions. In comparison, there is a great variety in the structure and navigation of digital texts. A table of contents may be difficult to locate; an index may not exist or be located at the beginning as opposed to the end.

Curtis & Karp describe a number of differences between reading print text and reading electronic text, including screen flicker, display quality, material orientation, color, and presence of imagery.²¹¹ Recent research reveals that although electronic book reading is not yet faster than printed book reading, e-books are greatly improved. Nielsen writes that reading with an iPad is 6.2% slower, and the Kindle is 10.7% slower, than reading in print. All three formats (paper, iPad, and Kindle) were rated by testers as more satisfying than reading on a computer.²¹² However, publishers of electronic content now offer readers more friendly and intuitive interfaces which greatly improve one’s experience with digital text. These include wide margins, white space, headings and subheadings, properly spaced text, indices, and within-text navigation hyperlinks, word counts, and often MP3 or audio files to improve accessibility.

Although tomorrow’s law students will most likely be very familiar and comfortable with screen reading, they may not be as familiar with the nuances of various databases most frequently used for legal research. Expanding upon the expert reading strategies and checklists discussed in the literature and briefly mentioned above, a tool or checklist for managing digital text and minimizing

²⁰⁹ Curtis & Karp, *supra* note 87, at 282-283.

²¹⁰ Jakob Nielsen, *Test Taking Enhances Learning*, USEIT.COM (Jan. 31, 2011), <http://www.useit.com/alertbox/learning-recall.html>.

²¹¹ Curtis & Karp, *supra* note 87, at 252-254.

²¹² Jakob Nielsen, *iPad and Kindle Reading Speeds*, USEIT.COM (July 2, 2010), <http://www.useit.com/alertbox/ipad-kindle-reading.html>.

distractions for novice users can be piloted and tested in future research. This tool could incorporate, for example, specific strategies to manage database navigation and readability of digital text by setting database preferences prior to diving into the material. It also could recommend specific suggestions to assist new students with improving concentration and focused attention to facilitate comprehension and understanding. For example, the tool might include tips to deal with some of the following issues:

- *Techniques to improve concentration:* Students may feel compelled to follow-through to hyperlinks that all look relevant, become sidetracked with unfamiliar terminology, and become easily distracted when trying to engage with legal material:
 - o *Develop a strategy for dealing with text interruptions:* With Internet-style information gathering and reading, clicking on hyperlinks is a natural way of navigating the material. Students having trouble with concentrated reading likely will benefit initially from holding-off on hyperlink follow-through while building a tolerance to the complexity of legal text.
 - o *Implement vocabulary exercises:* A number of researchers note the benefits of learning and expanding one’s vocabulary to enhance brain performance. To minimize interruptions, strategies might include making a list of words requiring definitions during pre-reading skimming and scanning and holding off on looking up definitions until completing a pre-read.
 - o *Focus on reading with a purpose:* Reading with a purpose improves efficiency, effectiveness, comprehension, and retention.²¹³ As noted by Christensen, “[s]hort, focused reading is more beneficial than hours spent in the library staring at legal text.”²¹⁴ Christensen notes that expert legal readers create their own purpose in the absence of one; students can do this as well by imagining they are reading as a judge or legal counsel on the case.²¹⁵

- *Techniques to improve comprehension:* Previous research reveals that reading scrolling text versus paginated text may present comprehension difficulties for some readers, while others prefer pagination. Researchers found that a scrolling format reduced understanding of complex topics from web pages, especially for readers who were lower in working memory capacity.²¹⁶ Some researchers suggest that for optimal reading comprehension, one strategy is to

²¹³ Christensen, *supra* note 197, at 70; Leah M. Christensen, *Legal Reading and Success in Law School: The Reading Strategies of Law Students with Attention Deficit Disorder (ADD)*, 12 SCHOLAR 173, 209 (2009-2010).

²¹⁴ Leah M. Christensen, *Legal Reading and Success in Law School: The Reading Strategies of Law Students with Attention Deficit Disorder (ADD)*, 12 SCHOLAR 173, 209 (2009-2010).

²¹⁵ *Id.*

²¹⁶ Sanchez & Wiley, *supra* note 78, at 737.

- break electronic reading material down into smaller “paginated” chunks.²¹⁷ A student should identify whether she or he prefers single-page continuous reading or paginated reading, recognizing the answer may vary depending on the reading material and hence some flexibility is required. A student should work to identify and control the pace of his or her reading, learning when to spend more time on some sections than others.²¹⁸
- *Techniques to aid in website navigation and readability:* Students will benefit from getting to know the navigation nuances of the most frequently used databases for legal research:
 - o *Adjust preferences:* When working on a laptop as many students do, the viewable area and readability options vary greatly among databases. A student should be instructed to take the time to become familiar with the preference settings of frequently used digital resources to optimize functionality. For example, in the current version of LexisNexis, one must select the *view in printer friendly format* icon to improve the viewable area. Otherwise, when reading a case on a laptop for example, the top one-third of the viewing area is essentially dedicated to branding, leaving only an approximate two-inch wide horizontal band from which to read the most important contents. In comparison, the WestlawNext *display options* icon allows a reader to adjust a variety of preferences, including size of font (from small to extra-large), type of font (four choices), and width of content area (narrow, normal, wide). A *full screen* icon also is available, greatly increasing the viewable area while retaining navigation icons. There also is plenty of white space and generous spacing between lines of text. HeinOnline also allows for excellent navigation of PDFs, allowing one to read the digital resource in its original print format. A full screen option and user-controlled toolbar that allows one to increase or decrease the size, while hiding the left navigation bar, also is helpful. Aiding readability, each document page is layered against a dark blue background, resulting in an excellent contrast between the background and foreground.²¹⁹
 - o *Locate each database’s structural cues and become familiar with its organization:* Skimming and scanning should be used to identify the structure and organization of digital material.²²⁰ A new law student

²¹⁷ *Id.*

²¹⁸ For suggestions on how to assess one’s reading speed, see Christensen, *supra* note 214, at 207.

²¹⁹ Dale Purves at Duke University’s Center for Cognitive Neuroscience studies human perception of brightness and color. The Purves Labs website includes “See for Yourself” perception demos to test color perception, for example, why certain colors appear brighter than others.

PURVESLAB.NET, <http://www.purveslab.net/seeforyourself/> (last visited May 7, 2011). Contrast also is a feature of the Kindle for PC application; white “book” pages are set against a black background.

²²⁰ Curtis & Karp, *supra* note 87, at 280.

should be instructed to take the time to locate the structural cues²²¹ provided within the digital text interface such as indices and table of contents, and understand that there is no consistent format among databases for such cues. For example, a student may find a table of contents for secondary material in the current version of LexisNexis for Law Schools in the top left corner by looking for “TOC.” On Westlaw Classic, a table of contents link may appear next to the source on the main source selection page. In the current version of WestlawNext, a table of contents button is available for statutes and regulations by clicking on “preferences,” and then “search.” The goal with this technique is for a reader to simply identify the particular cues that increase his or her ability to manage digital text and improve its readability, such as identifying whether and where a PDF version is available, how to increase or decrease the font size, how to navigate among pages, and how to maximize research trails for organization and efficiency.

VI. Conclusion: Training and Care of the Brain

Is Google making us stupid? In a 2010 *Future of the Internet* report addressing this question, 75% of the 895 technology stakeholders and critics surveyed agreed with this statement: “By 2020, people’s use of the Internet has enhanced human intelligence; as people are allowed unprecedented access to more information they become smarter and make better choices. Nicholas Carr was wrong: Google does not make us stupid.”²²² After reviewing numerous published studies, reports, news, popular works, and blogs exclusively using the Internet to access library catalogs, electronic databases, electronic books, and websites, I can’t say I wholeheartedly agree with Carr’s position. But I do have a new understanding of the pull of technology, and the need to balance it.

With the pace of technology it is difficult to predict what the future holds and whether his predictions will come to fruition. As our legal learning environment continues to trend from a print to an electronic environment, brain plasticity has the potential for both amazing outcomes and negative consequences. It is clear that legal reasoning and analysis requires a different style of learning than the Internet encourages, and upward and downward trends in LSAT scores, bar passage rates, even malpractice claims for failure to act competently should be monitored to assess for correlations and/or statistically significant changes. To help manage digital influences, educators may want to consider expanding and/or piloting baseline surveys of information literacy levels to assess digital habits, implement screening tools to spot learning issues, and incorporate digital text

²²¹ McKinney, *supra* note 161.

²²² Janna Quitney Anderson & Lee Rainie, *The Future of the Internet*, PEW INTERNET & AM. LIFE PROJECT 2 (Feb. 19, 2010), <http://www.pewinternet.org/~media/Files/Reports/2010/Future%20of%20Internet%202010%20-%20AAAS%20paper.pdf>.

reading and management checklists that new law students may consult should they need additional support.

As a runner I often think of most things in terms of training for a race. For example, when I know a project will take mental stamina, I break the activity into mental training runs. A half marathon after all, is simply three, four mile runs (give or take a few hundred meters). Similarly, Restak, citing neurologist Kenneth Rockwood, uses the marathon as a metaphor for the brain, “[a]s our brains age, we must prepare them to resist injury – equip them with good education, train them thoughtfully with challenging regimens, support them with nurturing environments, and be prepared to refresh from time to time.”²²³ He notes that like a runner, it is believed the brain can be improved with training and effort.²²⁴

Thus, even if the Internet is changing our brains in unexpected ways, it certainly need not be gloom and doom. Wolf describes the best of both worlds, where we develop and exercise our deep reading neural circuits along with the sharp and quick neural circuits that Internet-style information gathering and reading offers us.²²⁵ We are in control of our destiny in this regard. The trick is simply to recognize what is at stake, and be mindful of our environment and how we use our technological tools. If certain technologically induced behaviors begin to negatively dominate our time and effort, then we should make a change. We will regret it if we and future generations spend so much time with our screens that we miss the world around us. Because what is more enjoyable than looking at our tropical island screen saver? It is experiencing the real thing, preferably with a few insightful and delightful books at our side.

²²³ Restak, *supra* note 22, at 252.

²²⁴ *Id.*

²²⁵ Wolf, *supra* note 52, at 228-229.